# CHAPTER 9

# MANAGEMENT RECOMMENDATIONS

## Communicating conservation actions

Communication is the process of exchanging thoughts and ideas between two or more parties and it is essential for the formulation and implementation of the proposed management strategy for the Muzi Swamp. Management efforts should, however, be concentrated in the southern sections of the Muzi Swamp at first. The southern Muzi Swamp is of greatest concern to the Tembe Elephant Park management because of the increasing pressure on it from the neighbouring Sibonisweni community for more free access to the reeds growing there. The first step in this process is to identify the various stakeholders that are, or would like to be, included in the process. These stakeholders may include members of the Sibonisweni community, Tembe Elephant Park staff, Ezemvelo KwaZulu-Natal Wildlife and the local government (Tembe Tribal Authority).

Recognising the increasing importance of the role that women play in rural communities one immediate concern that has to be addressed (Ellis & Biggs 2001; Rahman & Westley 2001). The majority of the world's rural poor are women who face the challenge of providing water and fuel, food and fodder every single day. Faced with ever dwindling supplies of these mostly natural resources, women have a huge incentive to protect the environment (Astolfi 1995), and are thus potentially powerful allies to protected areas. The Sibonisweni Reed Cutters Association members are mostly women but the heads of the association are men who make all-important decisions regarding the reed harvesting. Women should have greater influence in the decision-making process as they are the ones who are most affected by the eventual outcomes. The inclusion of interested parties in the Sibonsweni-Tembe Elephant

Park partnership should secure the successful implementation of the proposed natural resource management plan for the Muzi Swamp. Many management plans, such as the one devised for a National Park in the Abuja province in Nigeria (Gbadegesin & Ayileka 2000), that have excluded and marginalised local communities have failed due to a top to bottom approach in management. Management decisions made by people in positions of authority are difficult to enforce properly. It is preferable to have collaboration between interested parties to ensure voluntary participation because there then will be consensus on the strategy, implementation and the rewards gained from the management plan (Munro 1995). The rural poor should have greater control over their environment, but they should also be made aware of the options available and any possible repercussions of their actions (Gbadegesin & Ayileka 2000; Johnson 2001; Rahman & Westley 2001).

Barriers to communication do exist, but can be overcome if there is a will to do so. Differences in language, culture and educational levels may exist, but the ability to communicate despite these differences is essential. Ezemvelo KwaZulu-Natal Wildlife must be alert to the possibility that they might not have people within their institution that have the necessary communication skills to overcome such barriers. There is a case to be made that natural scientists have not been taught to work with other people, let alone develop productive relationships. Unlike other professions where human contact and teamwork are valued assets, people involved in the natural sciences have mostly been trained to work with data or with species other than our own (Von Droste 1995). Many managers of reserves admit that they are not trained to deal with the social aspects of conservation. Obviously there are also barriers that cannot be overcome easily, such as financial constraints. Perhaps a restructuring of the budget towards employing communication specialists, such as people in the social sciences, to address community-based problems and issues in and around KwaZulu-Natal Parks would be more beneficial, especially in the long-

term, than allotting more resources to improve fencing and security. Both natural scientists and social scientists can contribute to the better understanding of the processes surrounding wetland management (Machlis 1995; Turner *et al*. 2003). An interdisciplinary study of these processes should lead to the formulation and successful implementation of a management strategy for the southern Muzi Swamp.

In developing a management programme, defining the problem has to be done as diplomatically as possible. The issues involved should rather be stated in broad terms, and the positive aspects of the situation must be highlighted. It should not be stated that the problem in the Muzi Swamp is the over-utilisation of reeds by local community members. The use of natural resources in the Tembe Elephant Park was originally supposed to be on a subsistence use basis only and the fact that reed harvesting has escalated to commercial levels is no longer a relevant concern because the levels of use will never return to that of a subsistence basis. The concern should therefore focus on how to manage the southern Muzi Swamp in such a way as to improve the reed quality while maintaining current harvesting quotas. The clear objective of meetings for the development of a management scheme for the southern Muzi Swamp should be that of maintaining and/or improving reed quality in a sustainable manner. In this way the Tembe Elephant Park will maintain its conservation goals while the Sibonisweni community will benefit by having a continual natural resource base from which to harvest. The conservation of the Muzi Swamp through its sustainable use should be the ultimate goal of all parties.

