

# Wet & Wild

## URBAN WETLAND WINS AWARDS

***Waiatarua Reserve, the largest urban constructed wetland in New Zealand, took 16 years to complete and has just won the Arthur Mead Environment Award awarded for excellence in sustainable environmental engineering, as well as the inaugural New Zealand Contractor's Federation Environmental Excellence Awards for best practice in the field of environmental management of civil construction and related projects.***



**Situated within Auckland City's 679-hectare Ellerslie-Waiatarua catchment, it uses natural and engineering measures to remove polluted sediment from stormwater runoff and improve water quality downstream, in the process transforming a degraded urban reserve into a beautiful wildlife habitat.**

Waiatarua's 57ha reserve used to be home to a 22ha wetland formed around 9000 years ago when a volcanic eruption isolated the catchment from the sea. The wetland was utilised by early Polynesian settlers as a source of food, augmented by clearing surrounding land for additional crops. Significant modification to the wetland occurred in the 1930s with the inclusion of drainage channels that reduced the wetland size to around 6ha. These channels along with a maintenance regime of cattle grazing the pasture and wetland margins caused erosion problems and faecal contamination, creating one of the key sources of pollution coming into

the Orakei Basin and contributing to algal bloom. It was estimated that around 130 tons of sediment and contaminants were washed out of Waiatarua Park into the Orakei Basin each year, causing long-term environmental damage and poor water quality. In addition, the reserve's path network and bridges were insufficient, cattle pugged up the ground in winter, paths flooded regularly and vegetation was very dense with no under-storey development.

Planning for the \$5.9 million Waiatarua restoration project, which was opened in 2004, began with a catchment management plan then unique in its provisions for stormwater treatment.

"The whole wetland system was a leap forward from start to finish," says Grant Ockleston, Auckland City Council Manager Stormwater Projects. "We wanted to maximise the reserve's environmental and ecological values as well as improve the stormwater quality and quantity entering the reserve. But in the early 90s it was unheard of to even have a catchment management plan that included stormwater treatment, and so the innovative nature of the project is the main reason it

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Wet & Wild is the National Wetland Trust's quarterly publication. We seek contributions, though published at the editor's discretion. Each issue will be available on [www.wetlandtrust.org.nz](http://www.wetlandtrust.org.nz) within a month of publication, where they can be downloaded as pdfs. Submit articles to [slindsay@fishandgame.org.nz](mailto:slindsay@fishandgame.org.nz). A grateful thanks to Mighty River Power for sponsoring Wet & Wild. Contact the NWT on [www.wetlandtrust.org.nz](http://www.wetlandtrust.org.nz)



took 15 years to complete, with the catchment plan alone taking six years to get consent before design and construction could begin.”

Restoration of the wetland involved significant public consultation and was constrained by the need for flood protection of neighbouring residential dwellings, an estimated 196 homes in a 100-year flooding event, along with a challenging geology involving a thin surface crust underlain by as much as 8m of soft peat.

Abhishek Sharma, the BECA project engineer who consulted on the project, describes the wetland’s restoration as a four-stage process. The first stage was to remove as much pollutant material as possible entering the wetland, as it was never envisaged as a primary treatment for pollution entering the Orakei Basin, but as a final polishing. To do this litter and coarse sediment traps were constructed, the latter novel in that they were designed to be relatively unobtrusive.

The next stage was to slow the water down with a system of weirs, which due to the site’s geology were designed with hydraulic control structures that did not require substantial stable foundations. They control the speed at which water enters the wetland with varying sized openings that manage water volume so that it is slowly released through a series of forebays. In a high rainfall event with flooding the forebays operate up to a certain level before the weirs force the extra water out onto secondary overlay flow paths, basically very large swales.

Lateral bunds with tiny drainage pipes also hold the water back so that it is released to each bund one after the other. Slowing the water down in this way maximises pollution treatment and minimises erosion, while also being a system designed to cope with a 100 year flooding event when more than six cubic metres of water per second would have to be stored in the wetland. The system is novel in that it even enables pollution treatment in a flooding event via a bypass and the grass pastures in the reserve.



