

**Advisory Council on the Environment
Nature Conservation Subcommittee**

Wetland Restoration in Country Parks

Purpose

This paper briefs Members on the wetland restoration projects in country parks.

Background

2. Freshwater seasonal and permanent marshland/pond habitats were formerly common in Hong Kong. These habitats have considerable ecological values for different wildlife such as dragonflies, amphibians, freshwater fish and even birds (e.g. Greater Painted-snipe and Pheasant-tailed Jacana). Since these habitats are mostly found in low-lying areas, they are potentially vulnerable to development threats. Information on local practical experiences including methodologies and techniques to be applied for restoration and enhancement of these types of wetland would be useful for building up a knowledge base for preparation of wetland mitigation/compensation proposals.

3. Freshwater seasonal/permanent marshes/ponds found in Hong Kong are largely developed from agricultural land following agriculture abandonment. However, when the water sources are no longer available, the original wetland vegetation in these habitats would be replaced by terrestrial vegetation and eventually lose their wetland functions. To restore the important biodiversity functions, overgrown and abandoned agricultural lands could be restored to seasonal or permanent marshlands/ponds under careful planning and design.

Site selection

4. We have selected government land inside the protected areas in Hong Kong, i.e. Country Parks (CP) & Special Areas (SA) as sites. In these areas, site availability, works supervision and project monitoring would not be a problem. Location in CP and SA would also facilitate future protection and management of these restored wetland habitats.

5. A number of trial projects are being undertaken inside CP & SA to assess the potential of restoring the wetland functions of abandoned agriculture land for wetland conservation so that it will perform vital roles of a wetland system by providing habitats for a variety of animals and plants. These projects will also provide

information on the practicality of implementing wetland mitigation/compensation measures inside the protected areas.

6. Sites chosen for the trial projects in the protected areas should meet the following criteria:

- the sites should have some existing wetland characteristics or features like the presence of hydric soil;
- the sites are hydrologically sustainable with stable sources of flowing water feeding the sites so that potential future water shortage problem would be minimal;
- they should preferably to be ecologically linked with adjacent habitats like woodland, scrubland, marshland or streams in order to enhance the overall biodiversity of the sites;
- they should have the potential to be public education facilities on wetland ecology and conservation.

7. The restored wetland would preferably be a mosaic of different wetland types including freshwater pond, marsh, wet cultivated areas, meander and shallows providing diversified habitats for wetland wildlife including amphibians, dragonflies and freshwater fish. If appropriate, some visitor facilities like boardwalk and on-site interpretation signs could be provided in the restored wetlands.

8. At present, there are three restored wetlands in CP and SA and the details of the wetland restoration programme are set out at **Annexes 1 to 3**:

- Lions Nature Education Centre, Tsiu Hang Special Area (Annex 1)
- Shing Mun Country Park (Annex 2)
- Tai Lam Country Park (Annex 3)

Advice Sought

9. Members are invited to note the wetland restoration projects undertaken in CP and SA.

Agriculture, Fisheries and Conservation Department
August 2005

**Wetland Restoration
in Lions Nature Education Centre, Tsiu Hang Special Area**

A piece of fallow agricultural land of about 600 m² was identified in Lions Nature Education Centre (LNEC), Tsiu Hang Special Area for a small scale trial on restoration and creation of different wetland types including Wet Cultivation Area, an Artificial Stream and a Freshwater Pond. Restoration of the wetland would enhance the ecological values of the site as well as forming ecological links with the adjacent habitats (e.g. dragonfly ponds and wooded areas) in LNEC.

2. The following works were carried out from September 2004 to June 2005:

- Site clearance works to remove overgrown shrubs and trees of poor conditions;
- Excavation works to create a Wet Cultivation Area for different wetland plants;
- Excavation of a Freshwater Pond;
- Construction of an Artificial Stream to maintain water supply to the site;
- Construction of a Boardwalk; and
- Planting of wetland plants for creating habitats and shelters for wetland fauna.