Goals should be clearly stated for both the resource and the parties involved. The major goal for the Sibonisweni community should be to achieve a level of resource use that maintains reed quality over time. The harvesting of reeds should also be considered as a tool to develop the community in terms of the infrastructure and the economy. The growing tendency in sub-Saharan Africa is towards part-time farming

and the supplementation of family income by other activities and resources (Ellis & Biggs 2001). Income from reed “farming” should be supplemented by processing the resource, thereby creating secondary industries. The emphasis on community reed management, however, should not take the form of increasing the amount of reeds that can be harvested, but rather on an approach to find more efficient and profitable ways of utilising the current quota. Reeds can be used as a resource, providing economic means to improve the community’s basic living standards. Money generated in the community from the sound utilisation of natural resources can be put to positive use through the building of clinics and improvements to schools. It must be realised that natural resource (reed) harvesting on its own will not sustain the community indefinitely (Woodhouse 2003).

The economic growth that is necessary to sustain the current levels of human population growth will not be met with the sale of reeds alone. Secondary industries associated with the sustainable use of this and other natural resources will have to be developed in order to add value to the resource. In this way the benefits of sound natural resource management will be enhanced above and beyond merely those people who harvest and sell reeds, and will reach the community as a whole. In this way not just the individuals who are fortunate enough to be allocated a harvesting permit will benefit from this approach. Members of the Sibonisweni Reed Cutters Association must bear in mind that they are privileged to have access to the resource, which by all rights belongs to the whole community. This re-iterates the importance of identifying all the interested parties, especially the community leaders, and allowing them the opportunity to become involved in discussions regarding the potential of the southern Muzi Swamp as a community development vehicle. The use of the southern Muzi Swamp as a developmental tool for rural development should therefore become a more democratic process. Allowing the majorities to have an input into the use of the resource will reduce animosity to those directly benefiting

from it. The challenge of encouraging democracy in rural areas, where people such as *Indunas*, traditional healers and small numbers of powerful elites reign over a large number of others by cultural default is daunting (Johnson 2001).

The goals of Ezemvelo KwaZulu-Natal Wildlife should fit in with the broad definition of their mandate as custodians of the Tembe Elephant Park. The primary aim of the establishment of the Tembe Elephant Park in 1983 was to protect the people from crop and other damage caused by elephants, and to afford protection to the elephants and the unique sand forest vegetation type along with the unique fauna associated with it, such as the suni antelope *Neotragus moschatus*. The then KwaZulu-Natal Nature Conservation Service indicated in its management plan that one of their aims was also to promote the well-being of the neighbouring community through economic and social development. One of the means through which this was to be accomplished, was to foster a culture of sustainable living within the neighbouring communities (KwaZulu-Natal Nature Conservation Service Protected Area Management Plan 1997). The Tembe Elephant Park management have, by their own admission, expressed concern that they have not succeeded in doing this to date. Simple conservation semantics, such as sustainable use, might make sense to those who have undergone formal training in nature conservation, but it might be lost on those who have little or no formal education of any kind (Woodhouse 2003). The future emphasis should be on communicating such conservation ideals effectively.

**Rotational resting of the utilisation area in the Muzi Swamp**

Reed harvesters appear to be allowing for the regeneration of reeds after harvesting, but the period of rest between successive harvests is not long enough. The tendency in the harvesting area within the Muzi Swamp is for the reeds to be of a poorer quality than those found outside the harvesting area. This can be attributed to the

small area within the Muzi Swamp in which the reed cutters are allowed to harvest at present. There is an area of approximately 1.8 by 0.2 km (36 ha) of reed bed in which the Sibonisweni harvesters are currently allowed to harvest reeds. Increasing the size of the current harvesting area while maintaining similar quotas will allow for the implementation of a rotational resting system. Such a system will allow for a longer recovery period between successive harvests. At present the harvesters appear to return to a previously harvested site once they deem it to have recovered sufficiently. The extension of the recovery period will result in a healthier rootstock in the long-term, and will produce reeds that are comparable in quality to those found outside the utilisation areas in the Tembe Elephant Park.