**Above: cows grazing reserve, and litter and coarse sediment traps.**



**Above: the system of channels and forebays and bunds. showing how it deals with flooding by distributing this bund by bund. Below: the overall treatment process including the perimeter channel and the rest of the reserve.**

The final stage of the design process was to create a channel around the wetland perimeter, which controls the entire system consisting of four main water channel inlets with different flow rates into the wetland. It balances the water coming in by distributing it evenly through the wetland. All the existing channels were widened and altered so there are deep and low water areas, and islands to create diversity of habitat along with viewing mounds for the public.



Another novel aspect of the wetland’s restoration is that stakeholder representatives were “embedded” into the design team. These included interest groups Ngati Whatua o Orakei, Orakei Basin Protection Group, Waiaatarua Reserve Protection Society as well as individuals such as Professor John Craig, University of Auckland, who Sharma says “ used to bring his students to Waiaatarua to demonstrate how a wetland should not be constructed.”

Waiaatarua has very a detailed and comprehensive monitoring and maintenance plan which has litter traps

cleared weekly, coarse sediment traps every six months and forebays every two years. And there are cleverly concealed camouflage haul roads - gravel covered with topsoil so invisible to visitors - providing all weather maintenance.

“But we don’t expect to have to significantly dredge the wetlands because the peat bog is sinking at the rate at which we estimate it will be topped up with sediments,” says Ockleston. However, the weir structure is designed so the entire wetlands can be drained if necessary with deep ponds providing wildlife habitat refuge during maintenance.

Sourcing large numbers of wetland plants for the site could have meant stealing them from the South Island, says Ockleston if they had not been able to persuade local nurseries to propagate them in water from seeds eco-sourced as much as possible from the site. Although the narrow range of plant diversity did mean some off site sourcing. He says the planting success rate was an unknown factor as many of the experts were unsure what would survive the wetland’s initial sequences of flooding and drying out to establish its vegetation.

As it is the outcome has been highly successful. Water entering the Orakei Basin is significantly cleaner: 90% of its zinc and over 80% of its copper removed, up to 90 litres of litter removed weekly and for the first time in 30 years there are no algal blooms in the Basin.

And there are a lot more birds: a kotuku (white heron, very rare in the North Island), harrier hawks, scaup, Caspian terns, little black shag and shoveler duck. Dr Grant Dumbell, an independent ecologist who has been involved with the project for the past two and half years and is now monitoring the wetland’s progress.

He says: “As far as I know both birds are species that were not recorded in the area before the restoration work was done and neither are common in New Zealand. The heron is a fish eater and the scaup is a weed eater and both have stayed for a long time. This indicates the ecological restoration is working. The wetland project is astonishing both in the number and range of birds that have made it their home. It is especially rare to see these birds in an urban environment.”

While Professor John Craig described Waiatarua Reserve as “a great example of the creative synergy needed between ecology and engineering. The redevelopment has turned a bad example of urban farming alongside a small and poorly performing wetland into an asset that is much appreciated by a growing number of Aucklanders.” For more information visit: [www.aucklandcity.govt.nz/stormwater](http://www.aucklandcity.govt.nz/stormwater)

## News

### WORLD WETLAND DAY SURVEY

**Of the 150 people who attended our World Wetland Day event at Rangiriri last February, 107 filled out our survey on what they would like at our planned national wetland centre.**

Given that the 150 people included young children and couples, we think a response rate of 107 is fantastic! Thanks to all of you who took time to tell us what you think would make a great wetland centre. Here is what you told us.

#### 1. Attractions

Most of you (over 80%) would like to visit a wetland centre for wetland walks, information about wetlands, to view wildlife and to view a wetland, e.g. from a tower. Outdoor activities and kids programmes would attract half of the people who responded. Some of the more interesting additional attractions suggested were night tours and wetland tramps. We weren’t sure if the entry ‘campsite breeding programmes’ was two suggestions or just the one!

#### 2. What you want to learn

Over 80% wanted to visit a wetland centre to learn more about wildlife, plants and vegetation types, wetlands you can visit and wetland values, with understandably fewer people interested in wetland research projects, study options, or jobs. Some individuals wanted to know what to do with injured wildlife, and what other conservation groups are involved in wetlands.

