C.A.P.E. ESTUARIES PROGRAMME

Generating Education & Awareness of the Estuaries in the Cape Floristic Region

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C.A.P.E. Estuarine Management Guideline

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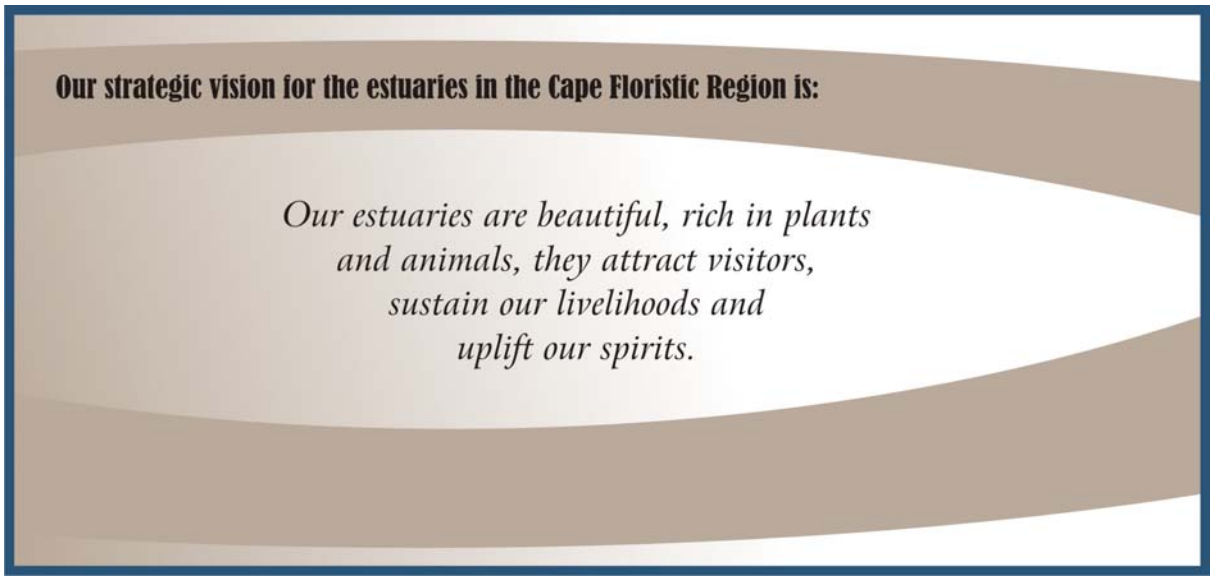

C.A.P.E. Estuaries Guideline 8: Generating Education and Awareness of the Estuaries in the Cape Floristic Region

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Education & Awareness

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1. Background to education and awareness

Estuaries provide important goods and services that help sustain human life, conserve biological diversity and combat the impacts of climate change. Communication, education and public awareness are the tools for changing people's social, political, economic and cultural perceptions regarding the goods and services provided by estuaries.

Mainstreaming estuarine biodiversity involves the processes by which societies, businesses and governments can be brought to recognise the full functions, services and benefits derived from ecosystems and the natural environment and then to act to give these values appropriate effect in decision making. Mainstreaming is achieved through communication, education and awareness. Managers involved in the implementation of effective educational and awareness programmes need tools and expertise to engage stakeholders and to convey appropriate messages in order to mainstream the wise use of estuarine goods and services in society.

Communication is a two-way exchange of information leading to mutual understanding. It can be used to gain the involvement of actors and stakeholders and is a means to gain cooperation of groups in society by listening to them and clarifying why and how decisions are made (Ramsar 2003). This communication needs to operate laterally, across and among relevant sectors, and vertically, from stakeholders to governments and back.

Awareness brings the issues relating to wetlands (including estuaries) to the attention of individuals and key groups who have the power to influence outcomes. Awareness is an advocacy exercise that helps people to know what and why an issue is important, the aspirations for the targets and what is and can be done to achieve these (Ramsar 2003).

Education is a process that can inform, motivate and empower people to support conservation not only by inducing lifestyle changes but also by fostering changes in the way that individuals, institutions, businesses and governments operate (Ramsar 2003). Education includes formal education through schools and colleges, research at tertiary institutions, as well as community education and the informal education of those who use and manage estuaries (English Nature 1993).

