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CONTENTS

Guest Editorial

Both high country tussock and monitoring estate conditions are technical topics that have been at the top of DOC's 'worry' list from the time the department was established. We offer here the views of Bob Webster and Carol Jensen. They are scientists working on the long-term monitoring and study of tussock grasslands.

Tussock grasslands—What's happening out there?

What vegetation changes have been occurring in the high-country tussock grasslands? Does anybody know, and does it matter? While over-grazing and burning are believed to have caused widespread degradation of the South Island's tussock grasslands up until the 1950s, attempts to actually measure the response of the tussock grasslands over the current period of less exploitative management have been limited in number and geographic coverage. The new market-driven model of research has led to a focus on providing quick answers to specific questions, and has not favoured long-term landscape-wide monitoring programs. Given that this is a time of land use and tenure review, the lack of information on actual vegetation change in the current era of less intensive grazing and burning may be a significant gap. Land use decisions based on perceptions of early exploitation, or models not based on measurements of change over time, may not be well founded. Interpretation of current management effects from spatial variations must take into account the effect of historical factors set in a landscape of considerable environmental variation.

Some limited monitoring evidence

At this year's New Zealand Ecological Society Annual Conference in Blenheim, we presented evidence of some consistent and widespread changes in tussock grassland composition over the last 10 to 15 years throughout the unimproved tussock grasslands of Otago and Canterbury, in both pastoral and public conservation land (results are intended to be published in the *N.Z. Journal of Ecology*).

We found that over this period, species richness had almost universally declined and this was particularly so for small herbs. Interestingly, many short tussock species were also in decline. Snow tussock (*Chionochloa* species) increased in abundance fairly commonly, and there was a marked increase in hawkweeds (*Hieracium* species).

We could find no support for the argument that the decline in species richness was related to competition from *Hieracium* or *Chionochloa,* nor that it was related to grazing pressure. The same very clear pattern was observed in areas that were retired conservation land (see Jensen et al. 1997), and areas managed under extensive pastoralism.

Implications for monitoring

Our results are limited in scope, and projected changes in species composition will not be the only factor to con-

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Te Papa Atawhai

sider when making land use decisions. Yet the observation that similar changes in grassland composition are occurring under varying levels of grazing in both public conservation land and extensively grazed pastoral lands, must be acknowledged. Existing and future monitoring results are likely to be picked up and scrutinised by all parties in debates on suitable tenure and land use. What interpretation will other parties choose to make about such results? Without measured evidence, how well-placed are agencies such as DOC to justify their tenure or land use decisions? If the press coverage of last summer is any guide, we are likely to see an increase in pressure to allow at least relief grazing in conservation grasslands. Actual effects measured over time may become critical. Simply locking the gates on ex-pastoral conservation land may become difficult to justify unless the decision is based on sound evidence of adverse effects.

Can we rely on successional models that are not based on measured changes over time? Models have recently been developed of indicator species for management, based on species differences across spatial gradients. Using such an approach, 13 species were identified as indicators of management in the St Bathans area in Central Otago (Gibson and Bosch 1996). However, our results from long-term monitoring reveals that nine of those species appear to be undergoing changes in abundance, across land under both retirement and extensive pastoralism. How confident can we be that changes in the occurrence of these species are indicators of current management practices? Our research points towards caution in this area.

Broad-scale monitoring may also indicate the degree to which patterns measured in locally based research can be applied to the wider environment. Recent *Hieracium* invasion hypotheses are a good case in point, where specific studies have pointed to local invasions regardless of current management, and maintenance of snow tussock cover has been suggested as the best insurance against invasion. Our data suggest such conclusions may be valid for a wider area. Finally, broad geographic coverage allows us to isolate the common from the unusual. Interpretation of our own property-based monitoring has been greatly enhanced. We now have the ability to view what might otherwise be seen as meaningless species fluctuations, as actually conforming to landscape-wide trends, with the identification of trends that are actually unusual or unique to the local area.

Our recent work has highlighted to us that, with a consistent methodology and experienced observers, a long-term broad-scale monitoring programme can reveal vegetation trends in the tussock grasslands which are quite measurable and non-random. Results from such work could provide a useful framework within which to assess results from local areas, validate proposed models of vegetation change, and provide evidence for or against management decisions. Can we afford not to understand what changes are actually occurring through time across the high-country landscape?