#### 3. Facilities

Just about everybody said the center should have a walkway to Lake Kopuera, and most also wanted books and other merchandise for sale. Other facilities asked for included knowledgeable staff on hand to identify wetland critters and provide restoration advice.

#### 4. Types of Wetlands

Responses were mixed when we asked what types of wetlands you would like to learn about. Half said all types of wetlands, but the rest were split fairly evenly between lowland wetlands, coastal wetlands, forested wetlands, peat bogs, alpine wetlands and geothermal wetlands.

**Results of the survey continued on page 7**

# WETlink The Community Wetland Restoration Projects Database

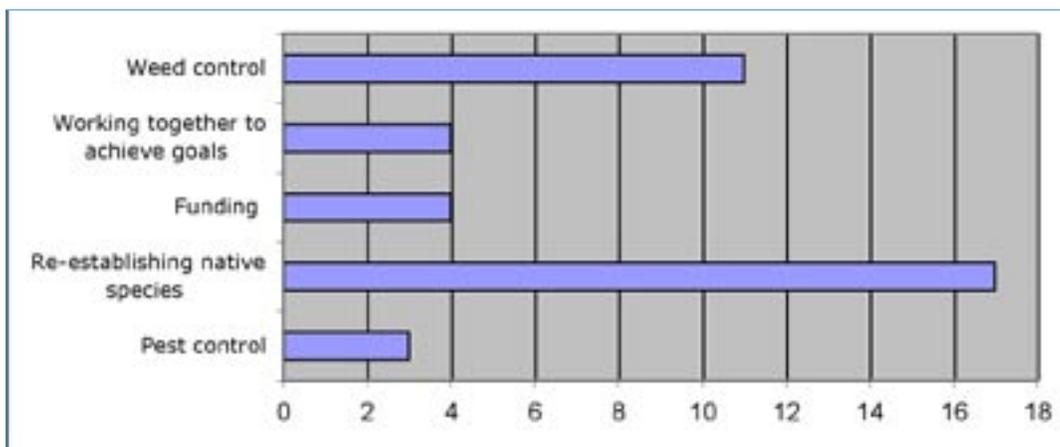
The New Zealand Landcare Trust and Landcare Research are bringing together a database on community led wetland restoration projects underway around New Zealand.

The main purpose of the WETlink database is to provide community groups already engaged in restoring a local wetland or interested in a future project with an easily accessible source of information. WETlink will be housed on the Internet and a website is currently being planned which will go on line next year.

To gather information for WETlink, community groups and agencies were asked a wide range of questions e.g. the location, size and type of wetland; project duration; type of work carried out; restoration problems and successes. Many community groups hold a wealth of practical skills and experience through having trialed different management approaches; some successful and others not. Their trials and errors (e.g. for controlling a specific type of weed) can provide useful pointers for other groups dealing with similar issues.



*Above: Restiad wetland, Kopuatai Peat Dome, Hauraki Plains.*



*Left: WETlink Restoration successes*

To date, there are 31 projects in WETlink scattered from Northland to Southland. Many different types of wetlands are included e.g. freshwater swamp, fen, salt marsh, peat bog and coastal dune lake. Man made wetlands are also included, with several projects in the Wellington region creating wetlands from boggy areas resulting from large scale engineering works. These projects vary in scale from 500m<sup>2</sup> to over 600ha. Some of the projects are just beginning while other have been going for decades.

WETlink forms a part of a larger Ministry for the Environment funded project: "Re-creating rare restiad ecosystems in the Waikato". The project centres on re-establishing populations of the threatened cane rush (*Sporadanthus ferrugineus*) and wire rush (*Empodisma minus*), both from the Restionaceae family.

If you'd like to add your project to WETlink or find out more about the restiad project, please contact Monica at 07 858 3725 or [email monica.peters@landcare.org.nz](mailto:monica.peters@landcare.org.nz)



# BIG LAGOON - a visionary model



**Wetlands conservation is Dr Tony Reiger's avocation, bringing him to New Zealand to realise his vision of restoring a large part of Big Lagoon, one of the largest freshwater coastal lagoons in Southland and the first regional affiliate of the National Wetland Trust.**

"My intention is to create a model for combining private and public funding to develop native wetlands here," says Reiger, who has persisted through competing visions to QE 11 covenant his Big Lagoon property so that he can both restore and manage his wetlands for public benefit.