The expansion of the harvesting area by 30 percent by extending it for 540 m in a south to north direction, and the division of the entire area into three equal harvesting areas for a tri-annual harvest would allow sufficient time for the recovery of the reed beds to their full potential. Harvesting of these three harvesting areas should also occur only in the winter, once the growing season is complete and nutrient transfer to the rootstock has been completed. The harvesting of reeds in the growing season is in fact used successfully elsewhere to eradicate reeds (Haslam 1969a; Granéli 1984; Marks, Lapin & Randall 1994).

The first years' harvest should take place in the predominantly unharvested area, from 1 601 to 2 400 m north of the fence at KwaMsomi Gate. The second years' harvest should start at a point 801 m away from to 1 600 m north of the fence at KwaMsomi Gate. The third years' harvest should occur from the fence at KwaMsomi Gate to 800 m north of it. Easily distinguishable cut-lines, or preferably marking posts, that divide these harvesting areas should be put in place to avoid any confusion as to the location of the relevant areas. Harvesting quotas should be adjusted to the projected quotas given in Table 1, with the goal being to harvest the

yearly quota within the winter months and not to spread the harvest over the entire year as was previously done. Yearly monitoring of the size, number and structure (basal diameter, height and reed density) of the reed bundles being harvested is essential. Destructive sampling and subsequent monitoring of the reed bed structure in the areas to be harvested in the following years should also be implemented. Continual monitoring of the effects of the rotational harvesting regime is required.

**Calculation of the harvesting quota**

The harvesting quota should always be examined, and adjusted if necessary, following yearly monitoring of the reed beds in all three harvesting areas. The harvesting quota has to be calculated according to the size of the harvesting area ($m^2$) and the number of usable reeds in the harvesting area. The measurable proportions of each reed harvester's bundles determine the characteristics of the usable reeds. These measurable proportions include mean reed diameter and height, as well as the mean number of reeds per harvested reed bundle.

Based on the values given in Table 1, the harvesting quotas should be adjusted to these new levels. Although the adjusted quota for the first year might be marginally lower than the current level, the adjustments have to be viewed positively in order to obtain higher quotas in following years. The motivation behind setting quotas based on the amount of usable reeds available is to promote reward-based outcomes for the successful implementation of a rotational resting programme. Should the management programme function successfully then one would expect the ratio of usable reeds per $m^2$ to increase. This increase in good quality reeds would be indicative of an improved root-stock because of the more effective relocation of nutrients produced in the growing season from the aerial parts to the rhizomes.

**Table 1:** *Projected reed harvesting quotas for the various tri-annual harvesting areas in the Muzi Swamp, Maputaland, South Africa.*

| Item | Harvesting area | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Distance from fence (m) | 1 601 - 2 400 | 801 - 1 600 | 0 - 800 |
| Surface area ($m^2$) | 160 000 | 160 000 | 160 000 |
| Reed density (per $m^2$) | 88 | 96 | 83 |
| Total number of reeds | 14 128 000 | 15 424 000 | 13 264 000 |
| Percentage usable reeds (diameter > 9 mm) | 24.14 | 13.40 | 8.71 |
| Number of usable reeds per $m^2$ | 21 | 13 | 7 |
| Total number of usable reeds | 3 410 499 | 2 066 816 | 1 155 294 |
| Mean number of reeds per harvested bundle | 508 | 508 | 508 |
| Currently available number of bundles | 6 714 | 4 069 | 2 274 |
| Number of years rested from beginning of proposed harvesting programme | 1 | 2 | 3 |
| Total number of bundles produced after resting | 6 714 | * | * |
| Projected annual harvesting quota | 6 714 | * | * |

* = Data will not be available untill monitoring of harvesting areas after a resting period has been completed.