Bob Webster, Carol Jensen
Knight Frank (NZ) Ltd
Christchurch

Gibson, R.S.; Bosch, O.J.H. 1996. Indicator species for the interpretation of vegetation condition in the St Bathans area, Central Otago, New Zealand. *New Zealand Journal of Ecology 20*: 163-172.

Jensen, C.A.; Webster. R.J.; Carter, D.; Treskonova, M. 1997. Succession in tussock grasslands: implications for conservation management. *Science for Conservation 61.*

Opinions expressed in this article are those of the contributors, and do not necessarily represent the policy of the Department of Conservation.

PRS PROFILE

If it's Tuesday it must be Wellington!

Staff profile of James Goff, Principal Regional Scientist (PRS) Central Region. These new PRSs are an exciting addition to DOCs science establishment with both a quality scientific career and plenty of rugged practical experience.

Well, where do you start without sounding like a scratched record? My name is James Goff, another one of those new PRSs, this time in Central, and yes indeed, these are interesting times for a new kid on the block—life is hectic!

Now the niceties are over though, let me give you a quick potted history of what my science is all about. Strictly speaking I am a Quaternary Geologist. After starting by studying sediment movement in gravel-bed rivers in the French Alps, I moved onto similar work in the Canadian Rockies, and finally on to the sedimentary history of

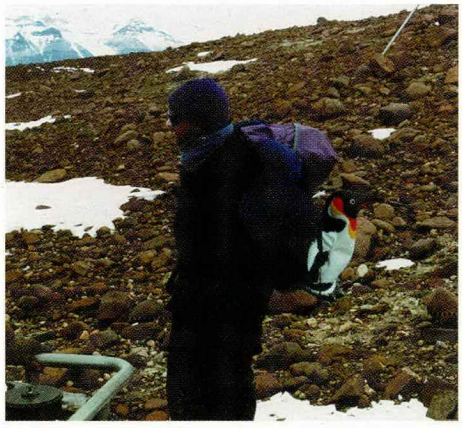

Figure 1. Doing field work on glacial deposits, with the team mascot, Table Mountain, Antarctica.

a slice of British Columbia over the past 20,000 years. This last bit got me involved in glacial, fluvial, lacustrine, and even landslide sediments, with the impacts of logging and effects on fish spawning grounds thrown in for fun. One result of this mixed bag of research is that I am a confirmed believer in the benefits of multidisciplinary work, and a firm advocate of applied research.

I moved to New Zealand in 1993 to work at Victoria University of Wellington, first in the Department of Geology and later the Department of Geography. During this time, I acquired a healthy respect for the coastal and inshore waters of much of New Zealand, but particularly Wellington Harbour in which I have dived over 1500 times to investigate aspects of sedimentation and contamination. I gradually changed the focus of my research, having to my mind studied nearly all possible sediment systems from the high mountains to the deep sea. So in about 1995, while lecturing at VUW, I let myself be initiated into the world of wetlands by my wife. Thus started an epic journey that has seen us study many of New Zealand's wetlands, but in particular has seen us start to unravel a long history of past tsunami to have inundated our coastline. It all started in Abel Tasman National Park, but has moved through Kapiti Island, Great Barrier Island, the Wairarapa, and both the west and east coasts of the South Island. Apart from giving me many hours of fun and frustration, it also gave me the opportunity of going to Papua New Guinea last year as part of a team of New Zealand scientists studying the catastrophic tsunami of July 1998. Among other things this was a sobering expe-

Figure 2. In search of a tsunami, Awaroa inlet, Able Tasman National Park.

rience, made more so by the fact that tsunami will undoubtedly happen here at some time in the future.

Sometime during all this I made the move from academia to the Institute of Geological and Nuclear Sciences to become their coastal hazard expert, and then subsequently Group Marketing Manager for their Environment Group. I joined the Department of Conservation in January this year and have been running ever since, not only trying to catch up with my two colleagues, but also to get up to speed with the workings of the Department. There are definitely busy times ahead for the PRSs, but I believe that since science is such a key part of conservation management, the effort we are putting in now will become increasingly apparent in the future.