Big Lagoon contains a lagoon and wetlands which 30 years ago were drained for farming, reducing its open water from approximately 60 acres to just a few. When Reiger bought the farm it had two thirds of the former lagoon, and he has since raised the property's water level, creating 45 acres of open water with islands as well as the lagoon edge for much more wildlife habitat, including a number of rare native birds as well as game birds.

Reiger says his vision for the property, which contains the major portion of Big Lagoon, will encompass a research and educational facility to enhance greater understanding and awareness of wetland protection and

hunting procedures to students, for tertiary research and eco-tourism. "I had been visiting wetlands in the US, Canada and Mexico all my adult life and learnt that hunting is a very crucial management tool for the health of wildlife populations and their habitat," says Reiger, who went to the same high school as Aldo Leopold, renowned as the father of wildlife ecology.

"My first visit to NZ was in 1978 when I fell in love with the country, and I've been coming back almost every year for a month or so since, gradually developing my goal of contributing to the restoration of wetlands here."

"I think New Zealand represents an opportunity that the conservation movement has largely lost in the US where divisiveness has won out over collaboration."

"Twenty five years ago conservation advocates became dissatisfied with the progress being made and evolved into more and more extreme positions, to the point where it has now become virtually impossible to have a public discussion and reach any degree of consensus."

"We must make sure we don't repeat the same mistakes, we have to avoid a fiefdom mentality amongst the different advocates and agencies and recognise how much we can achieve by working together."



An approximate estimate of New Zealand's former wetlands is that only 10% remain with the greatest losses occurring in the lowland zone where wetlands were drained for agriculture. Southland with its cool predominantly maritime climate and extensive flood plain landscapes created an environment that favoured wetland formation, with a wide range of wetland types present prior to human habitation. There were swamps, fens and bogs to estuaries, lagoons and dune lakes as well as significant areas of flood plain and terrace forests.

Together these have been described by researchers as ecosystems forming 'a diverse landscape mosaic with complex gradients between salt and freshwater and transitions from terrestrial to aquatic environments. As in other parts of New Zealand, many of Southland's wetlands have been converted to farmland. Unlike some other parts of New Zealand, however, it is still not too late to protect and enhance those remaining.'

## NEW ZEALAND GAMEBIRD HABITAT TRUST'S SUCCESSFUL GRANTS 2005

**The New Zealand Game Bird Habitat Trust is a body appointed by the Minister of Conservation to distribute the proceeds of the Gamebird Habitat Stamp Programme administered by the NZ Fish & Game Council.**

Established under the 1953 Wildlife Act, it exists primarily to improve New Zealand game bird habitat, and secondarily to improve the habitat of other wildlife. The Fish & Game New Zealand Game Bird Habitat Stamp Programme raises funds from the collection of game bird habitat stamp fees - \$2 of every hunting licence sale - as well as the sale of game bird habitat stamps and associated products to fund the programme.

Since its Board was established it has distributed approximately \$500,000 on 46 wetland projects throughout New Zealand. At the Board meeting in 2005 these seven grants were approved totalling \$128,500. Brief descriptions of these projects are as follows.

### Kiri Wai Wetland

This is a project by Andrew Hastie in Taranaki to redevelop an old farm quarry into a pond with planted riparian margins. This project would create 0.3ha open water with surrounding planted margins totalling 0.6ha and the Board granted \$2,500 towards this project.

### Mangone Wetland

The Board agreed to contribute \$30,000 towards this project managed by Graeme Berry situated near Raetihi in the centre of the North Island. The landowner is developing substantial areas throughout his large farm property, which will ultimately result in the restoration of 60ha of wetlands and associated margins. The portion covered by the Boards grant will result in the development of 7ha of wetland.

### Wheogo Downs

This development by Ken and Kathy Swainson on a 116ha farm near Palmerston North is part of the holistic project to develop an organic farm into a sustainable system. The Board agreed to grant \$20,000 towards the establishment of 7 small ponding areas within large gully systems, which would give an additional 2ha of open water. This is part of the total development on the property of creating 10ha of open water in a total of 21 small ponds, each of which will be fenced and planted as part of the farm development.

