

TRAVIS SWAMP REVISITED

Colin D. Meurk¹**Introduction**

In 1984 Partridge prepared a report in response to proposed infilling of Travis Swamp for urban subdivision. Botanical values that might be jeopardized were assessed. Although no development has taken place in the intervening four years, proposals by Travis Country Estates Ltd have been recently reactivated (Christchurch Star, December 11 1987, Travis Country Estate Concept Plan 1987).

Since the earlier assessment of the swamp there has been little change to the area and there is little to add to Partridge's description of a stream ('Travis stream'), its islands and their vegetation.

As Partridge (1984) pointed out "the islands of *Carex secta*... are excellent examples of remnant swamp vegetation of the Christchurch city area. Similar vegetation is rare." Partridge argued that "the development of a park with the stream at its focus would ... (preserve) the vegetation and (provide) an attractive amenity."

Of the total wetland area, bounded by Travis, Frosts and Mairehau Roads and, in the west, by Travis Swamp Drain, Partridge was able to visit only a small part, mainly in the south and east - the rest being flooded at the time. Apart from the natural stream and islands, which he correctly identified as valuable (above), most of the area examined is relatively well drained and natural values are largely degraded by cattle grazing.

However, a recent examination of the wetter, northwestern corner of Travis Swamp revealed some outstanding, though modified, remnants of Christchurch freshwater mires. For example, the large, insectivorous sundew (*Drosera binata*) has not been reported in the Christchurch area since last century (Armstrong 1869, Herriott 1919, Wall 1923) and indeed, in Canterbury, is known elsewhere only at Ellesmere (Clarke and Partridge 1984) and Coleridge (A.Shanks pers. comm. 1988). Some other species are unknown in Christchurch, or are now restricted to a few, threatened pockets, or no longer exist in natural surroundings. For example, native ferns and sedges are largely confined in the Canterbury Plains to drains, canals and river banks, where they are mixed with adventive tall

¹ Botany Division, D.S.I.R., Private Bag, Christchurch

grasses and herbs which are regularly mown. Moreover, many open waterways are being replaced by pipes.

Vegetation, with emphasis on northern area

The western boundary of the swamp is defined by a drainage channel (Travis Swamp Drain) at the foot of an ancient sand dune, now built on, and by the artificial fill of a Post Office Reserve - some of which covers former stands of manuka (*Leptospermum scoparium*) (G. Collett pers. comm. 1988). To the north (along Mairehau Road) are horse-grazed sand ridges dominated by lupin. South and east of these boundaries is the low-lying (<1.5 m a.s.l.) swamp proper. A mosaic of several plant communities on peats and gleyed silts is recognized and these are described below (see Map). Appendix 1 is a species list.

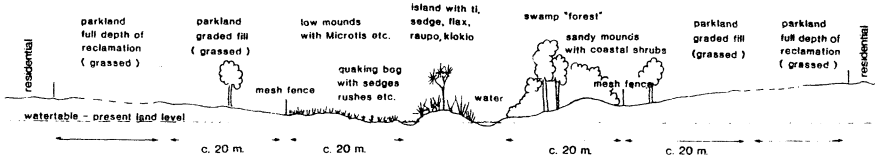
1. Willow Woodland (crosshatched on map) This is dominated by thickets, ca. 5 m tall, of grey (*Salix cinerea*) and golden willows (*S. alba*) on peats 1.5-2 m deep:

(i) The wetter, and periodically flooded parts are reminiscent of carr woods of Europe. There is a vigorous ground cover of kiokio (*Blechnum minus*) under the grey willow canopy. Three small colonies (4, 7, 16 plants) of the spider orchid (*Corybas rivularis* - some flowering through 3-29.10.88) occur on low banks, some beside cattle tracks through manuka and willows. The species is not known elsewhere on The Plains. Occasional saplings of karamu (*Coprosma robusta*), mikimiki (*C. propinqua*), ti (*Cordyline australis*), rare kohuhu (*Pittosporum tenuifolium* in Partridge 1984) and introduced species occur in the understorey. Bryophytes were quite common on the ground (*Racopilum strumiferum*, *Hypnum cupressiforme* and *Brachythecium salebrosum*).