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Tory Street Winter Seminar Series 1999

"Operational Conservation"

Held at the Department of Conservation
Conservation Sciences Centre
Conference Room, 1st floor, 58 Tory Street, Wellington
Time: 10.30 to 11.30am

Thursday 19 August	Restoration of Tree Weta to a Modified Island	(Chris Green)
Thursday 2 September	Marine Mammal Bycatch Mitigation	(Ian West)
Thursday 16 September	Papua New Guinea Tsunami, 17 July 1998	(James Goff)

NOTES AND NEWS

The Species Group

Staff, Location, Investigations, Major Tasks and Responsibilities

One of the things that readers requested during our survey was more information on DOC Science & Research staff, and what they were doing. Here is the first in a series that will tell you about the Species Group.

Don Newman

Science Manager Species

Don has had a long and distinguished career in herpetology, first as a research scientist with the Wildlife Service and then with DOC, where he added Acting Manager, and Manager Species to his portfolio.

Rogan Colbourne

Location: Wellington

Major Task:

1219: Kiwi distribution, ecology, conservation database and recovery support services.

Investigations:

1558: Kiwi: maximizing productivity.

2170: Ecology and threats of Haast tokoeka (Apteryx australis).

Peter de Lange

Location: Auckland

Major Task:

2424: Leader, Threatened Plants Research Programme.

Investigations:

1762: Evaluation of fire as a management tool to maintain habitat suitable for an endangered swamp orchid.

2320: Is introgression (hybridism) causing the extinction of rare and endangered plants.

Ian Flux

Location: Wellington

Investigations:

753: Kokako research by management: North Island.

2420: Mapara kokako pulsed management.

Terry Greene

Location: Auckland

Major Task:

2027: Kaka recovery co-ordination.

——: Biosecurity advice: Animals.

Investigations:

2251: Kaka population dynamics, Waipapa.

Brian Lloyd

Location: Wellington (current temporary placement Palmerston North)

Investigations:

2018: Evaluating the impact of 1080 operations on short-tailed bats.

2426: Determining the status of short-tailed bats in central North Island.

2427: Short-tailed bat use of traditional roosts in Rangataua Forest in relation to forest management.

Ron Moorhouse

Location: Nelson

Investigations:

2252: Effectiveness of pest control in kaka management, South Island.

Keri Neilson

Location: Hamilton

Investigations:

2262: Identification of habitat requirements of chevron skink.

2498: Habitat requirements of striped skinks: tests of moisture requirements.

2507: The effects of control of introduced predators on chevron skink on Great Barrier Island.

Colin O'Donnell

Location: Christchurch

Major Task:

2418: Leader, Threatened Animals Research Programme Leader (takes over this task 1999/2000 from Murray Williams).

Investigations:

1578: Bats—factors which have caused their decline in mainland New Zealand.

2504: Development of methods for

monitoring productivity and survival of long-tailed bat populations.

Hugh Robertson

Location: Wellington

Major Task:

1218: Kiwi recovery co-ordination.

Investigations:

1781: Kiwi, possum and poison relationship.

3176: Genetics and health status of kiwi.

Greg Sherley

Location: Apia, Samoa (3 year secondment from September 1998)

Lisa Sinclair

Location: Wellington

Investigations:

2258: *Notoreas* moth habitat conservation.

2295: Kapiti Island invertebrate study.

Mandy Tocher

Location: Dunedin

Investigations:

2255: Maud Island and Stephens Island frog monitoring and translocation methodologies.

2293: Giant skink population dynamics and behavioural ecology at Macreas Flat, Otago.

Michael Wakelin

Location: Wellington

Major Tasks:

1236: Technical support: New Zealand Bird Banding Scheme.

1242: Conservation Sciences Centre laboratory supervision.

3193: Technical support: Effects of pest control on forest invertebrates.

Kath Walker

Location: Nelson

Investigations:

2429: Powelliphanta snail recovery

Murray Williams

Location: Wellington

Investigations:

1222: Biology and general ecology of Sub-Antarctic teal to support their recovery.

1800: Brown teal ecology in Northland.

2325: Blue duck energetics - Tongariro Power Scheme.

2419: Energetics of endangered and threatened birds.

