

SOUTHLAND CONSERVANCY

Te Anau Basin Wetland Complex (71)

Location: 45°27'S, 167°46'E. To the east and southeast of Lake Te Anau, Southland, South Island.

Area: c.2,400 ha.

Altitude: 180-360 m.

Overview: The Te Anau Basin Wetland Complex consists of seven distinct and isolated wetlands within the Te Anau Basin. These sites are the Dome Mire and Dismal Swamp area, Kepler Mire, Amoeboid Mire, Kakapo Swamp, Dunton Bog and two areas within the Snowdon Forest. The Dome Mire and Dismal Swamp area and Kepler Mire are described in greater detail as Sites 71a and 71b, respectively. All of the wetlands have a similar glacial origin; however, individual sites vary as a consequence of their history, drainage (water table, amounts of ponded water), fertility, topography *etc.* The complex of peatlands contains a rich variety of plant communities which include several significant plant distributions and provide important habitat for wildlife.

Physical features: The Te Anau Basin lies on the eastern margin of Fiordland, a gneiss/schist/granite massif uplifted by the Alpine Fault on its western margin and carved by extensive glaciation through the Quaternary. On its eastern flank, down-faulting in the Te Anau Basin area has contributed to the preservation of soft Tertiary sedimentary rocks, and the deposition of glacial gravels. During the last glaciation, glaciers occupied much of the basin. Depressions and areas of limited drainage developed in the moraines, tills and outwash gravels as the glaciers retreated. Wetlands have developed on these glacial outwash deposits of last glacial to post-glacial age. The soils that developed on these deposits were never very fertile, and poor drainage and high rainfall resulted in widespread gleying and podzolization. Differences in drainage (water movement, water table, amount of ponded water) and fertility are largely responsible for variations in character between the seven wetlands described here.

The climate is cloudy, with lower sunshine hours and temperatures than other lowland areas in New Zealand. Winters are cool, with frequent frosts and periods of fog which may last for several days. The average annual rainfall is approximately 1,105 mm.

Ecological features: The seven wetlands which comprise this site are representative of the vegetation (both communities and species) of the Te Anau Basin. The larger mires frequently have a mosaic of vegetation, while smaller mires are more uniform. Each site has a different physical character (topography, drainage and fertility) and consequently sites have distinct individual characteristics. Most sites contain a diverse array of plant communities. The major plant communities are: Wire Rush *Empodisma minus*, *Dracophyllum oliveri* and Bog Pine *Halocarpus bidwillii* on infertile peatlands; *Carex* spp., including *C. diandra*, *C. sinclairii*, *C. gaudichaudiana* and *C. secta*, on more fertile areas; *Baumea rubiginosa* and *Sphagnum* sp. around pools and wet hollows; Red Tussock *Chionochloa rubra* ssp. *cuprea* tussocklands; and Manuka *Leptospermum scoparium* shrubland. The peat soils have been studied to determine the glacial and post-glacial vegetation history associated with climate change in the area.

Land tenure: The wetlands included in the complex are Crown land held as Conservation Area, Wildlife Management Reserve and National Park, and are administered by the Department of Conservation. Surrounding areas are generally either Crown land held as Conservation Area or National Park, or private land.

Conservation measures taken: Kepler Swamp, Dome Mire/Dismal Swamp, Dunton Bog and the two areas within Snowdon Forest are Crown land held as Conservation Area. Kakapo Swamp is a Wildlife Management Reserve, and Amoeboid Mire is part of Fiordland National

Park. All are administered by the Department of Conservation, and all are fenced or otherwise free from grazing.

Conservation measures proposed: It has been recommended that the wetlands be investigated with a view to nomination for listing as a Ramsar Site under the Ramsar Convention.

Land use: The principal land use throughout the wetlands is nature conservation, especially conservation of ecological values. There is no permanent human habitation within the wetland. Game-bird hunting occurs in some of the wetlands. Private land in surrounding areas is predominantly agricultural land used for pastoral farming.

Possible changes in land use: None known at the wetland. Continued land development, including drainage, ploughing, top-dressing and over-sowing, is likely on private land in the catchment area.

Disturbances and threats: The drainage of adjacent areas may alter water flow and the dynamics of individual wetlands. Intrusion by domestic livestock can lead to trampling which affects both the vegetation and the drainage. Fires change the vegetation cover and cause a loss of habitat for wildlife. Invasion by woody weed species, which can over-top some native plant communities, also poses a threat.

Hydrological and biophysical values: The wetlands play a general role in the maintenance of water quality, recharge and discharge of groundwater, and support of food chains.

Social and cultural values: Very limited; there is some game-bird hunting at some wetlands.