### Te Tawa Wetland

This project is located near Katikati in the Bay of Plenty. The Board agreed to contribute \$19,000 towards the restoration and re-flooding of the riparian margin of an existing watercourse that had been separated from the main stream flow. This project will create 1.8ha of open water with a total of 2.7ha within the wetland that will be fenced and protected. This project is being coordinated by John Meikle of the Eastern Region Fish and Game Council.

### Purimu Lake

This is a project to restore an outlet structure to this lake near Waipukurau which was heavily damaged during major storm events 2 years ago. During that storm the sill which formed part of the natural outlet was destroyed, initiating erosion in the outlet stream bed that would have ultimately drained the whole lake. The project is being organised by Iain Maxwell from the Hawkes Bay Fish & Game Council and will create an outfall structure that will halt the erosion and provide some measure of long term control over the lake levels to retain this 17ha lake. The Board agreed to grant \$20,000 towards this project.

### Fullerton-Smith Wetland

This project being undertaken by Joe Fullerton-Smith on his property near Marton will create a 1.5ha open water pond adjacent to 2ha of regenerating native bush. The Board agreed to contribute \$7,000 to this project which would ultimately see both the wetland and the bush area fenced and protected by way of a covenant.

## Southern Wetland Trust

This project is being developed by a Trust affiliated with the National Wetland Trust by Dr Tony Reiger near Invercargill. The project is restoring the major portion of Big Lagoon which is a regionally significant wetland that had been previously largely drained. The Board agreed to contribute \$30,000 towards the re-flooding of 16ha and the owner intends to undertake other extensive works in the future. These restoration works will be accompanied by the development of a centre that will be utilised for research and educational purposes.

## Future Funding Options:

The Trust Board has a relatively limited income of approximately \$70,000 per year, but as can be seen is prepared to fund a range of wetland restoration and protection projects with the primary aim of creating gamebird habitat. The Board normally meets in September of each year and application forms are available at any Regional Fish & Game Council offices or can be downloaded from the Fish & Game website at [www.fishandgame.org.nz](http://www.fishandgame.org.nz).

## WORLD WETLAND DAY SURVEY

### 5. NZ or International Wetlands?

There was also an even split when it came to geography, with half wanting to learn primarily about New Zealand wetlands, and half wanting to know about wetlands in both NZ and the rest of the world.

### 6. Center Name

The most popular names suggested for the wetland centre were National Wetland Centre or Rangiriri Wetland Centre. Other suggestions were variations on these names such as Rangiriri National Wetland Centre, Wetlands National Centre, or Wetland Centre of New Zealand, but we particularly liked the bold suggestion of "The Great Wetland Centre"! One suggestion was that to look it up in the phone book it must start with Wetlands, while another respondent said to strengthen the Trust's name and promote the organisation, the centre must have "National Wetland Trust" in it's title.

We have given your responses to the architects and interpretation specialists who are developing the detailed building and display plans so they can incorporate your suggestions.

Thanks again to all who completed the questionnaires, it will help us create a truly community-based focal point for wetland conservation.

## RAMSAR SITE: Manawatu river mouth and estuary - our sixth 'Wetland of International Importance'



On the 25th July 2005 the Ramsar Secretariat announced that the Government of New Zealand had designated the Manawatu river mouth and estuary as its sixth Wetland of International Importance.

Our newest Ramsar listed wetland is 200 hectares (40°29'S 175°14'E) a moderate-size estuary on the

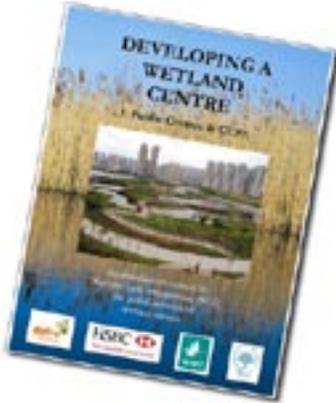
southwest coast of the North Island and retains a high degree of naturalness and diversity, important as a feeding ground for migratory birds. The river estuarine area includes tidal mudflats and a series of sand dunes at the river mouth, an area that extends approximately four kilometres upstream of the river mouth. It is regarded by the Ornithological Society of New Zealand as one of the best habitats for wading birds south of Kawhia.