Summary

Staff: 15 (including 1 on 3-year secondment to Samoa)

Locations:

Apia (temp.)	1
Auckland	2
Hamilton	1
Plamerston North (temp.)	1
Wellington	6
Nelson	2
Christchurch	1
Dunedin	1

Investigations: 27

Our reviewer says the information is well presented, with fantastic large photos of native birds. Instructions are easy to follow. There are some really innovative games to play with the children and it looks like fun! The kit targetes a wide range of age groups.

New book from Manaaki Whenua Press!

Title: *New Zealand Native Birds Teachers' Resource*

Authors: Educational Solutions Ltd and Manaaki Whenua Press. Publisher: Manaaki Whenua Press. Size: 420 x 297 mm. Pages: 4 x A3 Photographs, 10 x A4

Price: NZ$39.95 (incl. GST and postage)

Remember—DOC staff get a discount when they order direct from the press, at Landcare Research P O Box 40, Lincoln 8152 or mwpress@landcare.cri.nz

RESEARCH IN PROGRESS

Summary of Operation Nest Egg for the 1998/99 season

Captive rearing and release of endangered species has become a standard part of DOC work. Operation Nest Egg or O.N.E. is the program holding the line for Kiwi Chicks.

Information about protected species work was another of the items requested in our readers survey, so here's the first instalment: Rogan Colbourne's annual report on Operation Nest Egg.

• May 1999: released kiwi are doing well. Must be La Nina weather patterns as all kiwi in the Northland study sites are very fat and with sleek plumage at the moment. It is just about the end of the breeding season. Still finding the odd nest with newly hatched chicks but most of the adults are too busy gorging themselves on the plagues of black beetle to think about breeding. With the amount of food about, this coming breeding season may be an early one. Reports throughout the country suggest the last year was a good one for the O.N.E. releases.

• In the last four months, Richard Jacob-Hoff has confirmed the presence of coccidia in five wild populations of North Island Brown kiwi. Although three populations involve O.N.E. activities, the fourth and fifth at Kuaotuna and Little Barrier Island do not. A low-level presence in the wild is not surprising given some of the species of this parasite are host-specific. Several species of protozoans that cause coccidia so the next step is to work out what type they are. With the renewed interest in kiwi health Hugh Robertson is starting a project to determine what is a healthy kiwi. Blood smears and blood samples will be taken from wild kiwi, analysed, and these compared with the captive birds. The proportion of red blood cells to white blood cells to plasma tells a lot about the health of a bird.

• Transmitter failure at **Trounson** has meant that one of the five released juveniles is unaccounted for. Another juvenile died, the cause was unknown. Maggots in Northland destroy evidence faster than elsewhere! The remaining three kiwi are going well.

• One egg that was abandoned has hatched at the Whangarei Native Bird Recovery Centre and will be released back into Trounson in a few months time.

• Work for the up and coming **Bream Head** restoration project is now on target. Whangarei Polytech students have begun surveying the forest for remaining kiwi. No kiwi were detected on the first night of the survey, but on the second night there was the report of a possible distant male calling. Previous surveys as part of the Northland-wide survey in 1995 also failed to detect kiwi, however kiwi are occasionally heard by local people from time to time. There must have been a good population on Bream Head once: Pat Miller recalls closely following more than one kiwi on a camping trip in the mid 1970s.

• The repopulating of Bream Head should take place in May 2000. A good start to the millennium.

• No deaths of O.N.E kiwi have been recorded at the Whangarei Study Sites for over a year now. Obviously the dogs have been educated to leave the captive birds alone, though there still continues to be dog-killing of wild kiwi here, including some of the very few wild juveniles that have made it so far. Some of the older chicks will be celebrating their third birthdays shortly. Growth rates reveal that male juveniles take about two and a half years to reach minimum adult male size. We are now confident of the sexes of all our releases. 'Gracie' is

Rogan says: 'While O.N.E. will not solve the continued demise of kiwi throughout New Zealand it should help keep key populations ticking over until such time that magic stoat bullets are invented in the near future.

now 'Gregory', and 'Sweetie' is now a male with an inferiority problem! Both Gregory and Sweetie are dating wild females, so the race is on between the two of them to see who is going to be a dad first. They are both at the age that they could be sitting on eggs this season. Beaky has moved closer to Hodges Bush and is living nearby a female, so he may have things on his mind as well. One of the missing juveniles (Sarkaia), a female, has now been found two kilometres away from the release site in a small grove of Kahikatea surrounded by farmland. Pat Miller and Sue Bell spotted her (or at least picked up a signal) on an aerial search for all the kiwi missing the previous year. We still can't find Ata.