The calculation of the harvesting quotas for the second and third harvesting areas should be determined in a similar manner, but should be calculated after monitoring the reed bed in these particular areas. Were these areas to be harvested immediately, according to the criteria as set out above, the harvesting quota would be well below the current quota. This is mainly due to the high number of inferior quality reeds that currently occur in these areas and not to a reduced reed density. It is expected, however, that following a system where reeds would be harvested in one area in the winter months, followed by a period of rest for three years, would improve the reed bed conditions dramatically over a relatively short time. The formerly harvested areas that have been rested will also then produce an increased number of good quality reeds. It is hoped that after such as rest period, the previously harvested areas will have a higher proportion of good quality reeds per $m^2$, these accruing from not only the current season but also from the accumulation of reeds that takes place over the previous seasons. *Phragmites australis* has a tendency to produce large reeds when the rootstock is healthy, allocating more resources to a single large reed than to numerous small reeds (Van der Toorn & Mook 1982). This is especially true for reeds growing in deep water (Vretare, Weisner, Strand & Granéli 2001), but water depth is unfortunately beyond the control of reserve management because the Muzi Swamp is an open system.

Although there is a tendency for reed beds that have been rested to have a lower reed density than harvested ones, it is expected that the proportion of good, usable reeds will increase after a period of resting. Good quality reeds that have grown in the previous seasons might not necessarily be wasted because large reeds can remain erect for up to three years (Haslam 1969; Björk & Granéli 1978; Granéli 1984; Hocking 1989). This is even more pronounced in areas where continuous destructive elements such as wave action and wind are less prevalent. This is the case in the Muzi Swamp, which does not experience fast-flowing water except in occasional

extreme cases of flooding, such as was experienced in the 1999 and 2000 rainy season. The Muzi Swamp is also protected from wind by the fact that it is a low-lying area and is protected by closed woodland along both its western and to a lesser degree its eastern peripheries.

**Implementation of the harvesting quota**

Harvesting should occur from May to August, effectively the dormant season. This yields a harvesting season of four months or approximately 100 working days. Harvesting should be allowed to take place every weekday in this period because the harvesting period is condensed into a relatively short time when compared with how the harvesting is currently being done. If this harvesting schedule were to be implemented, then that would equate to the harvesting of 6714 reed bundles in 100 days, or approximately 67 reed bundles per day. This would mean that all the members of the Sibonisweni Reed Cutters Association would be allowed to harvest one bundle of reeds every day for this period.

Condensing the harvesting quota into these 100 days will make harvesting the quota strenuous. The added distance being covered by the harvesters due to the expansion of the current harvesting area would make it difficult for them to maintain their current daily regime of reed collection. This could be made easier by allowing the removal of their harvested bundles from the Tembe Elephant Park by using some kind of transport. Perhaps the park management could allocate, if financially possible, the use of a tractor and trailer to transport the harvested bundles from the harvesting area to the gate at KwaMsomi. This type of co-operation would go a long way towards ensuring the success of the management programme for the Muzi Swamp. If reed collection was quicker and easier during this condensed harvesting period it would allow reed harvesters more time in the day to complete other necessary chores, making daily harvesting feasible.

**Fire management in the Muzi Swamp**

Fire in a reed swamp is notoriously difficult to control. The accumulation of large volumes of moribund material and varying water depths both contribute to unpredictable fire intensity. An exceptional accumulation of moribund reed material and a low water level will result in a much more intense and hotter fire than if there were little standing litter and a high water level. Varying fire intensities have different effects on reed beds. A hot fire in a reed bed that has a low water depth can retard reed shoot development (Van der Toorn & Mook 1982). In contrast, canopy burns after the growing season when the reeds are driest will have little effect on the reed beds, while a slow surface burn when the substrate is very dry can damage the root stock of the reed beds and retard the following season's growth (Van der Toorn & Mook 1982). When dry, Peat can burn for a long time, sometimes even for many years. After such a burn a wetland can become colonised by terrestrial plant species and reduce or remove the water supply to the wetland (Grundling & Blackmore 1998). This would have adverse effects on the animals and human population that rely on the Muzi Swamp for water because it is the only permanent natural supply of water in the area.