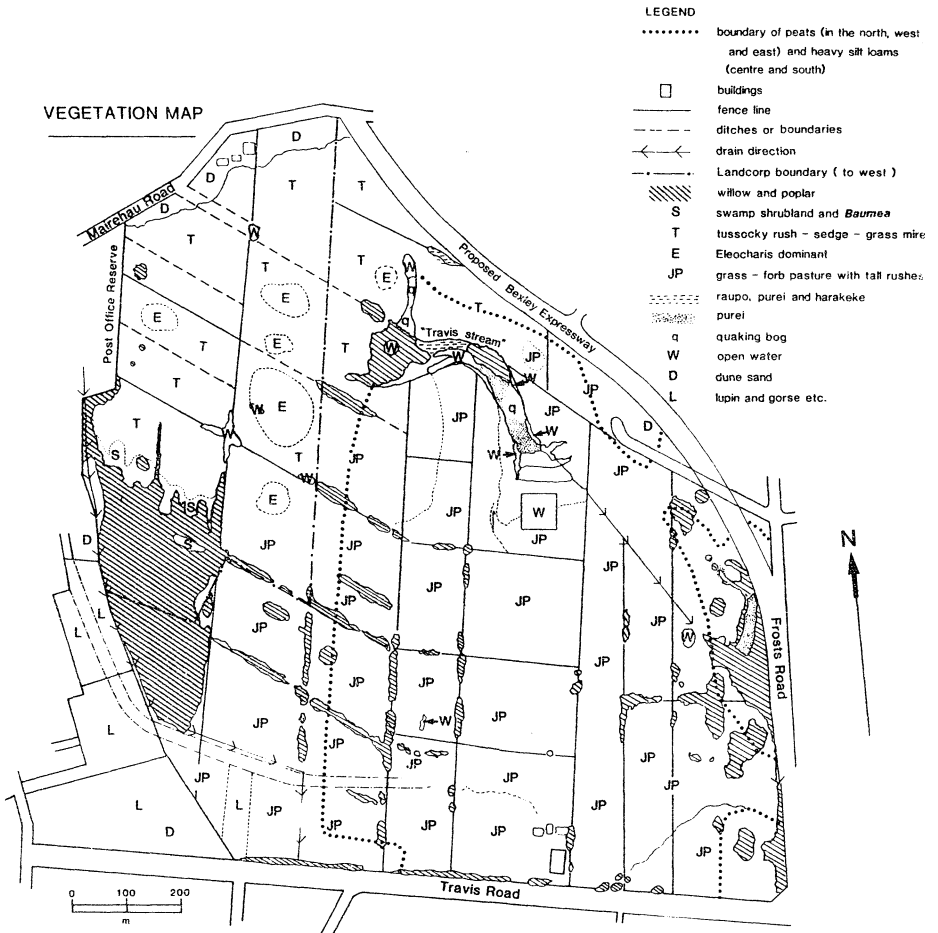
(ii) On slightly elevated, more silty terrain, the willow woodland is drier with less kiokio, more of the fern *Hypolepis ambigua*, with other native ferns and herbs (*Hydrocotyle*, *Centella*, *Cardamine*, introduced herbs, cocksfoot grass, shrubs and *Dryopteris* fern, the *Coprosma* species and hybrid, and some shaded ti. A few native lichens and mosses occur epiphytically on willow trunks throughout (*Xanthoria*, *Punctelia*, *Ramalina*, *Parmotrema*).

2. Swamp Shrubland (S on map) Along the northern fringes of the willow carr are scattered shrubs of manuka (mapped in 1856 as significant woodlands in this area, recently considered extinct in Christchurch, but now also known from a few plants at Brooklands Lagoon, Lincoln and Ellesmere), mikimiki (otherwise in the region confined now to Riccarton Bush, hills and coasts), willows,

Profile across proposed Travis Stream reserve.



VEGETATION MAP



Travers Swamp showing major vegetation, landform and soil units. The profile diagram is a concept for integrating urban, buffering parkland and conservation zones in the "Travis Stream" area.

blackberry (*Rubus echinatus*, *R. laciniatus*, *R. procerus*), gorse (*Ulex*), broom (*Cytisus*) and hawthorn (*Crataegus*). Pushing up around these taller woody plants are robust stands of kiokio and the reddish brown native reed *Baumea rubiginosa* (known otherwise only from small, threatened populations in the Cockayne Reserve, Saltwater Creek, Orton-Bradley Park and Ellesmere; Mason 1975, 1976). In shelter some of the *Baumea* is over 2.5 m tall. Also, in shorter rush-sedgeland among the islands of scrub, are occasional plants of *Triglochin striatum*, *Juncus planifolius*, rare *Luzula picta* and the remarkable find of sundew (*Drosera binata*) as scattered individual plants and in larger patches (ca. 1 m²); emerging on 8.11.88 with foliage up to 15 cm tall on 9.11.88.

3. Rush-sedge-grass Mire This mosaic of tussock and turf vegetation covers the greater area of Travis Swamp with rushes and sedges dominating in the north and grasses and forbs in the south. The relative dominance of rushes (*Juncus articulatus*, *J. effusus*, *J. planifolius*, *J. gregiflorus*, *J. bufonius*), sedges (*Carex flacca*, *C. virgata*, *C. secta*, *C. maorica*, *C. ovalis*, *Eleocharis acuta*, *Baumea*) and grasses (*Agrostis stolonifera*, *A. ?capillaris*, *Holcus lanatus*, *Glyceria plicata*, *Anthoxanthum odoratum*, *Dactylis glomerata*, *Poa pratensis*, *Cynosurus cristatus*) varies according to drainage, nutrient supply and grazing pressure. Of sporadic importance are buttercups (*Ranunculus repens*, *R. acris*, *R. sceleratus*), legumes (*Trifolium repens*, *T. fragiferum*, *Lotus pedunculatus*), docks (*Rumex crispus*, *R. conglomeratus*), catsear (*Hypochoeris radicata*), *Hypericum tetrapterum* and the native herbs *Microtis unifolia*, *Epilobium insulare*, *E. pallidiflorum* and *Potentilla anserinoides*.

Three phases of this mire are recognized together forming a matrix through the whole area:

(i) *Baumea* sedgeland (S on map) - fringing and mixed with the shrubland and woodland. This together with *Carex secta* is currently browsed by cattle and should recover and overshadow naturalized rushes (*Juncus articulatus*) and sedges (*Carex flacca*, *C. ovalis*) once the cattle are removed. About 50 plants of the spider orchid were noted here in flower on 3.10.88. *Potentilla* is scattered throughout.