• All seven chicks raised at Auckland zoo last season (from eight fertile eggs collected) were to be released into Hodges Bush on the first of May. Unfortunately they were diagnosed with coccidia, so the release has been postponed. Maybe the gods intervened with the dangers of the duck hunting season scheduled for the same day! The release, when it occurs, will be attended by a party of BNZ officials and Clients and will be a good opportunity for our sponsors to get a good first-hand look at what their money can achieve.

• Gonzo and Awhi are the two latest juveniles to be released into **Tongariro Forest.** They were welcomed home by Tuwharetoa Paramount Chief Tumu Te Heu Heu at a gathering of local iwi, Bank of New Zealand representatives, the Griffin family (who have donated a significant sum to the project), Rainbow Springs staff, DOC, local school students and Massey University students. The return to their former home brings the number of kiwi put back into Tongariro Forest to 10.

• Two juveniles from eggs sourced from **Waikaremoana** have been put back into the peninsula. A third chick is still at Napier awaiting release.

• From Hawkes Bay, preparations are underway to begin restoring kiwi at **Boundary Stream.** Eggs are being sourced from the Kaweka Range and will be incubated at the Westshore Wildlife Centre.

• Previously captive-raised kiwi returned to Okarito are still are still alive and well and are becoming something of a tourist attraction for the Township. Word is about that the boardwalk is the place to see kiwi and most people are not disappointed. These birds are still not wary of humans and will approach for photo sessions. There have even been rumours of these kiwi ganging up on humans and the odd attack! Hugh Robertson met Simon Upton (Minister for the Environment) in his local supermarket and was told about the Minister's encounter with wild kiwi on his family holiday to the Westcoast. Seems even MPs can be impressed with the work that is going on down at Okarito. This maybe getting out of hand as 'Casey', one of the friendly kiwi, may have been hit by a car. Found on the road in a pile of feathers he was picked up, kept in a box overnight and was released the following evening. There were no obvious injuries and he was acting feisty. Checks on his progress are continuing. The latest release of juveniles who spent their 'impressionable years' or months on Motuara Island has been going to plan or maybe better than planned! All were checked twice during the first week of release and were found to be 'shocking bolters' on the second check. All were fitted with mortality transmitters (transmitters that send out a different signal if the bird does not move after

24 hours). These birds now are checked every 6 weeks which minimises disturbance. It has been reported that they are using excellent shelters and not only have they not lost weight but many immediately put weight on. Claudette has gained an incredible 375 g in two months. Bobbit was found sheltering with Fancy at the last check (a juvenile from the year before). A number of the bush-wise juveniles have moved into or through territories of adults, all without apparent mishap. Maybe with all their schooling on Motuara they have learnt to run away from calls rather than to run towards adults. After the 1080 drop throughout Okarito forest, 11 chicks were left in the forest to determine its effectiveness. So far 7 chicks have died, three definitely to predation. The seven chicks removed to captivity before the poison drop have now been released into Motuara Island.

• In January I visited the islands in Lake Wakatipu and Lake Wanaka, with Paul von Klink and Lynn Adams, to investigate potential crèche sites for Haast tokoeka. Unfortunately, while stoat-free and with adequate food resources, these islands are not quite ready because of high numbers of holiday makers and their dogs present. Fire is a real concern. Of the four islands visited, **Pigeon Island** was the best and has the potential to carry a small population of kiwi. An O.N.E. project involving little spotted kiwi is a possibility in the future.

Rogan Colbourne
SRU, Tory Street

Animals on the brink

Part 1—A multi-layered survey of ecologically precarious animals in New Zealand

Many of us know Matthew Lark or have heard him broadcast on the National Programme, on a variety of natural history topics. Matthew was born in England in 1971, and moved to New Zealand in 1974 with his parents and seven older siblings. They settled in Paraparaumu where he still lives on a large section with an impressive complement of native plants. Matthew, who works with all the conservation organisations, wanted to share this new project with the readers of ConScience News.