It was shown that burning combined with continual harvesting had a more negative effect on the quality of the reeds in the Muzi Swamp than only harvesting or only burning. This might be related to the time that the swamp was burned. If it were harvested in the growing season and then followed by a burn almost directly afterwards it would further decrease nutrient relocation to the root stock. Research by Mook and Van der Toorn (1982) has shown that a spring burn would result in an increased shoot density, with the majority of the reeds being thinner, shorter and more likely to be damaged when compared with the reeds that they were replacing. A fire in the harvesting area of the Muzi Swamp after a winter harvest, if the fuel load were sufficient to carry a fire, would not necessarily negatively influence the reed

production the following growing season. The most important concern regarding fire treatment in the reed beds, as with harvesting, is the timing of the burn (Thompson & Shay 1985).

Burning in the Muzi Swamp as part of a management regime is not recommended because it will not have a significantly different effect on the reed beds when compared to the effects of harvesting. Burning and harvesting in the winter months have similar effects on the following year's reed production, and a winter burn (or harvest) is a common practice to ensure the future production of reeds (Granéli 1989). The dilemma in the case of the Muzi Swamp is the proximity of the three harvesting areas to one another. If the fire were to jump from one harvesting area to another then the reeds remaining from the previous season's production would be destroyed. This would negate the accumulation of reeds for the following harvest. The only direct benefit of a burn in the reed beds would be to encourage the vegetative spread of reeds and not necessarily to improve the quality of the already existing reed beds (Van der Toorn & Mook 1982; Thompson & Shay 1985). The burning of reeds shortly after the onset of spring has been used to promote the growth of uniformly proportioned reeds and for the removal of accumulated reed litter. This type of treatment would be beneficial when trying to encourage the spread of reeds in the re-establishment programme. Treatment of this nature should also only take place after two to three years after the initial planting of the reed bed, once the reed beds in these areas are well established and the underground biomass is sufficient to cope with the loss of even the slightest amount of nutrients.

**Monitoring the reed beds**

Yearly monitoring of the effects of human management and use is essential to avoid the degradation of the reed resource. Monitoring of how effective the management actions have been will determine if they are to continue or not. Monitoring is the basis

of adaptive management, through which trends can be timeously noted and management actions can be justified and adjusted, if necessary, to meet the management goals previously set out (Bothma 2002).

In the Tembe Elephant Park the reed characteristics should be determined in the area that is to be harvested in April, before the start of winter, or the proposed harvesting period. Four monitoring sites should be set out at 200 m intervals in each of the harvesting areas. The results of the monitoring, following the methods discussed in previous chapters, will give the mean reed characteristics for the harvesting area. Mean reed height, diameter, density per $m^2$, and mass per $m^2$ can be calculated for the harvesting areas. Environmental factors such as water depth and degree of trampling should be noted. Recent use by harvesters will not have to be estimated, as this will be known if the new rotational harvesting regime is implemented.

Monitoring sites do not have to be mapped and placed in a specific, pre-determined area within the harvesting area. Rather, they should be randomly selected at the recommended 200 m intervals within the harvesting area and they should also be considered to be representative of the area as a whole.

For the proper evaluation of trends regarding the production and recovery of the reed beds after a harvest a similar monitoring approach should be used in the harvesting areas that are being rested that year. These resting areas should be monitored when the data are being collected for the area that is to be harvested in the current year. This should make the trends in reed production more accurate and relative to the area as a whole because it would include overall environmental conditions. Continuous destructive harvesting of the same monitoring site during the growing season will result in a localised degradation in reed quality, providing a negatively

skewed perception of reed quality for that harvesting area. Care should be taken to ensure the random selection of monitoring sites within each harvesting area.

**Re-establishing reed beds outside the Tembe Elephant Park**

There is a portion of the Muzi Swamp outside the Tembe Elephant Park's borders that can contribute to the sustainable use philosophy within its borders. Re-establishment of reed beds in these areas will, over time, alleviate pressure on the Tembe Elephant Park for this resource. A community decision has to be made, however, to support such a programme. Financial and technical assistance will not be forthcoming if there is a risk that the endeavour could fail because of community negligence and non-participation by some, or all, of its members.