3. Since completion of the civil works at the restored wetland in March 2005, some amphibians, including Günther's Frogs (*Rana guentheri* 沼蛙) and Asian Common Toads (*Bufo melanostictus* 黑眶蟾蜍) have spawned in the Freshwater Pond and the Wet Cultivation Area and a lot of tadpoles were found in April and May this year. A Reeve's Turtle (*Chinemys reevesii* 烏龜) was also found at the Freshwater Pond. It is possible that it came from nearby habitats and was exploring this new wetland. Dragonflies including Russet Percher (*Neurothemis fulvia* 網脈蜻), Lesser Blue Skimmer (*Orthetrum triangulare triangulare* 鼎異色灰蜻), Pied Skimmer (*Pseudothemis zonata* 玉帶蜻) and Ruby Darter (*Rhodothemis rufa* 紅脰蜻) were found in the Wet Cultivation Area. Wetland plants such as Umbrella Plant (*Cyperus flabelliformis* 風車草) were found naturally colonizing the areas before planting took place. The above findings suggest that the site is suitable for a number of wetland species and successful in attracting their natural colonization.

4. Various wetland plants such as Ditch Millet (*Paspalum orbiculare* 圓果雀稗), Common Rush (*Juncus effuses* 燈芯草), Water Smartweed (*Polygonum hydropiper* 水蓼), Umbrella Plant and Frail Horsetail (*Equisetum debile* 筆管草); wetland crops such as Water Chestnut (*Eleocharis plantagineiformis* 荸薢), Chinese Arrow-head (*Sagittaria sagittifolia* 慈姑), Taro (*Colocasia esculenta* 芋) and Rice (*Oryza sativa* 水稻) were planted in the Wet Cultivation Area within the restored wetland in June 2005. The wetland vegetation will be allowed to establish for a few months before stocking the target fauna species to the site.

5. Target species of amphibians, dragonflies and freshwater fishes native to Hong Kong would be translocated or attracted to the restored wetland for establishment in order to enhance its ecological value. Only limited number of individuals from suitable sites which have abundant populations will be collected so that it would not affect the original populations.

6. Amphibian species occurring in the surrounding habitats including the Asian Common Toad, Brown Tree Frog (*Polypedates megacephalus* 斑腿泛樹蛙) and Romer's Tree Frog (*Philautus romeri* 盧氏小樹蛙) are expected to make use of the restored wetland not only as a foraging ground but also a breeding ground. Other lowland amphibian species such as the Ornate Pigmy Frog (*Microhyla ornate* 飾紋姬蛙) and Marbled Pigmy Frog (*Microhyla pulchra* 花姬蛙) would be introduced to the Wet Cultivation Area to enhance the diversity of amphibians. These lowland species prefer lowland, marshy area or wet cultivated fields. They are also known to be sympatric with each other in other natural wetlands in the territory.

7. Similarly, the restored wetland would provide various habitats for different dragonflies. For instance, Marsh Skimmer (*Orthetrum luzonicum* 呂宋灰蜻), Lesser Blue Skimmer, Forest Chaser (*Lyriothemis elegantissima* 華麗寬腹蜻) and Orange-tailed Midget (*Agriocnemis femina oryzae* 杯斑小蟳) would make use of the Wet Cultivation Area and the adjacent woodland as their habitat while Common Flangetail (*Ictinogomphus pertinax* 霸王葉春蜓) would make use of the Freshwater Pond since they favour ponds or still water area.

8. Three-lines Bagrid Fish (*Pseudobagrus trilineatus* 三線擬鱮), *Nicholsicypris normalis* (擬細鯽) and Hong Kong Paradise Fish *Macropodus hongkongensis* (香港鬥魚) will be introduced to the Freshwater Pond. Three-lines Bagrid Fish could only be found in two localities in Hong Kong and are considered as having conservation concern. The species inhabits at the bottom of streams or ponds and feeds actively only at night on small fishes and crustaceans. On the other hand, *Nicholsicypris normalis* and Hong Kong Paradise Fish mainly live in middle and upper layers of streams or ponds and feed on zooplankton, small aquatic fauna and

detritus. Hong Kong Paradise Fish has once been considered to have a very limited distribution locally. However, the recent surveys revealed that the species could be found at over ten localities in Hong Kong.

9. The trial site would be monitored to provide information on translocation and colonization process that would take place by various lowland wetland species. In addition to the creation of a more diverse habitat at minimal intervention, the experience gained from the trial would contribute to building our knowledge base in the restoration and management of wetland habitat. The restored wetland could also form a complementary part of the education facilities of the LNEC and let the public know more about wetland conservation.