This project aims to bring together the results of current and past investigations of some of New Zealand's least understood mammals, birds, reptiles and insects, and to present them within an easily accessible framework of publication for those with general or scholarly interests. It has two primary objectives that are self-contained but which will throughout its length,be fulfilled coincidentally:

1. To collect, collate and present material from multiple sources, which can provide comprehensive accounts of the key species within the project. Particular emphasis is to be placed on their biology and their place within naturally occurring ecosystems and the human endeavours of the past and the present mounted to investigate and protect them.
2. To establish a series of activities and events which can bring the wider community into closer contact with the concepts and species being investigated as part of objective 1.

The first objective is already being fulfilled by extensive collection and analysis of material for publication in print, radio and television media. This collection is being achieved by a concentrated programme of field research on the species themselves and by working with material supplied by biologists, hunters, conservation workers, etc.

One 10-part radio series has already

been produced for RNZ (National Radio Network) and this is now part of the Natural History Collection developed by myself for that network. It has had two playings and is available on cassette on loan from DOC, Science and Research AudioVisual Library, 58 Tory Street, Wellington, or from Sound Sense Spoken Productions.

A popularised book is being written and is to be published by Shoal Bay Press, Christchurch. Several articles are planned and will be written during the period in which the book is being put together and written and outlets are now being sought for these. Radio publicity on commercial radio, eg NewsTalk ZB (nationally and regionally) is being conducted now and is focussing on the field-based research I am now conducting. I aim to set up at least one and perhaps two major television opportunities to present some of the material, e.g. one full-length TV documentary and/or several short items for a larger programme.

The second objective is centred around the products of objective 1 and I envisage it involving the launching of a national speaking tour, a travelling audio visual exhibition, and the organising of a scientific symposium based around the themes of the project.

Alongside a national lecture tour, I hope to design and operate a series of field-based activities for local community groups and interested individuals. These will bring them closer to the areas in which key species live, and will aim to introduce them to ways in which they can better advocate for and protect special natural areas close to their communities.

I will be approaching regional museums, libraries, businesses and community groups across the country within the next year, in order to organise this wider initiative.

In addition, I am engaging in a collaborative project with one nationally significant museum, Te Papa, which is aiming to create a nationally available collection of my research resources, which have gone into the published work. This collection will include taped and transcribed interview material, historical logs, maps and species data, visual and audio material used, and will aim to publish, for public use, some detailed treatments of several key species within the project's scope.

Logistical and financial support has already been offered for the project by several private companies, and several more are being approached at present. Interested companies will be invited over the next three to four years, to participate in sponsorship arrangements at whatever level they deem suitable and they will undoubtedly benefit from all publicity and community oriented initiatives, e.g. a lecture tour or field courses, radio and print publicity, which arise from the project's work. Any company wishing to be involved in the project will be treated as a partner in it, rather than simply a sponsor for it, and the project co-ordinator will be encouraging sponsoring companies to utilise key species and key natural areas within their marketing and promotions. Significant opportunities for 'hands-on' involvement in the research and publicity will be available to staff working within companies supporting Animals on the Brink.

Assistance with field-based research is being offered by the New Zealand Department of Conservation, throughout most of its conservancies, and by Science & Research Unit, as well as by independent and university researchers across the country.

To be continued:
In the next issue we will bring you the species on which Matthew is collecting information. The most recent co-operative development of the project is that Matthew has agreed to develop a web page with 25 species profiles, for the World Wide Fund for Nature, which will be updated as new information comes to hand.

Opening the roads to migrating fish

Many fish species migrate up and downstream during some stage of their lives. Salmon, and the native whitebait provide well-known examples of this. Migrating fish encounter numerous obstacles to their movements, such as roads and dams that cross waterways. A major study by NIWA, sponsored by the Department of Conservation, is providing solutions for meeting the needs of both fish and roading engineers.

Flow through obstacles is usually provided by culverts: covered channels in dams, roads, and railways that allow drain and streamwater to continue. Culverts may also provide barriers, as they are usually designed to deal with extremes of (high) water levels in a cost-efficient way, rather than with the needs of fish in mind.