(ii) Rush-sedgeland (T & E on map)- the northern part of the swamp is crisscrossed with defunct drains; the 1 m deep peaty gel has its vegetation more or less at the minimum water table. In places it is dominated by the introduced glaucous sedge (*Carex flacca*), elsewhere by the native spike rush (*Eleocharis*) or tussocks of *Carex secta* and *C. maorica*, and then again by jointed rush (*J.*

articulatus), buttercups, monkey musk (*Mimulus guttatus*) and other introduced graminoids (*Agrostis*, *Holcus*) and forbs (*Hypericum*, *Rumex*). Small (2-4 m tall) grey willows are beginning to spread onto the mire. At present they are quite scattered.

(iii) Grass-rush-wet pasture (JP on map) - in the south, on the better drained shallow peats and heavy silt loams are old dairy pastures locally dominated by clumps of soft rush (*J. effusus*). The grazed turf supports jointed rush, grasses, clover, occasional sedges (*Carex ovalis*) and populations of the onion-leaved orchid.

4. Tall Swampland (stipple and dashes on map) The tall monocultural raupo, purei and harakeke stands are best developed in "Travis stream" as described by Partridge (1984). Floating or submerged rafts of duckweed (*Lemna*), *Wulfia*, floating fern (*Azolla*) and pondweed (*Potamogeton*) occur in natural and artificial ponds and channels. *Cotula coronopifolia* and *Potentilla* are common in the grassy verges of the sluggish "Travis" stream.

5. Sand Ridges and Reclamations (D&L on map) These are highly modified, some by horse grazing, and are dominated by lupin, broom, various other introduced trees, shrubs, forbs and grasses with native bracken (*Pteridium esculentum*) and sparse poroporo (*Solanum laciniatum*).

Soils: The soils described and mapped by Harris *et al.* (1946) are more or less as follows: sandy loams on the dunes, 1-2 m deep peats and peaty silt loams under the willow and mire (phases i and ii), and gleyed, heavy silt loams under the wet pasture (mire, phase iii).

Vertebrates: Forty two birds, including 26 natives, a skink, as well as eel (tuna) and galaxids (inanga) are recorded from the greater Travis Swamp area (Appendix 2).

Conservation status of vegetation

Given the virtual elimination of Christchurch's natural estate, within the space of a mere 150 years, the Travis Swamp area must be regarded as an invaluable, natural monument - ranking alongside the kahikatea forest of Riccarton Bush, the remaining salt and brackish marshes of the Avon-Heathcote Estuary, Brooklands Lagoon and Lake Ellesmere, the pingao dunelands of Kaitorete Spit, and the silver tussock and dry shrublands of the Port Hills and Mcleans Island area. These are the few representatives we have left of the pre-European vegetation. They are the touchstones upon which future generations will interpret and judge their

environmental roots and natural history, and their ancestors' foresight and industry. The wider Christchurch context of this issue is considered further by Meurk and Norton (1988).

Wall listed 50 freshwater swampland species in his Christchurch flora. Of these 63% are presently found in Travis Swamp suggesting that the half-dozen or so communities described are a fair representation of Christchurch's original extensive wetlands (formerly occupying about 70% of the area). Indeed Travis Swamp could be considered more representative of pristine Christchurch than Riccarton Bush.

A number of regionally rare, threatened or restricted species have been identified in Travis Swamp. Moreover, Travis Swamp preserves some of the only undeveloped examples of the 4000 ha of Canterbury Plains peatlands and gley soils. Despite modification of the marshland, the surviving mosaic, incorporating communities with a high proportion of native species and dominants, or with potential for restoration, must be regarded as a nationally significant relic. This is particularly so because of its location within a major city and its consequent value as an aesthetic, cultural, recreational and educational resource.

The following points can be noted in comparing Travis Swamp with other eastern New Zealand wetlands. *Drosera binata* and *Baumea rubiginosa* are recorded from a peaty site between Allans Beech and Hoopers Inlet, Otago peninsula (P.N. Johnson, pers. comm. 1988). The sundew is also thought to occur in a coastal wetland north of Timaru. In the southern and eastern North Island, only four of 11 major wetlands assessed share more than 50% of the native species found at Travis Swamp, and the average similarity is 40% (from data supplied by C. Ogle, pers comm. 1988). In the whole eastern New Zealand, Lakes Wairarapa and Ellesmere, both internationally significant wetlands from a wildlife standpoint, are the only wetlands with comparable floras, each supporting 70% of the Travis Swamp native plant list.

While there is in parts of Travis Swamp a large, and even dominating, exotic element (rushes, sedges, grasses and willows), some of these are related to native species (at the generic, growth form or functional levels), or do not interfere with the wilderness character of the site, or can be controlled, removed or gradually replaced with native species. It is not pristine but it is not beyond salvage and repair. Furthermore, one must realistically acknowledge that all reserves in an urban context will be modified

to some extent and even Canterbury's lowland Scientific Reserves have a high proportion of adventive species.

It is an established biogeographical principle that with decreasing reserve area the probability of species extinction and habitat degradation increases - unless there is a countervailing input of intensive management effort. Large boundary:area ratios create greater opportunity for marginal degradation and weed or predator invasion. A corollary of this is that with small, isolated, fragmented reserves the only way to reduce the risk of catastrophe is to replicate habitat types and populations among several reserves, attempt to maintain stepping stones or corridors between them, and/or actively translocate genetic material between restricted populations. Thus, the existence of other wetlands in eastern Canterbury does not render this (quite extensive) one superfluous to conservation needs. There is no other wetland in Canterbury with a similar combination of species, communities and environmental gradients - with the possible exception of the Ellesmere lake shore. A large unfragmented reservation would assure the best prognosis for Travis Swamp's future survival.

