

Goudie, Sandra (1994)

Wildfowl versus indigenous species

WILDFOWL versus INDIGENOUS SPECIES

Written by

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November 1994



Special thanks to

*all those who gave of their time
and patience during research*

and to

*Mr Malcolm Buckley for his
insight and depth.*

*It was a rare privilege to have
been able to record the
exceptional recollections
of an exceptional man.*

*Mr Bruce Lyons for giving his time
during a period of family illness.
A wealth of knowledge of the area
was again able to be recorded
through his great generosity.*

*Lynne Kingsbury - an angel on the
keyboard. A wonderful job by a
lovely person.*

Thank you.

WILDFOWL

versus

INDIGENOUS SPECIES

Is there a conflict? Ask around and nobody knows. In no other time of New Zealand's history is the paucity of information so highlighted as at the present. The need for such information is predominantly to satisfy the demands of the Resource Management Act (RMA), with one such example being a water right application for Swamp Restoration. This was a joint application by the Department of Conservation (DOC) and Auckland/Waikato Fish and Game Council.

The document of evidence for the application was titled "Swamp Restoration in the Whangamarino Wetland". Evidence was prepared by ten DOC personnel, two Fish and Game Council personnel, a Water Consultancy Civil Engineer and a retired Waikato Regional Council Section Manager with a Civil Engineering degree.

DOC sought to restore swamp habitat for native swamp flora and fauna. The Fish and Game Council's objective was to restore wildfowl hunting on the areas of water created.

4960ha is Government Purpose Reserve under the management of DOC, with an additional 730ha owned by the Auckland/Waikato Fish and Game Council. The Fish and Game Council is a legislative body to represent "nationally the interests of anglers and hunters and provide co-ordination of the management, enhancement and maintenance of sports, fish and game". (Conservation Act 1987, 26B)