For example, if the culvert lies too high above the stream channel, the fish can't get through; if the culvert has too much gradient or causes too much turbulence, fish cannot cope with the flows. In some instances the building material of the culvert and the way it is positioned may determine whether a fish can get through or not.

The recently completed, DOC-commissioned NIWA report reviews the international literature on the effect of culverts on migrating fish. The applicability of overseas fish passage solutions are put into a New Zealand perspective.

The researchers (Jacques Boubée, Shirley Nichols, Ian Jowett and others) also did some trials of swimming ability for inanga and smelt and tested the suitability of some baffle designs for small New Zealand species. Ian then developed a culvert assessment computer program, by which simple tests can predict which designs would suit which fish species.

Most New Zealand native fish species migrate up stream at a small size and are therefore poor swimmers compared to large salmonids. On the other hand, small fish need less water, and there is often a zone of shallow, low-velocity water at the edge of a culvert through which they can swim.

Some species are also good climbers and can bypasss high water velocities by progressing along the wetted margin. Such climbers may not need a low-velocity zone along the edge of the culvert at all. But it is essential for the climbing species that there is a zone of a smooth, moist surface with no breaks or sharp angles.

In order to assess whether fish passage is required at a culvert, the research team suggests answering the following questions:

- Do other migration barriers exist up stream and down stream of the culvert?
- How are the species of fish distributed within the catchment?
- Is suitable habitat available up stream?
- What is the timing of fish migrations, their duration and flow requirement?
- At what altitude, and how far away from the sea is the culvert located?

Based on New Zealand observations and experience, the authors of the report give these recommendations:

- Each culvert should be placed so that its gradient and alignment are the same as that of the stream. This fundamental rule must apply not only to the culvert but also to the upstream and downstream apron.

RESEARCH IN PROGRESS

- The width of the culvert should be similar to that of the stream.
- The culvert invert (floor) should be set slightly below the level of the stream bed.
- Assess the potential of bed material for down stream erosion. If this is likely, provide a weir, or series of weirs, down stream of the outlet. Weirs also provide pools as resting areas, reduce culvert velocities by backwatering, and eliminate elevated outlets. Care is needed here as a poorly designed or constructed weir, or one that is porous (e.g. a gabion basket), could itself prevent passage.
- Armour the banks with riprap at the outlet and inlet to prevent erosion.
- The average low-flow water velocity in the barrel should ideally be below 0.3 m/s; if this is not possible, a 5-10 cm zone on either side of the culvert with velocities below 0.3 m/s should be provided.
- Smooth culverts provide a more suitable climbing surface for native New Zealand species than ribbed ones, where average barrel velocities are greater than 0.3 m/s (but ribbed culverts of the Polyfloä type are useful for reducing barrel velocities, especially during periods of low flows).
- Spoiler baffles can reduce barrel velocities. These must be installed only where they will not cause obstruction of the culvert through accumulation of debris, and where site and engineering restrictions leave no other option.
- At sites with low flows, and therefore shallow water, the apron, weir (and for box culverts, the barrel floor) should be dished or installed with a slope to concentrate flows.
- All junctions at the leading end of, and in between, the culvert components should be rounded to allow climbing species to pass.
- Where the flow regime of the stream permits, water depth should be no greater than 45% of the culvert height for the majority of the up stream migration period, to ensure that there is a shallow wetted margin.

A draft copy of the full report is currently available to staff, from DOC's regional offices. The report is undergoing revision to take account of more recently developed techniques. The updated version will become a joint DOC-NIWA publication, to be widely available at the end of this calendar year. The publication will include the culvert testing program: a trial version is already mounted on the DOC intranet, at http://docintranet/content/sru/culvert.exe Why not have a go at it?

(JAJ)

We thought that this one was so good that we have a number of copies at a special DOC staff price.

New book from Manaaki Whenua Press

Title: *Current names of wild plants in New Zealand.*
Authors: Murray Parsons, Pailine Douglass and Bryony Macmillan
Publisher: Manaaki Whenua Press
Published: January 1999. Size: 210 x 297 mm. Pages: 206
Price: NZ$42.50 (incl GST and postage)

Remember—DOC staff get a discount when they order direct from the press, at Landcare Research P O Box 40, Lincoln 8152 or mwpress@landcare.cri.nz DOC staff price: NZ$ 30.00

Gel Pruning for the Control of Invasive Vines

Invasive vines can be found in native reserves on public conservation land. They are old man's beard (*Clematis vitalba*), Japanese honeysuckle (*Lonicera japonica*) and climbing spindleberry (*Celastrus orbiculatis*). These vines are all extremely vigorous, growing up through the canopy of trees, smothering and ultimately killing the host tree. The traditional technique to control these plants is by foliar application of herbicides but the non-target effect of overspray can damage adjacent natives and the local ecology. To avoid this collateral damage a more selective approach is needed.