Estuaries are valuable sites for education, as they are comparatively accessible and can illustrate a good number of natural processes, habitats and species in a small area. They are visually exciting, as they are highly dynamic and change with the tide and seasons (English Nature 1993). Community education is important for social development and can enhance people's interest and pride in their estuary. This makes it easier for people to understand reasons behind management decisions and is more likely to promote self-regulation.

Ongoing education and awareness are needed of those who use and manage estuaries to improve their ability to make the right decisions and respond to change. Through the involvement of local stakeholders, information can diffuse out and influence the attitudes and behaviours of local communities.

2. Formal education at tertiary institutions

A short review is provided below on existing training and educational programmes for estuaries focusing on tertiary institutions (such as universities and technical colleges) (See Table 1). Members of the Consortium for Estuarine Research and Management (CERM) were invited to provide input on the modules offered by their tertiary institutions. The information was collated in an excel worksheet. Seven universities responded, with details from Stellenbosch University and Walter Sisulu University still outstanding. Technical colleges and technikons offering training opportunities in estuaries through their nature conservation courses have not yet been identified.

At the University of the Western Cape, estuaries are briefly addressed in a single undergraduate course and, at the University of Fort Hare, an honours module is offered by the South African Institute of Aquatic Biodiversity, Grahamstown. Universities that offer both undergraduate and postgraduate modules include Nelson Mandela Metropolitan University, Rhodes University, the University of Cape Town, the University of Johannesburg, the University of KwaZulu-Natal and the University of Zululand. At undergraduate level, estuaries are generally a component of a larger course, such as Marine Biology or Environmental Management.

The list of existing training and education programmes indicates that skills can be acquired in a number of disciplines at postgraduate level. Adequate opportunities are available for postgraduate study in the biological sciences. Fewer opportunities are available for the study of physical or chemical processes, although these are often addressed as a component of biological studies. Training in resource economics with estuaries as a topic is also possible at various institutions. Social science opportunities in relation to estuaries are few. Course work in MSc studies is offered at two universities.

3. Less formal training opportunities

The following two additional training courses were recently developed to support estuarine management:

- Introductory Training Course on Estuarine Management in South Africa
- Resource Directed Measures: Estuarine Reserve

3.1 Introductory Training Course on Estuarine Management in South Africa (Eastern Cape Estuaries Management Programme) (ECEMP)

The Introductory Training Course on Estuarine Management in South Africa was developed by the CSIR as part of the ECEMP and funded by the Water Research Commission (WRC) (Van Niekerk, Taljaard and Schonegevel 2007). The course forms part of the ECEMP Phase II, which focuses on the development of a capacity of local authorities and stakeholders.

The material included in the training course is based primarily on issues highlighted by the ECEMP as part of discussions with local authorities and stakeholders. The course material is available from the WRC (without cost for residents of South Africa).

Table 1. Estuary courses available at tertiary institutions

UNIVERSITY	*MODULE*	*LEVEL*	*COURSE CONTENT*
Nelson Mandela Metropolitan University	*Botany Department*		
	BOT 140 Ecology and Environmental Management	*1st year*	*Brief introduction to the importance of estuaries and their freshwater requirements*
	BOT 230 Marine Botany	*2nd year*	*Estuary structure and function*
	BOT 350 Research project	*3rd year*	*Research project, including estuary topics*
	BOT 430 and BOT 440 Elected topic	*Honours*	*Estuary ecology, estuary management*
	BOT 450 and BOT 460	*Honours*	*Research project, including estuary topics*
	BOT 500	*MSc*	*Master's research on topics of estuary botany*
	BOT 600	*PhD*	*Doctoral research on topics of estuary botany*
Nelson Mandela Metropolitan University	*Zoology Department*		
	ZOO 140a Introduction to Ecology	*1st year*	*Introductory course to ecology that includes aspects of estuarine ecology, e.g. the behaviour of zooplankton*
	ZOO 140b Introduction to Marine Biology	*1st year*	*Introductory course to marine biology that includes estuaries*
	ZOO 311 Aquatic Ecology	*3rd year*	*Big section devoted to estuarine structure and function*
	ZOO 425 Research project; seminar	*Honours*	*Students select projects or seminars that may cover any aspect of estuarine ecology*
	ZOO 474 Coastal Zone Integrated Environmental Management	*Honours*	*Elective module that includes estuaries*
	ZOO 482 Conservation Biology and Planning	*Honours*	*Elective module that includes estuaries*
	ZOO 500	*MSc*	*Master's research on topics of estuarine biology or ecology*
	ZOO 600	*PhD*	*Doctoral research on topics of estuarine biology or ecology*
Nelson Mandela Metropolitan University	*Economics Department*		
	ECO 400 Environmental Economics	*Honours*	*Coverage of estuaries provided under renewable resources and valuation sections*
Rhodes University	*Zoology Department*		
	Zoology 302 course	*3rd year*	*Brief introduction to the ecological functioning of estuaries*
	Marine Biology Honours	*Honours*	*Estuary structure and function*
	Master's	*MSc*	*Master's research projects on estuarine food webs*