Wetland Restoration at Shing Mun Country Park

The subject site was former agricultural land in the Shing Mun Country Park of about 1000 m². The restored wetland comprises a mixture of habitats including freshwater ponds, marsh, an artificial stream and a cascade. The purpose of the trial is to create and restore a degraded wetland so as to enhance the ecological values of the site and provide suitable habitats for different wildlife such as freshwater fish, dragonflies and amphibians.

2 The restoration works commenced in December 2004 and completed in July 2005, including the following tasks:

- Excavation of three Freshwater Ponds for freshwater fish, tadpoles and dragonfly larvae;
- Construction of a Cascade and an Artificial Stream to provide different microhabitats for various fauna;
- Fabrication of gabions to fasten and affix the water ponds. The use of gabions would allow growing of aquatic plants and provide favourable marshy habitats for wildlife, as well as reinforcing the bank of the ponds;
- Installation of a stainless steel strainer and water pipes to collect pristine freshwater from a stream nearby to feed the ponds and the marsh;
- Building of hibernacula for amphibians and reptiles to hibernate in winter; and
- Planting of various native wetland plants including Water Hyssop (*Bacopa monnieri* 假馬齒莧), Water-dragon (*Ludwigia adscendens* 水龍), Globose Twinball Grass (*Isachne globosa* 柳葉箬) and Climber Floscopa (*Floscopa scandens* 聚花草) to provide favorable habitats and shelters for dragonflies, amphibians and other wetland fauna.

3. Selected fish species of conservation concern such as *Acrossocheilus parallens* (側條光唇魚) and *Rasborinus formosae* (台細 𩰾) would be stocked into one of the fish ponds once the conditions of the ponds have been stabilized. It is anticipated that the created fish ponds would provide suitable habitats for the fish to establish a sustainable population in the long term.

4. The restored wetland habitats will be closely and regularly monitored. It is expected that the restored wetland would be naturally colonized by native species of amphibians, dragonflies and freshwater fish after site establishment.

**Wetland Restoration
at Tai Lam Country Park**

The wetland is located in a high mountain valley in Tai Lam Country Park. The subject area is about 500 m² and is overgrown with Paper-bark Tree (*Melaleuca quinquenervia* 白千層) and Chinese Scaleseed Sedge (*Lepidosperma chinense* 炮仗草). Temporary puddles and ephemeral streams were frequently formed during wet seasons. This project not only improved our understanding of wetland functions but also served as a showcase for future wetland creation and restoration works.

2 The project was carried out in December 2003 and the following works were done:

- Excavation and deposition of earth materials to create a pond of about one-metre depth;
- Removal of the exotic Paper-bark Trees and other overgrown vegetations to open up space;
- Construction of a simple berm using the soil dug out and wooden boards;
- Installation of an overflow spillway and an outlet pipe to control the water level;
- Excavation of two water channels to guide the water from the mountain down into the pond; and
- Placement of artificial rocks for fish hiding and egg attachment.

3 Construction works were completed in early 2004 and site was allowed to stabilize for several months before fish stocking. About 20 individuals of the rare freshwater fish – Chinese Rasbora (*Rasbora steineri* 斯氏波魚) were released into the pond in May 2004. Several hundreds of juvenile fish were observed in September and another brood of about 200 individuals were recorded in 2005.

4 Apart from establishment of the Chinese Rasbora, various native species of freshwater fish, dragonflies, amphibians and reptiles such as Flat-headed Loach (*Oreonectes platycephalus* 平頭領鯽), Pied Skimmer (*Pseudothemis zonata* 玉帶蜻), Paddy Frog (*Fejervarya limnocharis* 澤蛙) and Mountain Water Snake (*Sinonatrix percarinata percarinata* 烏油蛇) were found to use the site as their feeding, breeding and nursery grounds.

5 To further enhance the wetland function of the site, another pond would be excavated in the adjacent area which would be linked up with the existing pond by a stream. The latter pond could serve as a shelter for any of the accidentally escaped fish while the stream would allow lateral movement of the fish.

6 The wetland was self-sustained by groundwater and further replenished by natural runoff from a nearby watershed. Since the created pond closely imitates natural systems adapted to the nearby area and is largely self-maintaining, it requires little and minimal operating and maintenance costs.