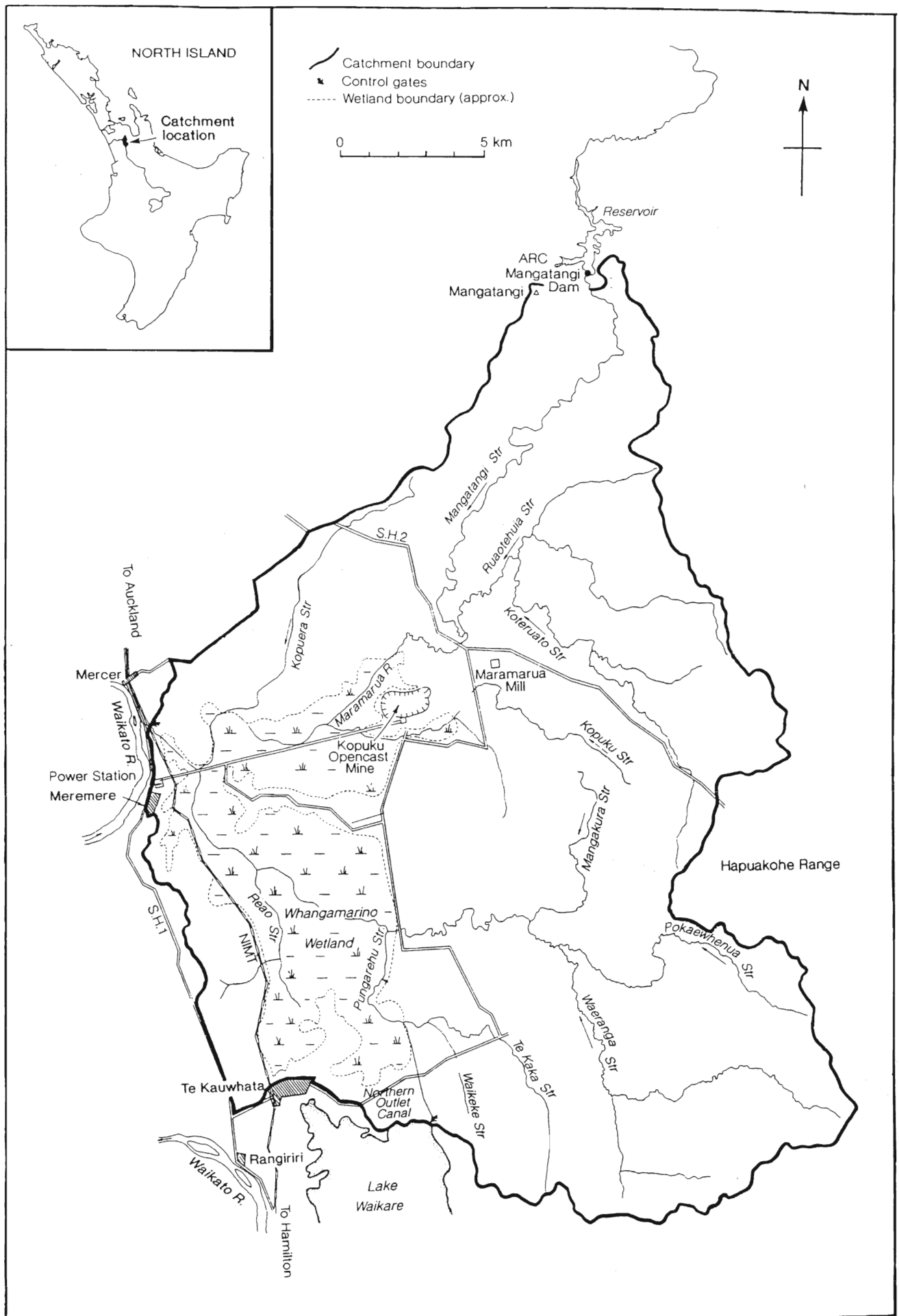


Figure 1: Whangamarino Catchment Location Map

Legislation governing DOC requires it to ensure, among other things, “is not inconsistent with its conservation, to foster the use of NATURAL AND HISTORIC RESOURCES for recreation, and to allow their use for Tourism”. (Conservation Act 1987, 6e)

A further 4630ha is privately owned wetland, which is just under half of the total area. This all combines to make a total of 9220ha. Only 1100ha less than the original total of 10.320 approximately put forward by the Waikato Regional Council (WRC) in the Whangamarino Catchment Management Plan 1993.

In the combined effort for swamp restoration, the objective was to seek a water right to construct a series of weirs in the Whangamarino River below Maramarua. This was the sum total of the project aimed at swamp restoration. At a later date a single weir was to be decided upon.

By this method it was hoped to restore approximately 1465ha of swamp habitat. A variance of 365ha compared to WRC figures. They considered this area lost as a consequence of lowering water levels. The restoration initiative was to improve and extend the habitat of a fertile swamp.

In October 1989, the joint application was lodged for a Water Right to dam. Federated Farmers asked for an opportunity to investigate the issue. On 17 October (J. Cotman chronology), concerned landowners called for site discussions with Fish and Game Council and were unhappy with information provided.

There seemed to be some variance between what DOC were saying on one hand and Fish and Game Council on the other. Letters were sent to the Commissioner for the Environment requesting an independent environmental impact report.

In 1990 DOC and Auckland/Waikato Fish and Game Council decided to discard the original three smaller weirs in favour of a single weir, sited further upstream. Throughout site surveys and investigations discussions were held with some private landowners. DOC and Fish and Game Council had in June 1991 requested from the WRC a pre-hearing meeting or conference of all parties.

Rumours of a hearing in July 1991 prompted concerned landowners to call the Regional Council. A meeting was set by Regional Council to outline the hearing procedures. This was held on 9 August 1991 in the Te Kauwhata Rugby Clubrooms. It was discovered at this meeting that not only were the weirs to be reduced from three to one, but there was also a site change for the weir. DOC outlined their intention to proceed regardless of some landowner concerns. In addition, DOC at this stage were not prepared to pay compensation for loss of land. A resolution put to the meeting and calling for a halt to a Hearing Proceeding was passed unanimously.

DOC and Fish and Game Council were not apposed to a reasonable period of deferral. The Hearing was deferred until February 1992. The RMA was passed in October 1991 which meant the application was now subject to RMA statutes as a water permit.

The Whangamarino Peer Review Committee was set up to organise a cohesive working party from a public meeting in September 1991.

This Committee was to examine the effects of the application. A letter was sent to the WRC outlining major areas of concern in which the proposals were considered deficient. Dr Ian Johnson of MAF was approached at this time to research the proposals further. DOC were asked to provide access to all the information on file with permission finally being granted after an initial attempt to require payment for that access.