Various methods of reed bed re-establishment have been successfully used around the world. Björk and Granéli (1978) describe reed cultivation for the purpose of harvesting during the winter for the production of an alternative energy source. They describe the preparation of the substrate, making it suitable for the cultivation of *Phragmites australis,* as well as the planting of reed shoots, the sowing of seeds and the planting of reed rhizome pieces. Reed shoots would have to be planted in an area where they would not be submerged in water. Reed shoots cannot tolerate extended periods of submergence because it results in the death of approximately 20 percent of the planted reed shoots (Mauchamp, Blanch & Grillas 2001). The planting of reed shoots would also be difficult to implement because it would require the construction of greenhouses and of related equipment to grow reed shoots that would be able to survive once transplanted. This would not be cost-effective and will be too time consuming to implement. The aerial sowing of seeds would be too expensive and the germination rate of seeds is low in conditions that are not ideal. Such conditions include areas that are already vegetated or are overly waterlogged. The aerial sowing of *Phragmites australis* seeds was used most successfully over

large uniform areas that had been prepared specifically to vegetate the area subsequent to land consolidation (Björk & Granéli 1978).

The planting of rhizome pieces seems to be the most promising method of re-establishing reed beds in the Sibonisweni community. Rhizome pieces can be selected from reed beds inside Tembe Elephant Park that have good reed characteristics as the genetic predisposition of the rhizomes will produce similar reeds if managed correctly. Management and monitoring of the reed beds outside the Tembe Elephant Park should follow the guidelines of the management plan for the harvesting area inside the reserve. The most effective means of *Phragmites australis* spread is through vegetative growth of the rhizomes (Granéli 1984; Van der Werff 1991; Chambers, Meyerson & Saltonstall 1999). However, the use of rhizome transplantation requires that the substrate be fairly well drained so that the water level is not above that of the soil level. Rhizomes should be planted so that some part of each rhizome is exposed to the atmosphere for gaseous exchange until root formation has taken place (Granéli 1984). Rhizomes should be harvested from the Muzi Swamp in late winter and be prevented from desiccating. Rhizome pieces should be collected by using a soil auger in those reed beds that are deemed to be of a good quality. Areas within the reed bed that have good quality reeds will tend to have a healthy nutrient-rich rhizome component. Rhizome pieces should be rinsed by using a sieve to remove excess soil and undesirable organic components. The rhizome pieces must then be planted just before the onset of spring (middle to late August). This should allow time for the rhizome to establish roots necessary for gaseous exchange before the onset of the seasonal rains, and thereby survive inundation by water.

The establishment of a healthy reed bed will take time, and more than one growing season is required before the underground biomass is sufficient to produce a

harvestable crop in the winter months. An exclosure that surrounds the planted areas would be preferable in the re-establishment process to prevent domestic livestock from grazing the newly emerging reed shoots in the summer months. As the area will initially be small it is not entirely impossible for such domestic animals to destroy newly planted areas. The trampling effect of large numbers of domestic stock will also damage new shoots. This damage will lead to reduced nutrient accumulation in the root stock of the reed bed and a delay in vegetative growth.

An exclosure plot surrounding a newly planted area within the community would allow the successful and rapid establishment of a reed bed. A simple fence with three or four strands for keeping animals out would allow the vegetative spread of the reeds into the surrounding areas. This would effectively act as a source area for other parts of the swamp that occur in the Siboniseweni community. The re-establishment process will take time, but it will have long-term benefits for the community.

**References**

ASTOLFI, B. 1995. How to involve women in protected area issues. In: J.A. McNeely (Ed.), Expanding partnerships in conservation. (Pp. 151-155). Island Press, Washington DC.

BJÖRK, S. & GRANÉLI, W. 1978. Energy reeds and the environment. *Ambio* 7: 150-156.

BOTHMA, J. DU P. 2002. Objectives. In: J. du P. Bothma (Ed.), Game Ranch Management (pp. 25-29). Van Schaik, Pretoria.

CHAMBERS, R.M., MEYERSON, L.A. & SALTONSTALL, K. 1999. Expansion of *Phragmites australis* into tidal wetlands of North America. *Aquat. Bot.* 64: 261-273.

ELLIS, F. & BIGGS, S. 2001. Evolving themes in rural development 1950s-2000s. *Development Policy Review* 19: 437-448.

GBADEGESIN, A. & AYILEKA, O. 2000. Avoiding the mistakes of the past: towards a community orientated management strategy for the proposed National Park in Abuja-Nigeria. *Land Use Policy* 17: 89-100.