Proposed conservation plan

Travis Swamp is a freehold property, largely owned by Travis Country Estates Ltd. The northwestern part is under Landcorp control and is therefore subject to a Waitangi Treaty claim by the Kaitahu. The land was zoned residential G1 in 1974. As such the developers or owners have the legal right to drain and fill the swamp and establish an urban estate, provided certain conditions are met to the satisfaction of the Waimairi District Council, the local controlling authority, and the North Canterbury Catchment Board. The Travis Country Estate Concept Plan (1987) is a document primarily dealing with engineering, town planning and sociological matters. As this article goes to press the fate of Travis Swamp is in the hands of a North Canterbury Catchment Board tribunal considering water right applications, and the Waimairi district Council who have heard submissions concerning planning and reserve matters.

At this point a range of options for the site exists - from abandoning the development, and creating a nature reserve status for the whole area, to carrying out the full development as presented in the Concept Plan.

The following conservation and management proposal is premised firstly on the core natural values described for 'Travis Stream' and the Landcorp block, and biogeographical principles of reserve

design. Secondly, re-establishing fragments of this system in Clare Park as the developers have suggested is not feasible nor viable as a conservation measure (alienating genetic populations from their natural environmental context). Thirdly, there is a requirement that the developer must incorporate a certain proportion of 'parkland' within urban development (45-130 m²/section).

The proposal is as follows:

1. Minimally the whole northern third of Travis swamp should be protected (see Map). This would encompass a small dune ridge along Mairehau Road, 'Travis Stream' and its first three or so islands (defined by Partridge 1984), the western willow woodlands, shrublands and sedgelands, and the connecting rush-sedge-grass mire complex. All of the Landcorp-administered land should be involved. This whole unit comprises areas that are mapped by Harris *et al.* (1946) as peats and some heavy silt loams, which are at or below the winter water table. As such it comprises a natural catchment or ponding area.

2. The first management necessity would be to remove the cattle which will allow *Carex*, *Eleocharis*, *Baumea* and *Coprosma* spp. to recover.

3. Control of noxious weeds including blackberry, hawthorn gorse and broom, and containing the willow, would be the next priority.

4. Wholesale clearance of willows is not envisaged, but some areas might be gradually replaced or enriched (in several nuclei) with swamp forest species from Riccarton Bush - in particular kahikatea (*Dracrycarpus dacrydioides*) and other flood-tolerant woody plants - manatu (*Plagianthus regius*), *Pittosporum*, *Pseudopanax*, weeping matipo (*Myrsine divaricata*), makomako (*Aristotelia serrata*), kapuka (*Griselinia littoralis*) and others at a later stage.

Sedges, rushes, harakeke, raupo and kiokio (from islands 4-6 of Partridge, 1984) could be scooped up and used to enrich parts of the proposed swamp reserve which is presently depleted by cattle grazing and pugging.

Introductions to the swamp proper might include a native buttercup (*Ranunculus glabrifolius*), and the grasses (*Hierochloe* or karetu, and toetoe). Some of these plants occur in the area and further searching of Travis Swamp may show others to be present.

Toetoe was reported earlier by Harris *et al.* (1946). From these stocks, material could be propagated in a nursery for later planting.

The sand ridge along Mairehau Rd could be planted with akeake (*Dodonea viscosa*), ngaio (*Myoporum laetum*), ti, kanuka (*Kunzea ericoides*), kohuhu, karamu, akiraho (*Olearia paniculata*), rohutu (*Lophomyrtus obcordata*), poroporo, and tauhinu (*Cassinia leptophylla*). Other species like kapuka, mahoe (*Meliccytus ramiflorus*), totara (*Podocarpus totara*) and mapau (*Myrsine australis*) might be planted in later.

5. Close monitoring of the rush-sedge-grass swamp would be maintained to ensure the survival of the rarities and lower growing species such as *Potentilla*, *Drosera*, *Microtis*, *Epilobium*, *Corybas*, *Luzula*, *Centella* and *Triglochin*. Some localized management such as mowing, scything or more drastic disturbance might be required. It should be noted that the present habitat exists under a management of light cattle grazing. Bird cropping combined with the high water table may be sufficient to keep some areas open.

6. Again some swamp birds, and even bush birds, may be encouraged to establish here. Additional ponds, with islands, excavated from already heavily modified areas would encourage a greater diversity of bird life. Stocks of eel and galaxids should be maintained if possible with access to the sea.

7. Some patches of harakeke, planted into areas of exotic sedges, and other reeds might be harvested on a small scale for traditional Maori uses.

8. The final and most crucial component in all such work is the human factor. It seems that the best way to combat vandalism and abuse of the work is for it to be a community venture in which the neighbourhood establishing around the park and reserve grow up with it, understand it, learn from it, have a hand in its construction and management, and thus develop a vested interest in protecting it. Particularly in the formative years, protection and replanting is likely to be required - until the hydrology and land has settled into its new configuration and trees have reached a size whereby they can look after themselves. The swampiness will deter major human intrusion and strategic fencing should hopefully eliminate any hazard. But controlled accessibility will be important. This may be achieved by a ring track, board walks, hides, interpretation boards, and graded marginal parklands. There is major scope here for an important bicultural educational resource. An appropriate

landscape and management plan with wide participation will be integral to the success of the concept.

It should be recognized that there are precedents for wetlands within urban areas - e.g. Matawai Park - Rangiora, Avon and Heathcote rivers, and in the Warrington "ecological plantings" in England (see also the Dip. L.A. thesis by Dinah Hansman, 1987). A neighbourhood conservation group would be the ideal means of ensuring the success of this type of venture.