Finally the Hearing was held on 24 February 1992. There is no doubt that certain points are agreed by all parties. That the ecology of the area has certainly changed, and that it is a wetland of fluctuating water levels. Indeed applicant's evidence actually states that (DOC Evidence, Hearing 1992, page 9) "of critical importance to the whole wetland complex is the need to restore a fluctuating water regime in the seasonally flooded swamp areas", and then goes on to say, "because of the exceptional habitat values of these areas".

The objectors also recognise the importance of the seasonality fluctuation of water levels as being an integral part of the wetland.

But their question was how do you "restore" fluctuation when it already exists? The water levels fluctuate. The ecology relies on that fluctuation regardless of any changes to either the periphery, or the interior, where water fluctuation has been the guiding ecological factor.

The applicant's evidence outlined the changes and loss to the wetland. It did not say exactly how much of the Whangamarino had actually gone. It showed losses in other areas of the Waikato but not of the entire Whangamarino wetland itself.

Changes are recognised as being made by various drainage schemes, with too much emphasis being placed on farming practices and too little on the effects of mining, power stations, feral animals, rodents, fire, siltation and, more particularly, introduced species competing for habitat, i.e. willow, ducks, koi carp. Regardless of these changes it was necessary for the applicants to establish the need for a weir to be set at 1960's water levels and how this would increase the area and type of wetland habitat available for native flora and fauna.

Recreational wildfowl hunting opportunities are another change inflicted by man and in the restoration of a wetland the objectors were concerned that such an activity was being given precedence over the real needs of the wetland itself. It was felt that restoration be in line with what the inhabitants of the area knew to be the Historical Ecology of the wetland.

Reading the document of evidence two issues become apparent. Number one was the lack of an understanding of the Historical Ecology of the area. Number Two was the lack of research, determining the impacts on the area and its species by creating wildfowl habitat.

The Regional Conservator, Gerald Rowan, recognised in his evidence the seasonal flooding of the swamp. By its very nature it fluctuates between wet and dry. However, it was DOC's intention to seek a water right and put in a weir, as part of a swamp rehabilitation process. The weir would modify water fluctuations at a level set by DOC. It was hoped that this would "provide for the continuation of the species that have been put at risk by the loss of their habitat". The impacts were considered to be minor, however, that could only be assessed over time once the weir was established.

1965 was the year chosen to restore approximate levels to, since the earliest recorded water levels only go back as far as the 1960's. Local knowledge of the area has not been recorded at any stage to gain impressions of the swamp prior to the 1960's. Residents still remain who can give account of conditions back to the 1920's. This has been largely ignored.

A major concern was that the 1960's was a particularly wet period in contrast to earlier and later years.

How that impacts on the swamps ecology would be difficult to assess. Certainly, as stated by DOC evidence, high water levels can cause excessive damage to peat bog communities. Duplicating such an era in the life of a swamp could prove to be more damaging to its continuing ecology.

Recognised under the "Ramsar Convention" as a wetland of international importance, protection can only be accomplished by a full understanding of that ecology.

A. J. Roxburgh (DOC) gave “impressions” of the region from 1974 to 1989 as he observed it periodically. He did, however, give greater insight into the complexities of the hydrology of the area. “The problem is to define and quantify the features of the hydrological regime which need to be reinstated to restore the swamps”. There is no doubt of the Waikato River’s influence on water levels for the area. Roxburgh further states, “Replicating a natural water regime that operated within the wetland in the past is not feasible given the changes that have occurred”.

A letter from Mr Roxburgh whilst employed as a Senior Wildlife Officer to the then Commissioner of Crown Lands, 30 October 1985, looked further at the introduction of exotic plants. Willow, grey alder and sweet grass were recognised as particularly restrictive to the growth of indigenous species. Local residents have voiced their concerns loud and long over the impact of willow most particularly. It is felt that immeasurable damage has occurred from its rapid spread over the decades and, to this day, largely unchecked. None of the reference material used by Roxburgh related to the Whangamarino.

E. T. Burke of Works Consultancy covered mainly the weir structure in his evidence, but also recognised the significant influence of the Waikato River. One of the major concerns was to ensure fish passage over the weir at all times.

A self-professed hunter of the area J. Greenwood wrote in a letter to Bryce Johnson, 9 December 1988, “thus giving an ability to manipulate the water levels to the advantage of the wetland, its plants, the protected bird species, the fish species, and of course the waterfowl that you and I love to hunt”.