GRANÉLI, W. 1984. Reed *Phragmites australis* (Cav.) Trin. *ex* Steudel as an energy source in Sweden. *Biomass* 4: 183-208.

GRANÉLI, W. 1989. Influence of standing litter on shoot production in reed, *Phragmites australis* (Cav.) Trin. ex Steudel. *Aquat. Bot.* 35: 99-109.

GRUNDLING, P-L & BLACKMORE, A. 1998. Peat fire in the Vasi pan peatland. Report no. 1998-0208. Council for Geoscience Geological Survey, Pretoria.

HASLAM, S.M. 1969. The development of shoots in *Phragmites communis* Trin. *Ann. Bot-London* 33: 695-709.

HOCKING, P.J. 1989. Seasonal dynamics of production, and nutrient accumulation and cycling by *Phagmites australis* (Cav.) Trin. *ex* Steudel in a nutrient-enriched swamp in inland Australia. I. Whole plants. *Aust. J. Mar. Freshwater Res.* 40: 421-424.

JOHNSON, C. 2001. Local democracy, democratic decentralisation and rural development: theories, challenges and options for policy. *Development Policy Review* 19: 521-532.

KWAZULU-NATAL NATURE CONSERVATION SERVICE PROTECTED AREA MANAGEMENT PLAN. 1997. Part B: General description of the Tembe Ndumo Complex and key references. Unpublished Report.

MACHLIS, G.E. 1995. Social science and protected area management: the principles of partnership. In: J.A. McNeely (Ed.), Expanding partnerships in conservation. (Pp. 45-57). Island Press, Washington DC.

MARKS, M., LAPIN, B. & RANDALL, J. 1994. *Phragmites australis (P. communis)*: Threats management and monitoring. *Nat. Area. J.* 14: 285-294.

MAUCHAMP, A., BLANCH, S. & GRILLAS, P. 2001. Effects of submergence on the growth of *Phragmites australis* seedlings. *Aquat. Bot.* 69: 147-164.

MUNRO, D.A. 1995. New partners in conservation. In: J.A. McNeely (Ed.), Expanding partnerships in conservation. (Pp. 13-18). Island Press, Washington DC.

RAHMAN, A. & WESTLEY, J. 2001. The challenge of ending rural poverty. *Development Policy Review* 19: 553-562.

THOMPSON, D.J. & SHAY, J.M. 1985. The effects of fire on *Phragmites australis* in the Delta Marsh, Manitoba. *Can. J. Bot.* 63: 1864-1869.

TURNER, R.K., VAN DEN BERGH, J.C.J.M., SÖDERQVIST, T., BARENDREGT, A., VAN DER STRAATEN, J., MALTBY, E. & VAN IERLAND, E.C. 2000. Ecological-economic analysis of wetlands: scientific integration for management and policy. *Ecol. Econ.* 35: 7-23.

VAN DER TOORN, J. & MOOK, J.H. 1982. The influence of environmental factors and management on stands of *Phragmites australis* I. Effects of burning, frost and insect damage on shoot density and shoot size. *J. Appl. Ecol.* 19: 477-499.

VAN DER WERFF, M. 1991. Common Reed. In: J. Rozema & J.A.C Verkleij (Eds), Ecological responses to environmental stresses (pp. 172-182). Kluwer Academic Publishers, Netherlands.

VON DROSTE, B. 1995. Biosphere reserves: a comprehensive approach. In: J.A. McNeely (Ed.), Expanding partnerships in conservation. (Pp. 58-62). Island Press, Washington DC.

VRETARE, V., WEISNER, S.E.B., STRAND, J.A. & GRANÉLI, W. 2001. Phenotypic plasticity in *Phragmites australis* as a functional response to water depth. *Aquat. Bot.* 69: 127-145.

WEISNER, S.E.B & GRANÉLI, W. 1989. Influence of the substrate conditions on the growth of *Phragmites australis* after a reduction in oxygen transport to below-ground parts. *Aquat. Bot.* 35: 71-80.

WOODHOUSE, P. 2003. African enclosures: A default mode of development. *World Development* 31: 1705-1720.