A diverse range of bird species can easily be seen there, especially at high tide, including Wrybill (*Anarhynchus frontalis*), Australasian bittern (*Botarus poiciloptilus*), Caspian tern (*Sterna caspia*), Banded Dotterel (*Charadrius bicinctus*), White-fronted Tern (*Sterna striata*), and Shore Plover (*Thinornis novaeseelandiae*). The salt marsh-ribbonwood community is the largest in the ecological district and contains its southernmost and biggest population of fernbirds (*Bowdleria punctata*). A high diversity of fish are supported, including some that are threatened, and the site has high fisheries values. Archaeological signs of the semi-nomadic Moa hunter culture date from A.D. 1400-1650, and present Iwi groups in the area, chiefly the Rangitane, Muaupoko, and Ngati Raukawa, support Ramsar designation.

The main land uses include recreational activities such as sailing, boating, fishing, and seasonal duck shooting. Invasive plants (especially *Spartina anglica*) and off-road sport vehicles pose potential threats, but measures to address both in cooperation with stakeholders are progressing.

# INTERNATIONAL NEWS

## 'DEVELOPING A WETLAND CENTRE' A NEW ONLINE MANUAL



*A new manual about developing a wetland centre is available free from the Wetland Link International website homepage - [www.wli.org.uk](http://www.wli.org.uk). Concentrating on the CEPA aspects of running a centre, it considers the following key issues in the initial stages of developing a wetland centre:*

- \* whether a wetland centre is the solution for you - why do you want one?
- \* what messages are you trying to convey ?
- \* what audiences are you trying to reach?
- \* how to reach people through an interpretative approach
- \* ways and means (treatments and media) of relaying messages and telling stories
- \* issues associated with developing and operating a wetland centre that is open to the public.

## HONG KONG WETLAND PARK



The Hong Kong Wetland Park is a new major eco-tourism attraction in Hong Kong. The 61-hectare Park opened to the public on 20 May 2006. Adjacent to the Mai Po Inner Deep Bay Ramsar Site, the Park consists of recreated wetlands to compensate for the loss of wetland habitats due to development.

It boasts a unique combination of a grand visitor centre and outdoor

reserve. The 10000m2 visitor centre consists of three main galleries themed on biological, cultural and environmental aspects of wetlands. Visitors are welcome to roam about the outdoor reserve at their own pace,



following trails and boardwalks, exploring the freshwater marshes, ponds, mangroves and grassland.

It aims to attract local visitors as well as overseas tourists with exhibition displays presented in Chinese and English, as well as Japanese. **For further information, visit [www.wetlandpark.com](http://www.wetlandpark.com)**

## CONWAY'S BULLFROG MEETS ZOO 2000



**Description:**  
**Another day in the urban jungle**

Three children enter an airport terminal. It's a terminal with a difference, though, because the 'planes'

are birds, a host of waterbirds alighting and departing from a rich mosaic of lakes, lagoons and reedbeds. Elsewhere, a family is using a touch-screen to book a holiday through time for a weekend in Saxon or Stone Age London, perhaps. Someone else is watching a pair of endangered New Zealand Blue Duck (*Hymenolaimus malacorhynchus*) foraging in a white water stream. And a gaggle of school pupils have shrunk to the size of caddis flies in a thatched Neolithic-inspired building called the Pond Zone.

This is the Wetland Centre's 105 acres of newly created wetlands just four miles from Westminster in the heart of London. It's part reserve, part zoo, part garden, part interactive science museum and discovery centre - a celebration of the environmental and cultural aspects of wetlands, a chance for urbanites to reconnect with that all-evasive wilderness and a slice of social activism facilitating the route from awareness to action for a sustainable future.



# Creature Feature - Brown Teal

The Brown Teal (*Anas chlorotis*), or pateke is listed by DoC as a 'nationally endangered species.'

eggs. It is equal to a massive eleven percent of the female's weight and measuring a unique 43mm. The clutch size rarely exceeds four to six eggs and the incubation period is 27 to 30 days. Baby ducklings leave mum and dad at 55 days.