Bryce Johnson was at that time with the Auckland Acclimatisation Society. (Bryce Johnson is now a director of the New Zealand Fish and Game Council in Wellington.) Greenwood's evidence for the application certainly gave a very clear picture of his observations from 1990 when he began to take aerial photographs. However, the survey was aerial and gave no indication of the water covered by vegetation that would not be able to be seen from the air. An exercise limited in its ability to give accurate assessments.

F. V. Thompson of Fish and Game recorded water levels from 1989. Derek Cox, DOC, monitored ground levels from 1991.

Observations for all three only went as far back as 1990. This is lacking in sound science due to the shortness of the measurement period.

A. J. Saunders, DOC, began his association with the Whangamarino area from the mid-1980's. His evidence outlines the main criteria which establishes the wetland as internationally important. These are:

- (a) "support an appreciable assemblage of rare, vulnerable or endangered species or sub-species of plant or animals or an appreciable number of individuals of any one or more of these species."
- (b) "are of special value for maintaining the genetic and ecological diversity of a region because of the quality and peculiarities of its flora and fauna."
- (c) "are of special value for their endemic plant or animal species or communities."

Saunders states that:

“Fifty six species of bird have been recorded in the Whangamarino (Ogle and Cheyne 1981). By way of comparison, this figure far exceeds any comparable area of native forest in New Zealand”.

The area is particularly important for several threatened endemic species such as brown teal and North Island fernbird. However, other rare birds such as the Australian bittern, the banded rail and the crane are important co-habitants.

Much of this information supplied is generalised with detail being largely over various bird habitat requirements. With an increase in water levels he states it is “reasonable to assume”, “could be expected”, “is likely” to increase bird habitat.

Lack of research over time of the actual bird numbers and their habits in the Whangamarino wetland itself is all too apparent. Only an understanding over time of what was there before the weir was put in place could help determine the impacts it may have. The only reference for Saunders’ evidence was “Birds Recorded in the Whangamarino Wetlands - Ogle and Cheyne, 1981”.

Mammals

Mammals is another subject, covered in G. H. A. Kessels, DOC, evidence. Reference material is mostly 1981 onwards. Ferrets and stoats are the most common predator and prefer drier ground. Two rat species, the Norway and the ship rat, with the Norway being identified as a strong swimmer, are mentioned, along with possums.

Possums are reluctant swimmers but it hasn't stopped their predation or invasion of any area. Possum do not appear to have had any impact on the willow and its spread.

Maintained water levels "is likely to" reduce mammals predation but is by no means certain. There is no mention of how, or if, mammalian species were controlled using fire or the impacts of such a process. Fire can be an essential ecological tool (Professor F. Turner, Federated Farmers Conference 1994).

Vegetation

Vegetation as part of the ecology of the wetland was explored by S. E. Clegg, DOC. It was stated in the applicant's evidence that the peat bogs of the wetland are permanently waterlogged. In addition, dense flax was a predominant feature of the wetland. Surrounding areas once contained a much higher proportion of native species such as cabbage tree, kowhai, large sedges and, long ago, kahikatea.

It is claimed willow were planted between Rangiriri and Churchill in 1885, but does not state where the information came from. Locals only recall willow from 1920's-1930's onward, and consider the impact from the willows has caused, and is still causing, most of the adverse conditions of the wetland. Where willows are, kowhai and dense flax were predominant. This is supported by the applicant's evidence. Reference to manuka identified increase in some areas, decrease in others without any indication of its proliferation in the 1940's.

Flax, manuka and kowhai could not survive in a permanently flooded area that a weir would induce. The applicant's evidence on vegetation further states that "changes in the peat bog are primarily due to natural succession of plant communities and fires". Willows will continue to erode the wetland unless a comprehensive eradication programme becomes an essential part of the restoration process. The only saving grace is that willow does not tolerate the acidic infertile peat bog conditions which exist among the inner reaches of the swamp. Despite that, there has been strong encroachment by a long line of willow into the inner reaches of the peat bog.

Fire was recognised as having a major influence on vegetative patterns (both natural and man-induced).