UNIVERSITY	*MODULE*	*LEVEL*	*COURSE CONTENT*
	PhD	*PhD*	*Doctoral research projects on estuarine food webs*
	DIFS	*Honours*	*An introduction to estuarine ichthyology (presented by SAIAB)*
University of Cape Town	*BIO 3002S Marine Ecology*	*3rd year*	*Review of marine ecology with reference to South Africa*
	Honours	*4th year*	*Resource economics research projects*
	Master's	*MSc*	*Master's research on topics of estuarine birds or resource economics*
	PhD	*PhD*	*Doctoral research on topics of estuarine birds or resource economics*
University of Fort Hare	*Zoology Department*	*Honours*	*An introduction to estuarine ecology (presented by SAIAB)*
University of Johannesburg	*DKE 3A10 Basic and Marine Ecology*	*3rd year*	*Introductory lectures on the role of estuaries*
	DKE 0127 Indices for Biotic Integrity of Aquatic Ecosystems	*Honours*	*Introduction to the estuarine ecology and biological indices used in estuaries*
	DKE 0028 Freshwater and Estuarine Ecology	*MSc*	*Tutored MSc in aquatic health: Estuarine ecology and management with a fieldwork component*
	DKE 0018 Research article	*MSc*	*Mini-dissertation research topic in aquatic health*
	MSC 009	*MSc*	*Dissertation-based research topic in zoology, aquatic health or biodiversity*
	PHD 003	*PhD*	*Thesis-based research topic in zoology, aquatic health or biodiversity*
University of KwaZulu-Natal	*BIOL 231 Marine Environment*	*2nd year*	*Introduction to the biological, chemical, geological and physical processes of the marine environment*
	BIOL 341 Marine Systems	*3rd year*	*Marine ecosystems in the context of the global biosphere*
	BIOL 342 Marine Ecophysiology	*3rd year*	*Physiological functioning of marine animals, algae and plants in response to physio-chemical processes*
	BIOL 343 Marine Conservation	*3rd year*	*Principles of the sustainable management and protection of marine resources*
	BIOL 781 Marine Biodiversity	*Honours*	*Analysis of marine diversity at organism and ecosystem levels*
	BIOL 782 Fisheries Science	*Honours*	*Concepts of marine resource or stock assessment, modelling and management*
	BIOL 784 Marine Ecosystem Analysis	*Honours*	*Integrated marine ecosystem functioning: Theory and practical or analytical applications*
	BIOL 884 Coastal Ecology	*Master's CW*	*Coastal ecosystem structures, functions and processes*
	BIOL 880 Course work: Marine dissertation	*Master's CW*	*Course work: Master's in Marine and Coastal Management (MM&CM): Mini-dissertation*
	LAWS 8OL Ocean and Coastal Law	*Master's CW*	*Legislative tools for the protection of the marine environment, with emphasis on South Africa*
	ENVS 705 Environmental Impact Assessment	*Master's CW*	*Evaluation of policies, plans and programmes as they impact on the marine and other environments*