Summary

The biological significance of Travis Swamp is reassessed because of reactivation of proposals to fill in the wetland and develop an urban estate.

176 vascular plants are recorded, of which 50 are native. At least 27 lower plants are noted. 42 birds (26 native), a skink, and two indigenous fish are also reported.

Five compound plant formations are recognized: Willow woodland (two phases), swamp shrubland, rush-sedge-mire (three phases), tall swampland, and sand ridge. The sand ridges are almost devoid of native species, the willow woodland although dominated by exotic willow, has an important natural component, while the other three formations have a substantially natural/wilderness character with some locally and nationally significant elements, and some regionally rare species (sundew, manuka, sedges, orchids). These wetland communities were once a characteristic feature of the Christchurch area, but are now largely eliminated or severely modified. These vestiges in Travis Swamp offer some of the last opportunities for protection and restoration of such representative examples of our local natural heritage.

It is recommended that 'Travis Stream', draining Frosts Road, and its islands, and the western woodland, shrubland and mire should be protected in a single large reserve occupying at least the northern third of the total 80 ha area. This would fulfil all the criteria for a viable reserve - an unfragmented area with more or less natural landform/catchment boundaries. It would preserve most of the peat and sand dune soils and smaller patches of the heavy silt loams which predominate in the southeast and which would be more amenable to development if this is inevitable. A plan is presented involving one possible scenario within a continued, but modified, urban development, and management issues are discussed.

Acknowledgements

I wish to record my thanks to Mr Greg Collett for showing me some of Christchurch's last relics of swampland species, and for sharing his historical knowledge of the area. Also to Alan Fife, Bill Sykes, Phil Garnock-Jones, Colin Webb, Ruth mason, Brian Molloy and Elizabeth Edgar for some plant identifications.

References

- Armstrong, J.F. 1869. On the vegetation of the neighbourhood of Christchurch, including Riccarton, Dry Bush, etc. **Transactions and Proceedings of the New Zealand Institute** 2, 118-128.
- Clark, D.J. and Partridge, T.R. 1984. The shoreline vegetation of Lake Ellesmere, Canterbury, New Zealand. North Canterbury Catchment Board, unpublished report.
- Hansman, D.J. 1987. An Ecological Approach to Landscape Design in Urban Parks. Diploma of Landscape Architecture Thesis. Unpublished. Lincoln College.
- Herriot, E.M. 1919. A history of Hagley Park, Christchurch with special reference to its botany. **Transactions of the New Zealand Institute** 51, 427-447.
- Harris, C.S., Fox, J.P. and Vucetich, C.G. 1946. Soil report on Travis Block with special reference to subsidence. New Zealand Soil Bureau unpublished report.
- Mason, R. 1975. *Baumea rubiginosa* - *Lobelia anceps*. **Canterbury Botanical Society Journal** 8, 15-16.
- Mason, R. 1976. *Baumea rubiginosa* again. **Canterbury Botanical Society Journal** 9, 28.
- Meurk, C.D. and Norton, D.A. 1988. A conservation blueprint for Christchurch. **Canterbury Botanical Society Journal** 22,
- Partridge, T.R. 1984. The vegetation of Travis Swamp, Christchurch. Botany Division, D.S.I.R., Internal Report No. 487.
- Wall, A. 1953. **The Botany of Christchurch**. Revised edition. A.H. and A.W. Reed, Wellington.

Appendix 1

Plant species recorded in Travis Swamp in Willow Woodland (W), Shrubland (S), Rush-sedge-grass marshland (M), Streambanks and Island (I), and Sand Dunes + fill (D), * = indigenous species

<u>Woody Plants</u>		W	S	M	I	D
<i>Clematis vitalba</i>	old mans beard					X
<i>Coprosma propinqua</i> *	mikimiki	X	X		X	
<i>Coprosma robusta</i> *	karamu	X				
<i>Coprosma propinqua</i> <i>x robusta</i> *	hybrid coprosma	X	X			
<i>Cordyline australis</i> *	ti (cabbage tree)	X				
<i>Cotoneaster simonsii</i>	cotoneaster	X				
<i>Crataegus monogyna</i>	hawthorn		X			
<i>Cytisus scoparius</i>	broom		X			X
<i>Dodonaea viscosa</i> *	akeake (planted?)					X
<i>Eucalyptus</i> sp.	gum tree					X
<i>Hebe salicifolia</i> *	koromiko					X
<i>Hedera helix</i>	ivy	X				
<i>Ilex aquifolium</i>	holly	X				
<i>Leptospermum scoparium</i> *	manuka		X			
<i>Lonicera periclymenum</i>	honeysuckle	X				
<i>Lupinus arboreus</i>	lupin					X
<i>Mahonia lomariifolia</i>	mahonia	X				
<i>Muehlenbeckia australis</i> *	pohuehue	X				
<i>Pinus ?radiata</i>	monterey pine					X
<i>Pittosporum tenuifolium</i> *	kohuhu	X				
<i>Populus nigra</i> var. <i>italica</i>	lombardy poplar					X
<i>Prunus</i> sp.	plum	X				
<i>Quercus robur</i>	common oak	X				
<i>Rubus echinatus</i>	blackberry	X	X			
<i>Rubus laciniatus</i>	blackberry		X			
<i>Rubus procerus</i>	blackberry		X			X
<i>Salix alba</i> var. <i>vitellina</i>	golden willow	X				
<i>Salix cinerea</i>	grey willow	X	X	X		
<i>Salix fragilis</i>	crack willow	X				
<i>Salix matsudana</i> var. <i>tortuosa</i>	tortured willow					X
<i>Sambucus nigra</i>	elderberry	X				X
<i>Solanum laciniatum</i> *	poroporo	X				X
<i>Tamarix chinensis</i>	tamarisk					X
<i>Ulex europaeus</i>	gorse		X			X
<i>Vinca major</i>	greater periwinkle	X				
<u>Sedges, Rushes, Grasses, Orchids, Lilies</u>		W	S	M	I	D
<i>Agrostis capillaris</i>	browntop			X		
<i>Agrostis stolonifera</i>	creeping bent			X		
<i>Alopecurus geniculatus</i>	knead foxtail			X		
<i>Anthoxanthum odoratum</i>	sweet vernal			X		
<i>Baumea rubiginosa</i> *	native sedge		X	X		
<i>Bromus diandrus</i>	great brome			X		X
<i>Bromus unioloides/catharticus</i>	prairie grass					X
<i>Carex coriacea</i> *	rautahi			X		