At the beginning of Clegg's evidence it was stated, "I will describe the broad changes which have occurred in vegetation of the wetland since the 1940's". The only written historical data included related to the introduction of willow. However, maps depicting three different areas were included for 1942 and comparison maps for 1986. The only reference used was the Meremere-Maramarua Causeway Ecological Study, DOC, 1989.

Impacts on vegetation from a weir being constructed were assessed by E. A. Humphreys, DOC. She states, "Only small scattered areas still support the native plant community of cabbage tree, flax, ti-tree and sedges". Some residents still remember the abundance of kowhai that used to grow. Now, willow is the pre-dominant type of vegetation.

Areas beneath the willows, “will probably” “be replaced by native sedges and rushes”. Native sedges and rushes do not grow beneath the willows and have never done so according to local residents.

Maintaining water levels “will have little, if any, impact on the peat bogs”. No noticeable impact has been perceived in peat bogs with the lowering of the Waikato River. Two plants are recognised as being affected by the weir. “I expect” ... “will have no detrimental effect and may” and “it is unlikely to be affected” ... are all comments of uncertainty. Again with no long term study it will be difficult to assess the changes. Only one reference, “Proceedings of the National Symposium on Wetlands, Florida, 1978”, was used.

Fish

Fish are another aspect of the ecology of the wetland (R. T. T. Stephens, DOC). It is claimed that fish are “likely to benefit” which is a probability for an enlarged water habitat, regardless of its relevance to historic ecology.

If the vegetation which used to exist, i.e. flax, kowhai etc were still in abundance rather than the willow, then perhaps the giant kokopu might also exist in greater numbers (providing food sources around their various root systems, e.g. giant worm with flax). Exotic species (e.g. koi carp, catfish, mosquito fish, rudd, tench) are obviously competing for food with indigenous species, as well as fouling the water habitat.

There is no eradication programme of these very harmful species to protect the water habitat from the impacts they have on the ecology of the region. There is no apparent management of noxious plants and fish.

Regardless of this, the applicant's evidence states that the fish species are "expected to be unaffected" by raising the water levels. However, it is expected that some of the indigenous species will have difficulty in negotiating the weir. Natural water level fluctuations are also recognised as being "important to provide fish with access to" "earthworms, slugs, beetles and grubs when swamp or pasture" become flooded.

Seasonal flooding provides important feeding opportunities to many fish species. Will this still be the case with a raised water level? And without the original vegetation of flax and kowhai will the feeding opportunities be as abundant as they once were? Juvenile eel biology was the only subject used in reference.

Already eels have been severely affected with the weir inhibiting passing, killing hundreds. Such situations are of concern to Iwi, as outlined in their supporting letter for the application.

In rebuttal evidence Stephens concurs with Dr Johnson that the applicants submission does not provide evidence relating to water quality. "This is because neither the Department nor objectors identified water quality problems which needed to be addressed".

He further states that, "It is not the Applicants intention to restore the indigenous character of the swamps". And yet the title of evidence was "Swamp Restoration in the Whangamarino Wetland".

Senior Conservation Officer for DOC in the Planning Department, Paul Hardy, oversaw the preparation of a management plan for the Whangamarino Wetland. Hardy was primarily outlining effects on land use.

N. R. Watson, DOC Solicitor, presented a submission on behalf of the Auckland/Waikato Fish and Game Council and the Minister of Conservation. This covered seventeen pages of predominantly procedural matters related to the Resource Management Act.

Mr Roy Sledger, retired from WRC May 1990 as Section Manager, Rivers and Drainage, outlined drainage and hydrological aspects. He felt it was "difficult but necessary to define what the role of the swamp should be". He felt the new water level sought was "not easy to define exactly".

Lastly comes the evidence of P. J. Teal, employed by the Auckland/Waikato Fish and Game Council as a Wildlife Management Officer. His purpose was to outline the impacts on waterfowl (which are game species) and game bird hunters. A different set of priorities to DOC. It is worth noting at this point that the weir, while a joint project, is on Fish and Game land, to be managed by Fish and Game and with all hunting revenue controlled by Fish and Game. The weir would be paid for jointly, but with any compensation due to those adversely affected paid by DOC.

An assessment of the economics in relation to hunting in the Whangamarino was done in July 1973 by G. J. Williams, Water and Soil Division, MOW. There is no doubt that it is a profitable sport, but to whom? To the ecology? To locals? It was finally assessed that more could be made from hunting than farming in that particular area.