	ECON 8PE Principles of Environmental Economics	*Master's CW*	*Concepts of micro and macroeconomics applied to marine and other environmental goods and services*
	BIOL 810 Master's of Science by research only	*Master's R*	*Original dissertation (at least 3/4 of total credits) with optional course-work modules (max. 1/4 of credits)*
	BIOL 910 PhD (Doctor of Philosophy)	*Doctoral*	*Original research thesis*
	ENCV 8EF Environmental Fluid Dynamics	*MScEng*	*P/grad. course of environmental flows and modelling (inc. estuary hydrodynamics)*
	MScEng (Research)	*Master's R*	*Research topics in estuary bio-hydrodynamics*
	PhD (Engineering)	*Doctoral*	*Research topics in estuary bio-hydrodynamics*
University of Western Cape	*BCB 342 Ecosystem Diversity and Function*	*3rd year*	*Includes a marine biology, estuary and mangrove section*
University of Zululand	*SZBLZ 33 Animal Ecology III: Estuarine Ecology*	*3rd year*	*Nature and classification of estuaries, physical and biological characteristics, adaptations of fauna to estuarine conditions, the productivity and functioning of estuaries. Conservation and management: Case studies.*
	SZL 502 Estuarine Ecology	*Honours*	*Advanced module building on 3rd-year course*
	SZL 505 Research project available in a wide range of estuarine fields	*Honours*	*Content dependent on topic, fish, zooplankton, benthic invertebrates and ecophysiology main fields*
	SZL 700 Research dissertation: Estuarine focus	*MSc*	*Original research: Available in a wide range of estuarine fields: Content dependent on topic, fish, zooplankton, benthic inverts and ecophysiology main fields*
	SZL 800 Research thesis: Estuarine focus	*PhD*	*Original research: Available in a wide range of estuarine fields: Content dependent on topic, fish, zooplankton, benthic inverts and ecophysiology main fields*

The training course material includes the following:

- Short Training Course (PowerPoint presentation), which is aimed at senior municipal officials (one to two hours).
- Full Training Course (PowerPoint presentation), which is aimed at officials involved in actual on-the-ground management of estuaries and which can also be used as an individual training tool (one to two days).
- Training Course Manual, which includes more detailed information on different aspects addressed in the training modules (MS Word document).
- Instructor's Notes (MS Word document), which give guidance to the presenter/s of the course.
- A CD, which contains the interactive PowerPoint presentations, the Training Course Manual and Instructor's Notes.

The course was developed in a modular fashion to allow for flexibility. Modules on the following topics are included:

- The value of estuaries;
- Information on how estuaries work;
- Activities threatening estuaries;
- Legal mandates;
- Governance and management; and
- Introduction to management tools.

Although the CD provides a directory containing all the course material, presenters are recommended to select specific modules (or extracts of modules) to customise training material according to their particular needs. A recommended short course is also provided on the CD and includes extracts from the following modules:

- The value of estuaries;
- Legal mandates; and
- Governance and management.

Useful environmental data and information sources considered relevant to estuarine management in South Africa are provided in Appendix A, while Appendix B contains a list of important infrastructural needs essential to the effective operational management of estuaries.

3.2 Resource Directed Measures: Estuarine Reserve (DWAF)

The short Resource Directed Measures: Estuarine Training Course (one day) was developed by the Amazon Project (funded by the WRC) under the guidance of Prof. G Bate and the Amazon Team (2001-2004). The course material focuses on estuarine ecological flow requirements and how to determine an estuarine reserve. The details of this course are in the process of being incorporated into the FET water training programme.

Components included in the course material are as follows:

- Background on the Resource Directed Measures (RDM) process;
- Types of estuaries;
- Estuarine ecosystems;
- Abiotic components (such as hydrodynamics and water quality);
- Biotic components (such as vegetation);
- Determining the present ecological status;

- Determining estuarine importance; and
- Deriving the recommended ecological category.

Aspects such as setting resource quality objectives and developing a monitoring programme are not part of the course material. This shortcoming still needs to be addressed in the future. The course material can be used for training by anybody that has a background in the RDM process and understands how estuaries function.

4. Guidelines for developing an education and awareness programme

Education and awareness increase people's knowledge and awareness about the environment and associated challenges, assist in developing the necessary skills and expertise to address the challenges, and foster attitudes, motivations and commitments to make informed decisions and take responsible action (UNESCO, Tbilisi Declaration, 1978). It enhances critical thinking, problem solving and effective decision-making skills, and teaches individuals to weigh various sides of an environmental issue to make informed and responsible decisions.

An education and awareness programme should aim at the following:

- Increasing awareness and sensitivity to the environment and environmental challenges.
- Generating knowledge and understanding of the environment and environmental challenges.
- Changing attitudes of concern for the environment and motivation to improve or maintain environmental quality.
- Developing skills to identify and help resolve environmental challenges.