		W	S	M	I	D
<i>Carex flacca</i>	glaucous sedge			X		
<i>Carex maorica*</i>	?purei	X		X		
<i>Carex ovalis</i>	oval sedge			X		
<i>Carex secta*</i>	purei			X	X	
<i>Carex virgata*</i>	?purei			X	X	
<i>Cortaderia splendens</i>	pampus grass					X
<i>Corybas rivularis*</i>	spider orchid	X	X			
<i>Crocosmia x crocosmiiflora</i>	montbretia		X	X		
<i>Cynosurus cristatus</i>	crested dogstail			X		
<i>Dactylis glomerata</i>	cocksfoot	X		X		
<i>Eleocharis acuta*</i>	spike rush	X	X	X		
<i>Festuca arundinacea</i>	tall fescue			X		
<i>Festuca pratensis</i>	meadow fescue			X		
<i>Festuca rubra</i>	red fescue			X		
<i>Glyceria ?plicata</i>	plicate sweet					
	-grass			X		
<i>Holcus lanatus</i>	Yorkshire fog			X		
<i>Isolepis setacea</i>	bristle scirpus			X		
<i>Juncus articulatus</i>	jointed rush			X	X	
<i>Juncus bufonius</i>	toadrush			X		
<i>Juncus effusus</i>	soft rush			X	X	
<i>Juncus gregiflorus*</i>	wiwi			X	X	
<i>Juncus planifolius*</i>	native rush			X		
<i>Lolium multiflorum</i>	Italian ryegrass			X		
<i>Lolium perenne</i>	perennial ryegrass		X			
<i>Luzula picta var. limosa*</i>	NZ woodrush		X			
<i>Microtis unifolia*</i>	onion orchid	X	X	X		
<i>Phormium tenax*</i>	harakeke (NZ flax)	X	X	X	X	
<i>Poa annua</i>	annual meadowgrass			X		
<i>Poa pratensis</i>	smooth meadowgrass			X		
<i>Poa trivialis</i>	rough meadowgrass			X		
<i>Potamogeton cheesemanii*</i>	manihi (red pond -weed)					X
<i>Potamogeton ochreatus*</i>	pondweed					X
<i>Triglochin striatum*</i>	native arrow grass		X			
<i>Typha orientalis*</i>	raupo					X
<u>Other Herbs and Ferns</u>		W	S	M	I	D
<i>Achillea millefolium</i>	yarrow					X
<i>Angelica pachycarpa</i>	angelica	X				
<i>Athyrium filix-femina</i>	female fern	X				
<i>Atriplex ?prostrata</i>	orache				X	
<i>Azolla rubra*</i>	retoreto (floating fern)					X
<i>Blechnum minus*</i>	(kiokio) hard fern	X	X			
<i>Blechnum " blackspot" x minus*</i>	hybrid hard fern	X				
<i>Brassica rapa</i>	wild turnip					X
<i>Blechnum penna-marina*</i>	little hard fern	X				
<i>Callitriche stagnalis</i>	starwort	X			X	
<i>Cardamine debilis*</i>	panapana (NZ bitter cress)	X				
<i>Cardamine flexuosa</i>	bittercress	X				
<i>Cardamine hirsuta</i>	bittercress				X	
<i>Cardaria draba</i>	hoary cress					X