One cannot dispute the benefits to either wildfowl or hunters of an increased water area, but there is growing concern over the impacts this has on indigenous species.

Royal Forest and Bird supported "continued flood control function provided it does not conflict with conservation values". In more recent times Forest and Bird Issue 274 expressed growing alarm over declining bird populations. Duck shooters are coming under closer scrutiny as studies calculate the number of woundings of birds compared to each kill.

The Wildlife Act allows four native birds to be shot as game - the grey duck, shoveler, paradise duck and pukeko. The grey duck and shoveler are considered to be declining in numbers. This suggests that we are putting at risk our indigenous species. Study needs to be done to assess how far hunting impacts on all indigenous species, and just how much competition there is by the hardier breeds for food and habitat against indigenous species.

Maruia Society, in its submission on the Whangamarino Draft Management Plan, expressed concern that "habitat enhancement for game birds should not be part of the principal management purpose". And that there was no "justification given for game bird philosophy".

Game Birds

Maintaining and enhancing the habitat of game birds and maintaining recreational hunter opportunity has been a major thrust of the weir project.

Is the enhancement of habitat for game birds part of the same agenda as the restoration of a swamp?

The ability to issue hunting licences will provide more revenue with a greater area for hunting, but those funds will only be used by Fish and Game to do more of the same.

Again, is the objective really one of restoration?

Neither DOC nor Fish and Game pay rates, have a huge impact on the community and its ecology, yet ignore the very real concerns expressed by people in those communities.

Not all projects are a resounding success.

There is no doubt about the experience of those individuals giving evidence in the joint application. This is detailed in the appendix.

However, quantifiable data relating to historical ecology is practically nil. While species of fish, bird, flora and fauna are mentioned, the information is very broad without specific depth pertaining to the Whangamarino and the relationships therein.

DOC are willing to recognise data from overseas as supporting appendices in evidence, yet unwilling to recognise the same data from opposing parties, e.g. R. T. T. Stephens did not accept Dr Johnson's concerns with regard to koi carp and evidence of their very destructive potential supported by overseas data. Local knowledge is also largely ignored by the applicants.

Recorded historical accounts given by Mr Malcolm Buckley, aged 81, and Mr Bruce Lyons, aged 62, are incredibly detailed memories and recollections. Much of what is said could be substantiated given time and the interest to do so. The depth of these accounts far surpasses anything yet uncovered during research for this paper.

Researching information with regard to the Whangamarino unearthed some very interesting points, particularly in relation to water levels. In 1986 J. Van Kampen, Operations Manager, MOW, wrote a paper regarding survey operations in the area. Two extracts are as follows:

"The former foreman of the Roose Shipping Co., Mr Tetzlaff, stated that the lowest ever recorded water level at the site of their Mercer operations was marked by a nail in a pile driven by him personally in the 1920's. That mark was not seen again until the late 1960's. This is indicative of a period of elevated water levels having occurred, confirming the aggrading of the Waikato River bed mentioned above".

"The portion of the swamp between the causeway and the Island Block ridge was severed from its natural drainage outlet - the Maramarua River, and the water levels have been greatly elevated."

Mr Bayly, Senior Staff Engineer of the Waikato District Council, wrote in a letter to the Hearings Committee:

“15. The goal of wetland management is a flooded swamp, which is as artificial as an over drained swamp. The applicant wishes to make the swamp wetter, similar to conditions thirty years ago. However, within living memory, the swamp has also been drier. Trends relate back to the mid-sixties or 1913. Both of these base dates are shortly after major flood events, were as, the mid-eighties were particularly dry years.”

“16. In 1964 for nearly 20% of the time, stream levels were below 3.4. With the weir this will drop to 0. So there is a significant reduction in the range of the natural variability and consequent possibility of detrimental ecological impact.”

“19. Natural habitats are dynamic and wetlands are also affected by long term climatic variations.”

“20. Substantial changes have occurred with the widespread establishment of exotic flora and fauna. Willow infestation has impeded drainage and modified the ecology, the habitat now available is significantly (changed) from that prior to World War Two.”