The development of an education and awareness programme requires the following:

1) The transfer, exchange and sharing of information and expertise to promote the wise use of estuaries (Ramsar 2003).

- The C.A.P.E. Estuaries Programme should develop and distribute suitable resource materials through partnerships to facilitate education and awareness in the region.
- A C.A.P.E. Estuaries Website should be developed to distribute resource materials and promote the programme locally, regionally, nationally and globally.
- A link to the CERM national e-mail network should be established. The CERM's national e-mail networks should be maintained and expanded to include administrative authorities, Ramsar site managers, estuarine site managers, facilities dedicated to environmental education and awareness raising, and local stakeholders. The CERM network should be linked with global networks (such as that of Ramsar).
- The development of national centres of excellence should be promoted to facilitate information exchange among centres in both developed and developing countries.
- The twinning of wetland and estuarine education centres should be promoted to encourage the exchange and transfer of information and expertise among centres.
- A photo library should be established to support regional and local efforts to raise the awareness and appreciation of estuarine resources and of how these can be used wisely.

2) The generation of programmes and projects to raise community awareness of the

important ecosystem services provided by estuaries as well as their social, economic and cultural values through the following (Ramsar 2003):

- Campaigns, programmes and projects should be undertaken to raise awareness, build community support and promote stewardship approaches and attitudes towards estuaries.
- World Wetlands Day and Week should be celebrated with appropriate regional and local events and promotions and the distribution of resource materials in order to raise the awareness of estuarine values and functions.
- Collaboration with the media should be established to inform both decision makers and the broader society about the values and benefits of estuaries.
- The pilot C.A.P.E. Estuaries sites should be promoted to ensure that they are suitably equipped in terms of capacity, signage and interpretive materials.

3) The improvement of individual and collective capacity and in the opportunities of people to participate in and contribute to the wise use of estuaries through the recognition of the values of estuarine resources (Ramsar 2003).

- Current regional needs and capacities should be reviewed in areas of estuarine management, including in relation to the establishment and operations of education centres, to define capacity-building priorities.
- Sources of expert information and training opportunities should be identified to facilitate the sharing of expertise and knowledge at local, national, regional and global levels.
- Resources should be sought through appropriate mechanisms to support capacity building.

5. *Target groups for inclusion in an education and awareness programme*

Possible target groups and stakeholders to include in the education and awareness programme include the following (Ramsar 2003):

1) People in general are key to the successful implementation of an education and awareness programme:

Important stakeholder groups in an education and awareness programme include the following:

- Landowners (especially those who are responsible for managing estuaries);
- Indigenous people and local communities;
- Women;
- Children (as the next generation of environmental managers and caretakers);
- National and local non-government organisations;
- Those responsible for electronic and print media; and
- Community leaders and prominent people.

2) Governments at all levels need to be involved in an education and awareness programme for the programme to be successful:

- Environmental policy makers and planners;
- Wetland site managers (such as wardens and rangers) within local, provincial and national government;
- National administrative authorities;
- The ministers responsible for all sustainable development and education portfolios, environment-related conventions and members of parliament; and
- National aid agencies and bilateral donors.

3) The business sector has a key role to play in promoting education and awareness:

Key business sectors to include in the C.A.P.E. Estuaries Programme include the following:

- Water and sanitation;
- Irrigation and water supply;
- Agriculture;
- Mining;
- Forestry;
- Fishing;
- Environmental managers:
- Tourism;
- Waste disposal; and
- Energy.

Within the business sectors, there are industries that have the potential for major negative impacts on wetlands. The C.A.P.E. programme must promote practices within these industries to ensure that their activities do not result in habitat loss.

4) International and regional organisations can contribute to the development of an education and awareness programme in a region:

- Global organisations (such as the World Bank, the Global Environment Facility, the United Nations Development Programme and the United Nations Environment Programme).
- Regional organisations (the South Pacific Regional Environment Program, the European Commission, the Southern Africa Development Community and regional development banks).
- International and regional NGOs: Ramsar's four official NGO partners (the IUCN, the WWF and Wetlands International).
- The secretariats of other environment-related instruments (such as CITES and World Heritage).