		W	S	M	I	D
<i>Centaureum erythraea</i>	centaury			X		
<i>Centella uniflora*</i>		X	X			
<i>Cerastium fontanum</i> subsp.	mouse-eared					
<i>vulgare</i>	chickweed			X		
<i>Chenopodium album</i>	fathen					X
<i>Cirsium arvense</i>	Californian thistle			X		X
<i>Cirsium vulgare</i>	spear thistle			X		
<i>Conium maculatum</i>	hemlock					X
<i>Calystegia silvatica</i>	great bindweed					X
<i>Conyza albida</i>	fleabane	X				X
<i>Cotula coronopifolia*</i>	buttonweed			X	X	
<i>Crassula sieberiana*</i>						X
<i>Crepis capillaris</i>	hawksbeard					X
<i>Drosera binata*</i>	wahu (sundew)		X	X		
<i>Dryopteris dilatata</i>		X				
<i>Dryopteris filix-mas</i>	male fern	X				
<i>Epilobium ciliatum</i>	willowherb			X		
<i>Epilobium insulare*</i>	NZ willowherb	X		X		
<i>Epilobium billardiereanum</i> var. <i>billardiereanum*</i>	NZ willowherb			X		
<i>Epilobium nummulariifolium*</i>	NZ willowherb	X				
<i>Epilobium pallidiflorum*</i>	NZ willowherb			X		
<i>Foeniculum vulgare</i>	fennel					X
<i>Fumaria officinalis</i>	fumitory	X				
<i>Galium aparine</i>	cleavers	X		X		
<i>Galium palustre</i>	marsh bedstraw	X				
<i>Heracleum mantegazzianum</i>						X
<i>Histiopteris incisa*</i>	matamata (waterfern)	X				
<i>Hydrocotyle heteromeria*</i>	NZ pennywort	X				
<i>Hydrocotyle moschata*</i>	NZ pennywort	X				
<i>Hydrocotyle novae-zeelandiae*</i>	NZ pennywort			X		
<i>Hypericum tetrapterum</i>	square-stalked St. John's wort	X	X	X		
<i>Hypochoeris radicata</i>	catsear			X		X
<i>Hypolepis ambigua*</i>	NZ fern	X				
<i>Lactuca serriola</i>	prickly lettuce					X
<i>Lemna minor*</i>	duckweed				X	
<i>Leontodon taraxacoides</i>	hawkbit					X
<i>Lepidium africana</i>	pepper cress					X
<i>Lepidium bonariense</i>	Argentine cress					X
<i>Lotus pendunculatus</i>	marsh bird's-foot trefoil			X		
<i>Malva neglecta</i>	dwarf mallow					X
<i>Malva sylvestris</i>	large-flowered mallow					X
<i>Marrubium vulgare</i>	horehound					X
<i>Mentha spicata</i>	spearmint			X		
<i>Mimulus guttatus</i>	monkeymusk			X	X	
<i>Mimulus moschatus</i>	musk			X		
<i>Mirabilis jalapa</i>	marvel of Peru					X
<i>Montia perfoliata</i>	miners lettuce	X				
<i>Myosotis laxa</i> var. <i>caespitosa</i>	water forget-me-not			X	X	
<i>Nasturtium microphyllum</i>	watercress	X			X	
<i>Papaver rhoeas</i>	field poppy					X
<i>Parentucellia viscosa</i>	tarweed	X				
<i>Pastinaca sativa</i>	wild parsnip			X		X

		W	S	M	I	D
<i>Plantago lanceolata</i>	narrowleaved plantain				X	
<i>Plantago major</i>	broadleaved plantain				X	
<i>Polycarpon tetraphyllum</i>	all-seed					X
<i>Polygonum persicaria</i>	willowweed				X	
<i>Polystichum vestitum*</i>	prickly shield fern	X				
<i>Portulaca oleracea</i>	purslane					X
<i>Potentilla anserinoides*</i>	kowhaikura (silverweed)				X	X
<i>Prunella vulgaris</i>	selfheal				X	
<i>Pteridium esculentum*</i>	rarahu (bracken fern)				X	X
<i>Ranunculus acris</i>	field buttercup				X	
<i>Ranunculus repens</i>	creeping buttercup				X	
<i>Ranunculus sceleratus</i>	celery-leaved buttercup				X	X
<i>Rumex acetosa</i>	sorrel				X	
<i>Rumex acetosella</i>	sheeps sorrel					X
<i>Rumex conglomeratus</i>	clustered dock				X	
<i>Rumex crispus</i>	curled dock				X	
<i>Rumex obtusifolius</i>	broad dock					X
<i>Sagina procumbens</i>	pearlwort				X	
<i>Senecio glomeratus*</i>	pukatea (NZ groundsel)	X		X		
<i>Silene latifolia (alba)</i>	white campion					X
<i>Sisymbrium officinale</i>	hedgemustard					X
<i>Solanum dulcamara</i>	bittersweet	X				
<i>Sonchus asper</i>	prickly sowthistle				X	
<i>Sonchus oleraceus</i>	smooth sowthistle	X				
<i>Spergularia rubra</i>	sand spurrey					X
<i>Stellaria media</i>	chickweed					X
<i>Taraxacum officinale</i>	dandelion					X
<i>Trifolium arvense</i>	haresfoot trefoil					X
<i>Trifolium dubium</i>	suckling clover				X	
<i>Trifolium fragiferum</i>	strawberry clover				X	
<i>Trifolium repens</i>	white clover				X	
<i>Urtica urens</i>	stinging nettle					X
<i>Veronica serpyllifolia</i>	thyme-leaved speedwell				X	
<i>Wolffia arrhiza*</i>	water-meal					X

Mosses. (M). Liverworts (H). Lichens (L) and Fungi (F)

		W	S	M	I	D
<i>Agaric spp. (F)</i>		X	X			
<i>Aneura lobata (H)</i>					X	
<i>Brachythecium salebrosum (M)</i>		X		X		
<i>Bryum billardierei (M)</i>		X				
<i>Bryum ?chrysoneuron (M)</i>		X				
<i>Bryum pseudotriquetrum (M)</i>				X		
<i>Candelaria concolor (L)</i>		X				
<i>Funaria hygrometrica (M)</i>						X
<i>Hypnum cupressiforme (M)</i>		X				
<i>Lecanora chlarotera (L)</i>		X				
<i>Leptogium ?crispatellum (L) X</i>						
<i>Lophocolea bidentata (H) X</i>						
<i>Lophocolea semiteres (H) X</i>						
<i>Marchantia foliacea (H) X</i>						
<i>Parmotrema perlatum (L) X</i>						
<i>Physcia adscendens (L) X</i>						
<i>Physcia tribacioides (L) X</i>						