In the early 1970's, the Waikato County Council wrote a paper titled, “Whangamarino Swamp, Falls Sector, Preliminary Report on Reclamation”. “For the most part, the swamp is permanently wet. It is covered by water for eight months in any average year, and for four months dries out sufficiently to walk to any point (Buckley, 1994). Flooding is from two sources, the Whangamarino River and Lake Waikare via the Northern Outlet Canal in the Swan Road sector...”

Local residents recall always being able to ride a horse through the swamp for many years during the “dry” periods long before the 1970's (Buckley appendix).

Ross Kenneth Periam, a farmer in the district writes:

“4. Where our farm runs into the wetlands we have fences overgrown and too wet to even get to. These fences were obviously used once to hold grazing animals. This would have been in a time well before the flood scheme was put into place. When swamp levels were even lower than they are now.”

“5. The wetlands were given their international rating without this large lifting of the water levels in place.”

An extract from an opening submission on behalf of Objectors by G. D. G. Bailey, Solicitor:

“4. Instead, what we have is a simplistic and ingenuous approach by the applicants, no doubt based on the best of intentions, but quite incapable of producing the restoration of the wetland in its natural state. The application has been modified considerably since it was first advertised, no doubt for reasons of economy as much as anything else. Put simply, what the Department and the Fish and Game Council seek to achieve is to dam up the water in what was once a wetland supporting various forms of bird life, overlooking and ignoring everything that has happened since. The area that will be affected if this application is granted, is now infested by a particularly noxious form of fish, about which little is known, and whose eradication seems for the moment to be impossible; it is covered with thousands of willow trees which have emerged in recent years and it is already showing significant effects from sedimentation arising out of the diversion of Lake Waikare into the Whangamarino wetland area. The proposed damming will prevent silt from being carried downstream in the Waikato River as it is at the present time and the silt will therefore of necessity settle in the Whangamarino area. We therefore have a situation where sediment has been artificially diverted into

the area, noxious fish have been released in the area and the area has been infested with willows. Merely building a dam is going to do nothing to restore what used to be there, nor to achieve the purposes set out in section 5 of the Resource Management Act. It is not the natural resources of the area that would be sustained but these introduced elements.”

Further insight into the hydrology of the area can be found in a report to the Wildlife Service from C. R. Hannah, ME (Civil), Reg. Eng., Deputy Manager, Management Services, Waikato Valley Authority dated 13 August 1986. Hannah endorses Van Kampen’s comments related to water levels.

The Canal diverting Lake Waikare water through the Whangamarino has been recognised by many as having had an enormous impact on the swamp and its ecosystem. The effects of silting are of major concern in the medium to long term, as are koi carp and willow.

Jack Kelly, a local farmer, has been a game bird hunter for 60 years. Even he has grave concerns over the proposal. Koi carp, water quality and a reduction of wildfowl habitat from the weir were his main concerns. He recognised that an increased area of water would only provide more water area available on which duck could be more readily hunted. The actual breeding habitat would not necessarily increase. Kelly stated it could in fact diminish.

A survey was undertaken (J. Boubee, A. Stancliff, P. Empson, 1988, unpublished) to determine fish species present in the Whangamarino Swamp adjacent to the Kopuku-Meremere causeway. It was found that: "Inanga are a migratory species that require free passage to and from the Waikato River". "A more intensive study of their distribution in the Whangamarino Swamp is required to ensure that important habitats are not cut off by point sources of pollutants or by the construction of culverts or weirs."

The Commission for the Environment, in a letter to the Commissioner of Crown Lands, 12 May 1983, wrote:

"The values of the unmodified Whangamarino wetland... include:

(a) the service functions (maintenance of steady water flows, nutrient recycling and the filtering of nutrient from farm land run-off);".

With a weir, there would at times be no H₂O flow, therefore no flushing resulting in a build up of nutrients rather than a dilution and filtration.

The stated intent of this exercise was for the ecological enhancement and restoration of indigenous flora and fauna. However, it is patently clear that there has been a lack of sound scientific or local knowledge to rectify the predicted outcomes of this intent.

In view of this, how could the Waikato Regional Council, now called Environment Waikato, have granted consent? Not only did they grant consent, but they also presented evidence in favour of the applicants based in part on information supplied by the applicants. Some of this was later proved to be incorrect in relation to the survey on ground levels and the extent of predicted water inundation.

Outcomes of the Weir to Date

While habitat for introduced wild fowl has clearly increased this has already been at a cost (slides accompany).