5) The education sector and learning institutions need to be involved for successful implementation:

- Education ministries, curriculum development authorities, universities and in-service trainers. All these can assist in gaining the inclusion of estuarine conservation and wise-use issues in school and other formal curricula.
- National and international networks, associations and councils of environmental education, wetlands and water issues. These can be incorporated into curricula and other materials being developed by these organisations.
- Environment centres, zoos, aquaria and botanic gardens. These are ideal venues for

promoting the Ramsar message and efforts should be intensified in order to have suitable information, materials and programmes available within them.

- National and international networks of libraries. Library networks provide an excellent avenue for making information on estuaries more accessible to the general community.

6. An example of an education and awareness programme focusing on estuaries

A very good example of an educational and awareness programme directed towards estuaries is that of the Environmental Protection Agency (EPA), namely Estuaries and Your Coastal Watershed (EPA 1998). It is strongly recommended that a similar approach be followed by for the C.A.P.E. Estuaries Programme.

Extracts are included below for illustrative purposes:

What Is an Estuary and What Does It Do?

Estuaries are an important component of the coastal watershed. The economy of many coastal areas relies on the natural beauty and bounty of estuaries. When those natural resources are imperilled, so are the livelihoods of the people who live and work along the coast. As the population grows, the demands imposed on the natural resources increase and protecting these resources for all their natural, economic, and aesthetic values becomes even more important.

An estuary is a partially enclosed body of water formed where freshwater from rivers, streams, and groundwater flows to the ocean, mixing with the salty seawater. They are critical to the survival of tens of thousands of birds, mammals, fish, and other wildlife. Many different habitat types are found in and around estuaries, including shallow open waters, salt marshes, mud and sand flats and rocky shores. Many estuaries perform valuable functions including water quality and flood protection. They are a source of recreation, education, and aesthetic value. Boating, fishing, swimming, windsurfing, and bird-watching are just a few of the many activities people enjoy in estuaries. Estuaries have important commercial value. They serve as nursery grounds for two-thirds of the nation's commercial fish and shellfish. Estuaries are also home to ports and marinas that support shipping and other industrial activities.

Some Impacts on Estuaries

Pollution of coastal watersheds poses a threat to estuaries. Some typical impacts include loss of habitat, loss of recreational opportunities due to poor water quality, and loss of economic resources due to shellfish bed closures and a reduction in fisheries.

Stresses caused by the overuse of estuarine resources have resulted in reduction in fisheries, loss of habitat and wildlife, and fish kills.

Excessive nutrients from failing septic tanks, sewage treatment plants, storm water runoff, atmospheric deposition, industrial waste discharge, and contaminated runoff from fertilized farms adversely affect estuarine systems. Excessive nutrients in estuaries can result in accelerated eutrophication and algal lack of oxygen.

Pathogens are disease-causing microorganisms such as viruses, bacteria, and parasites and can be a result of sewage treatment works, leaky septic tanks, runoff from urban areas and boat and marina waste. They can pose a health threat to swimmers and divers. Fish and shellfish concentrate pathogens in their tissues and can cause illness in people eating them.

Habitat alteration such as the filling of marshes and tidal flats, and reconstruction of shorelines for infrastructure and transportation can degrade estuaries. Wetland loss and degradation have limited the amount of habitat available to support healthy populations.

Estuaries are vulnerable to the introduction of **toxic substances**. Metals, such as mercury, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and pesticides can concentrate in the water, sediment, and local aquatic animals. They enter estuaries through storm drains; industrial discharges; runoff urban and agricultural areas. Bottom-dwelling animals like shellfish are exposed to these chemicals and can pose a risk to human health if consumed.

The **introduction of invasive alien species** can result in unexpected ecological, economic, and social impacts on the estuarine environment. Alien introduced species have contributed to the loss / reduction of native populations.

Marine debris enters an estuary by washing in from storm sewers and with the tide. Debris comes from improper disposal of trash on land, storm water runoff and combined sewer overflows to rivers and streams, ships and other vessels. Once litter gets into the estuarine environment, it seriously affects wildlife, the environment, humans, and our economy. Coastal communities lose considerable income when littered beaches must be closed or cleaned up.