## Where do they live?

Brown Teal used to live all around New Zealand, but now can only be found in Eastern Northland from the Bay of Islands to Whanaki with some also on Great Barrier Island. During the day, they hang out in dense vegetation, beside wetlands and creeks, including forest streams. Sometimes they like to play on overhanging branches or loaf around in the banks of streams and ponds. At night they party in the wetlands and short grass paddocks with surface water.

## What do they eat?

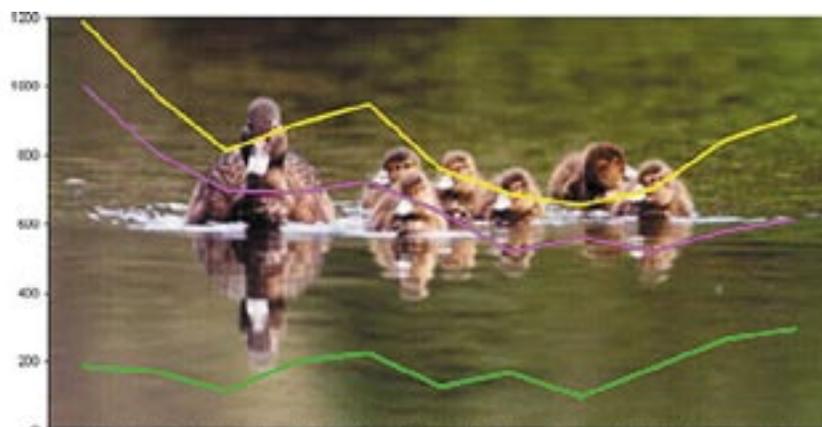
Breakfast, lunch and dinner meals they usually eat insects that live in the water or the vegetation nearby. These include all aquatic ones like water boatmen, bugs, back swimmers, etc. They also eat insects that spend their larval stages in water like stoneflies, mosquitoes, black flies, gnats, midges, caddis flies, mayflies, alderflies, dragonflies, damsel flies and lacewings. The insects in the vegetation usually include bees, wasps, beetles, ants and butterflies. They also love eating crustaceans that is fairy shrimps, clam shrimps, eater fleas, seed shrimps and cyclops. However they also like to eat green vegetables as well and this includes the wetland vegetation.

## How can I help?

If you live in New Zealand and believe you have both the avicultural skills and can provide a adequate predator proof enclosures (minimum size ideally: 40 square meters) suitable pond (minimum size: 2 square meters), with lots of ground cover then you could feed, care, maintain and breed these valuable birds in captivity. **For more information please go to <http://www.brownteal.com>**

## STOP PRESS - BLACK SWAN

New facts have been brought to our attention regarding the Black Swan's status as a native bird. The Department of Conservation's review of the Wildlife Act completed in 2005 stated that: "The black swan is native to NZ but was hunted to extinction in this country prior to European arrival. Recent examination of the bones of the 'extinct NZ swan' has revealed that it was the black swan, *Cygnus atratus*."



	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
OD	1002	840	696	992	725	605	521	559	521	591	614
Northland	187	170	116	201	224	127	168	96	181	262	298
Total	1189	960	814	993	549	732	689	657	700	843	912

## What do Brown Teal look like?



The males are slightly larger and heavier than the females. The males' average weight is 620-700g and females are 530-600g. But when they are not breeding both males and female look alike. They have a distinctive whitish narrow ring around each eye, with head, face and throat a speckled brown. During breeding the males have a colourful chestnut

chest, a shiny green head and a white ring around the eye. The females have speckled brown feathers. The Brown Teal beak is its most unique feature as it has a special strong lamellae that helps sieve through material quickly for food. Their wings are short and they often fly low to the ground with a fast wing beat. Although during moulting they lose all wing feathers, becoming flightless. This is the time when they are most likely to be attacked. The males usually speak with a muted bell-like whistle and the females with a wild growl.

## When do they breed?

Their main breeding season is from July to November. However, being unique, under suitable conditions they are able to breed in every month of the year. Their eggs are cream-tan in colour and also the largest of all teal



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Te Kauwhata

NEW ZEALAND