1. Major bank slumping of the Maramarua River.
2. Serious siltation as a result of river bank slumping.
3. Degraded water quality from siltation.
4. Weir has prevented river from cleaning itself causing putrefication of water.
5. Once clear waterway is now weed-bound.
6. The weir has created flood plains upstream.

Finally, 29 July 1994, when asked for an outline of the Historical Ecology of the Whangamarino wetland, the Manager Protection for Regional Conservator wrote:

“The answer to your query is quite simple. There ain’t any detailed historic info on the ecology of the Whangamarino”.

APPENDIX

Swamp Restoration in the Whangamarino Wetland, 1991, Document of Evidence

Gerald E. Rowan, Regional Conservator, DOC, Hamilton from July 1989.

Prior to that employed by Lands and Survey for 28 years.

Anthony J. Roxburgh, Senior Conservation Officer, DOC, Hamilton since 1987.

Formerly Senior Wildlife Officer.

Edward T. Burke, Registered Civil Engineer

John C. Greenwood, Manager Protection, DOC, Hamilton since 1987.

Prior to that was Senior Ranger with Dept Lands and Survey, Hamilton for 15 years.

Derek M. Cox, Survey Technician, DOC.

Alan J. Saunders, B.Sc. Zoology, University of Waikato 1978. 1979-1984 Survey Officer with NZ Wildlife Service Fauna Survey Unit. 1984 moved to Hamilton. 1987 became Principal Ecological Management Officer, DOC, Hamilton. 1990 became Manager of DOC's Threatened Species Unit, Wellington.

Gerardus H. A. Kessels, Conservation Officer, DOC, Hamilton.

2 1/2 years B.Sc. majoring in Zoology.

Phillip J. Teal, B.Sc. Biological Sciences 1986. M.Sc.(Hons) Biological Sciences 1989. Postgraduate research in Australian Bittern in the Whangamarino Wetland. Employed by Auckland/Waikato Fish and Game Council.

Suzanne E. Clegg, DOC, Te Kuiti for 5 years. B.Sc. Botany

Elizabeth A. Humphreys, DOC, Waikato. B.Sc.(Hons) in Environmental Science.

Richard T. T. Stephens, B.Sc. Biological and Earth Sciences, M.Sc.(Hons) Biological Sciences, and D.Phil., Waikato University. 1985 employed Research NZ Wildlife Service. Now DOC Waikato as Conservancy Advisory Scientist.

Paul F. Hardy, DOC Waikato, Senior Conservation Officer Planning. Diploma of Town Planning.

N. Watson, Solicitor, DOC, Waikato.

Roy F. Sledger, WRC - retired 1990. B.Sc.(hons) Civil Engineering, Nottingham University.

Technical Evidence - Waikato Regional Council

In respect of an application by DOC and Auckland/Waikato Fish and Game

Reassessment of the Economics of the Proposed Reclamation of Reao Arm,
Whangamarino Swamp
July, 1993 by G. J. Williams, Engineer-Economist, Water and Soil Division,
MOW, Wellington

Whangamarino Draft Management Plan Submission, WRC

John B. Keith, Farmer, life time resident. Evidence 1991.

Wetlands - Gordon Stephenson, 1986.

Waikato Valley Authority, 1973, Study Te Reao Arm.

Malcolm Buckley, Farmer. Resident since 1929. Aged 81. Recorded accounts of
history of the area, 1994.

Bruce Lyons, life time resident. Aged 62. Recorded accounts of history of the
area, 1994.

Meremere Causeway, 1986. Report to Wildlife Service. C. R. Hannah, M.E. (Civil),
Reg. Eng., Waikato Valley Authority.

Jack Kelly, Retired Farmer. Evidence 1991.

Ross K. Periam, Farmer. Evidence 1991.

Dr I. Johnson, B.Sc.(Hons) 1978, Ph.D. Microbiology 1986, Otago. Environmental
Services Manager, MAF, Pukekohe.

J. Van Kampen, 1986 Ropeway Causeway, Meremere to Kopuku.

Falls Sector Report, 1970, Waikato County Council.

G. D. G. Bailey, Solicitor. 1991 Submission Representing Objectors.

Forest and Bird, Issue 274, 1994.

National Geographic, Vol. 171, No. 3, 1987.

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Wetlands Documentary, Australian, Taped 1994.

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