	W	S	M	I	D
<i>Punctelia subrudecta</i> (L)	X				
<i>Racopilum strumiferum</i> (M)	X				
<i>Radula ?physoloba</i> (H)	X				
<i>Ramalina celastri</i> (L)	X				
<i>Psoroma</i> sp. (L)	X				
? <i>Scutellinia</i> sp. (F)				X	
Sooty fungus (F)		X			
<i>Teloschistes velifer</i> (L)	X				
<i>Thuidium furfurosum</i> (M)	X				
<i>Xanthoria parietina</i> (L)	X				

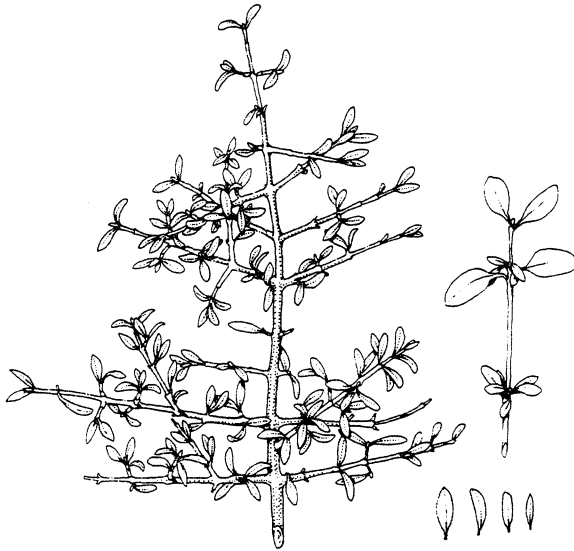
Appendix 2

A checklist of the birds (compiled by Andrew Crossland), reptiles and fish of Travis Swamp. W = wetland sp.; R = resident; N = nesting; N? = nesting suspected; (RV) = regular visitor; V = vagrant; S = status uncertain, possibly no longer present; I = population of regional importance; * = indigenous species.

Birds

<i>Alauda arvensis</i>	skylark	RN
<i>Anas platyrhynchos</i>	mallard	WRN
<i>Anas rhynchotis</i> *	NZ shoveler (kuruwhengi)	WRN
<i>Anas superciliosa</i> *	grey duck (parera)	WRN
<i>Anthus novaeseelandiae</i> *	NZ pipit (pihoihoi)	RN?
<i>Ardea novaehollandiae</i> *	white-faced heron	WRN?
<i>Athene noctua</i>	little owl	RN?
<i>Botaurus poiciloptilus</i> *	bittern (matuku)	WSI
<i>Branta canadensis</i>	Canada goose	WV
<i>Bubulcus ibis</i> *	cattle egret	WV
<i>Carduelis carduelis</i>	goldfinch	RN
<i>Carduelis flammea</i>	redpoll	RN
<i>Chalcites lucidus</i> *	shining cuckoo (pipiwharaua)	R-(RV)N?
<i>Chloris chloris</i>	greenfinch	RN
<i>Circus approximans</i> *	harrier (kahu)	WRN?
<i>Columba livia</i>	rock pigeon	(RV)
<i>Egretta alba</i> *	white heron (kotuku)	WVI
<i>Emberiza citrinella</i>	yellowhammer	RN
<i>Falco novaeseelandiae</i> *	NZ falcon (karearea)	V
<i>Finschia novaeseelandiae</i> *	brown creeper (pipipi)	VS
<i>Fringilla coelebs</i>	chaffinch	RN
<i>Gerygone igata</i> *	greywarbler (riroriro)	RN
<i>Gymnorhina hypoleuca</i>	white-backed magpie	RN
<i>Halcyon sancta</i> *	NZ kingfisher (kotare)	WRN?
<i>Himantopus leucocephalus</i> *	pieb stilt (poaka)	WRNI
<i>Hirundo neoxena</i> *	welcome swallow	WRN
<i>Larus bulleri</i> *	black-billed gull	WV

<i>Larus dominicanus</i> *	S. black-backed gull (karoro)	W(RV)
<i>Larus scopulinus</i> *	red-billed gull (tarapunga)	R(RV)
<i>Lobibyx novaehollandiae</i> *	spur-winged plover	WRN
<i>Passer domesticus</i>	house sparrow	RN
<i>Phalacrocorax carbo</i> *	black shag (kawau)	WV
<i>Phalacrocorax melanoleucos</i> *	little shag (kawaupaka)	WV
<i>Porphyrio melanotus</i> *	pukeko	WRNI
<i>Porzana pusilla</i> *	marsh crake (koitareke)	WN?SI
<i>Prunella modularis</i>	dunnock (hedge sparrow)	RN
<i>Rhipidura fuliginosa</i> *	fantail (piwakawaka)	RN
<i>Sturnus vulgaris</i>	starling	RN
<i>Tadorna variegata</i> *	paradis shelduck (putangitangi)	WRN
<i>Turdus merula</i>	blackbird	RN
<i>Turdus philomelos</i>	song thrush	RN
<i>Zosterops lateralis</i> *	silvereve (tauhou)	RN
<u>Fish</u>		
<i>Anguilla australis</i> *	short-finned eel (tuna)	
<i>Galaxias ?maculatus</i> *	whitebait (inanga)	
<u>Reptile</u>		
<i>Leiopisima</i> sp	skink	



Coprosma propinqua