Under a Department of Conservation S&R contract (contract number 2073) gel pruning is being investigated as an environmentally friendly and effective chemical application system for selectively killing invasive vines. Gel pruning is the application of a gel to the cut stem (Figure 1) of a trunk or shoot remaining on the plant immediately after it is pruned.

Initial investigative trials were set up to assess the effectiveness of applying herbicidal gels for killing the above vines. As herbicidal gels are not available in New Zealand, experimental gels containing water soluble forms of the main brushweed herbicides picloram, metsulfuron methyl, triclopyr, or glyphosate were formulated and applied to cut stems on the vines in summer 1993 or 1994. Effects were assessed at least 18 months after application and showed that a 10% picloram gel was the only treatment to consistently kill all treated canes on all three vine species. The 10% glyphosate and 1% metsulfuron methyl gels effectively killed all Japanese honeysuckle and climbing spindleberry canes but were only marginally effective on old man's beard (OMB) as less than 70% of treated canes were killed. The remaining herbicidal gels tested were even less effective. The better performing herbicides were then formulated with lower rates of active ingredients and applied in follow-up trials on OMB and climbing spindleberry to establish the most effective and economic rate of application. The treatments were applied in autumn/summer 1995 and again assessed after two growing seasons. The results reinforced the fact that picloram was the only herbicide to consistently kill all three vine species, and was effective at a minimum rate of 1%. These trials also highlighted that all canes on OMB need to be treated if the crown of the plant is to be killed.

Currently we are also carrying out large-scale management trials on OMB and climbing spindleberry, in which DOC field staff were asked to gel-prune and treat all of these vines within a 100–300 m^2 area of native reserve with either 1 or 5% picloram gels. The final effectiveness of treatments in the climbing spindleberry trials have not been assessed but a preliminary assessment at 12 months after application indicate that for OMB a 5% picloram rate is needed for field staff to achieve better than 98% kill rate. A 5% picloram gel is now being pursued for registration with the New Zealand Pesticide Board and if approved could be available for widespread use in summer 2000/2001.

An initial inspection after application of the gel treatments showed only

RESEARCH IN PROGRESS

40–50% of climbing spindleberry canes and 60–90% of OMB canes were treated in the first pass. This highlighted the difficulty in locating and treating all canes in a single pass regardless of whether they are in dense canopy (climbing spindleberry) or in a relatively open canopy (OMB plots) and emphasises the need for follow-up assessments and treatments.

In the management trials DOC staff were given a TIPIT gel pruner (Figure 2), a prototype gel lopper and a folda-way pocket pruning saw to assess the practicality and usefulness of the gel pruning technology. Immediately after the treatments were applied the staff were asked for their feedback. Their response was that gel pruning was an ideal technique for treating invasive vines growing up through the canopy of trees in understory areas or vines in open areas where there is good access to the stems. In areas where the vines are covered in weeds such as bracken and blackberry, they believe the technique is not suitable, as it is a major task to find and identify canes to be treated. For use on OMB canes up to around 25 mm diameter the preferred tool was the TIPIT gel pruner. For larger canes the preferred choice was to prune the cane using a pruning saw and then as a separate operation, dispense and spread the gel over the cut stem using the gel pruner. The lopper was found inappropriate for use on flimsy vines but it would be an ideal tool for gel pruning hard woody plants like willow and cotoneaster saplings.

Figure 1. Herbicidal gel on the cut stem of OMB after application by DOC staff.

Figure 2. DOC staff member Mick Abrams using the TIPIT gel pruner to apply treatments.

For further information contact:

Brian Ward or Ron Henzell
HortResearch
Ruakura Research Centre
Hamilton
Ph. (07) 856 2835
Fax. (07) 858 4705

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