Approach

The **National Estuary Program (NEP)** was designed to restore and protect America's nationally significant estuaries. Through its approach of inclusive, community-based planning and action on the watershed level, the NEP is striving to conserve estuarine resources. The program focuses not only on improving water quality in an estuary, but also on maintaining the integrity of the whole system - its chemical, physical, and biological properties, as well as its economic, recreational, and aesthetic values.

EPA's watershed approach has a **geographic focus** as watersheds are nature's boundaries, draining to surface water bodies including lakes, rivers, estuaries, wetlands, streams, and the surrounding landscape.

The programme requires **continuous improvement based on sound science** as sound scientific data, tools, and techniques are critical to inform the process.

Partnerships/stakeholder involvement are a key aspect as watersheds transcend political, social, and economic boundaries, it is important to involve all the affected interests in designing and implementing goals for the watershed.

Through the **Watershed Approach**, integrated coastal management tools and watershed concepts can be applied in the development of comprehensive management and conservation plans to assess, protect, and restore our nation's estuaries.

To increase the effectiveness of the programme it **links with other programs** such as the Clean Water Action Plan (EPA) developed to address the protection of public health from threats posed by water pollution and the federal Coastal Non-point Pollution Control Programs.

What Can You Do to Help Protect Estuaries?

Estuaries reflect the overall health of a watershed. Individuals are the most important contributors in the long-term effort to identify and address water quality, pollution, and habitat problems within estuaries. Examine your every-day activities and think about how you might be contributing to the pollution problem. Here are some suggestions on how you can make a difference:

Be informed and involved. Learn about estuarine water quality and habitat issues that affect the community in which you live and work. Become familiar with your local estuarine systems.

Take responsibility for your own backyard. Determine whether additional nutrients or pesticides are needed before you apply them, and look for alternatives where fertilizers and pesticides might run off into surface waters and, ultimately, the estuary.

Practice good housekeeping. Around the house, keep litter, pet waste, leaves, and grass clippings out of street gutters and storm drains to prevent their entrance into streams that might flow to estuaries. Never dump any household, automotive, or gardening wastes into a storm drain.

Respect your estuary. Avoid entering sensitive habitat areas with your boat or other motorized watercraft. Maintain your boat engine to prevent oil and gas leaks. Keep all waste produced during your excursions in a safe place to be disposed of properly when you're back on land. Maintain safe boat speeds to avoid shoreline erosion. Maintain your automobile so that oil doesn't leak and the engine is tuned to conserve energy. By reducing your energy consumption, many tons of nitrogen and toxic pollutants can be prevented from entering estuaries through emissions from the exhaust system.

(Source: Estuaries and Your Coastal Watershed Fact-sheets – EPA, 1998)

7. Management recommendations for implementing and improving the guidelines

Recommendations on addressing shortcomings within the existing suite of tertiary training programmes are given below. These recommendations focus on local management needs and include ways in which to empower historically disadvantaged individuals (HDIs).

- There are adequate opportunities for training in estuaries at all universities around the coast as well as some inland universities. These address the needs of new students or future estuary scientists and managers.
- Estuary managers who already have a degree or diploma can continue their training at an honours' or master's level. Bursaries are generally available to HDIs from the National Research Foundation (NRF). HDIs could also be empowered through bursaries for tertiary studies being offered in the C.A.P.E. Programme.
- Despite the variety of courses offered and the good geographical spread around the country, there is a need for a short (such as a two-week) course aimed at estuary managers (for example provincial conservation managers). This could address local management needs and focus on management issues, such as legislation, monitoring and estuary functioning. The course could be accredited at a university or technikon to ensure quality.
- Most estuary managers probably have their training in nature conservation. A review of course content would be needed to see if estuaries are adequately addressed. Alternatively, the two-week course could be offered to institutions that are interested in incorporating it.

The following recommendations are made to assist in knowledge transfer and improved management decision making:

- Users and mangers should be encouraged to work together on research projects, such as the South Coast Marine and Coastal Management study conducted in collaboration with CapeNature, to pool resources and increase existing knowledge for educational purposes.
- Researchers should be worked with to facilitate progress and the publication of research projects on selected aspects of the estuaries in the region. Publications should be in both the popular press and scientific journals to reach as wide an audience as possible.
- The broader C.A.P.E. Programme should be collaborated with and its education and awareness structures should be utilised to increase the profile of estuaries within the CFR.

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9. Acknowledgements

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