Noteworthy fauna: The fauna is generally neither diverse nor abundant. The most conspicuous birds are species of Anatidae which include Canada Goose *Branta canadensis*, Paradise Shelduck *Tadorna variegata*, Grey Teal *Anas gracilis*, Mallard *A. platyrhynchos*, Grey Duck *A. superciliosa*, New Zealand Shoveler *A. rhynchotis variegata* and New Zealand Scaup *Aythya novaeseelandiae*. Other birds present include Black Shag *Phalacrocorax carbo*, Little Shag *P. melanoleucos*, Australasian Bittern *Botaurus poiciloptilus*, Cattle Egret *Bubulcus ibis*, White-faced Heron *Egretta novaehollandiae*, Great Egret or White Heron *E. alba*, Australasian Harrier *Circus approximans*, Banded Rail *Rallus philippensis assimilis*, Marsh Crake *Porzana pusilla affinis*, Spotless Crake *P. tabuensis plumbea*, Pukeko *Porphyrio porphyrio melanotus*, South Island Pied Oystercatcher *Haematopus finschi*, Pied Stilt *Himantopus leucocephalus*, Southern Black-backed Gull *Larus dominicanus*, Black-billed Gull *L. bulleri*, Black-fronted Tern *Chlidonias albobristatus* and South Island Fernbird *Bowdleria punctata punctata*. The Glossy Ibis *Plegadis falcinellus* has been recorded as a vagrant.

The freshwater fish are not well known. Streams draining the wetlands contain Giant Kokopu *Galaxias argenteus*, Banded Kokopu *G. fasciatus*, Long-finned Eel *Anguilla dieffenbachii* and Short-finned Eel *A. australis*. Introduced Brown Trout *Salmo trutta* and Rainbow Trout *Oncorhynchus mykiss* have also been recorded locally.

Noteworthy flora: The flora is generally typical of lowland peat wetlands. A flora of over 200 species has been recorded from the wetlands and associated margins. Silver Pine *Lagarostrobos colensoi* is known from the Dome Mire/Dismal Swamp area as an eastern outlier population (the only known locality east of the main divide in the South Island). Yellow-silver Pine *Lepidothamnus intermedius* and Pygmy Pine *L. laxifolius*, which are both now uncommon at low altitudes (due to fires), are known from Amoeboid Mire and Kepler Mire.

Scientific research and facilities: The peat of these wetlands is of scientific interest as it contains pollen, spores and micro-fossils from which the vegetation history of the area can be mapped. Cranwell and von Post undertook pollen analyses at sites within the Te Anau Basin. This work outlined the course of post-glacial vegetation changes in the region (Cranwell & von Post, 1936). Burrows and Dobson undertook a study of wetlands in the Te Anau Basin

(including Kepler Mire, Dome Mire/Dismal Swamp, Amoeboid Mire, Lookout Mire and Kakapo Swamp) in which they describe the vegetation history of the area and the general nature and vegetation of certain mires (Burrows & Dobson, 1972). There are no research facilities in the area.

Conservation education: None at present. A great potential exists for interpretation and increased conservation education, as several sites are adjacent to roads or walking tracks.

Recreation and tourism: Ease of access varies considerably, and limits the usage of some of the wetland areas. Amoeboid Mire (Kepler Track Mire) is adjacent to the heavily used Kepler Track in Fiordland National Park. Game-bird hunting (mainly for introduced Mallard) occurs in some of the wetlands.

Management authority: The Department of Conservation (Southland Conservancy) is responsible for management of Conservation Areas, National Parks and wildlife. The Southland Regional Council has statutory responsibilities under the Resource Management Act 1991 for water resources. The Southland Fish and Game Council manages sport fishing (trout and salmon) and game-bird hunting.

Jurisdiction: Functional: Department of Conservation and Southland Fish and Game Council. Territorial: Southland Regional Council and Southland District Council.

References: Burrows & Dobson (1972); Cranwell & von Post (1936); Stephenson (1986).

Reasons for inclusion:

- 1a Te Anau Basin Wetland Complex is a particularly good representative example of a complex of peatlands, a wetland type characteristic of New Zealand.
- 2a The wetlands support populations of two threatened species of fish, *Galaxias argenteus* and *G. fasciatus*, and two threatened species of birds, *Botaurus poiciloptilus* and *Chlidonias albostratus*.
- 2b The wetlands are of special value for maintaining the genetic and ecological diversity of the region because of their diverse flora and fauna. Over 200 species of plants have been recorded, along with a wide range of indigenous fish and birds, including several threatened species and a number of endemic species.
- 2d The wetlands are of special value for their endemic plant and animal species, including the plants *Baumea tenax*, *Cardamine debilis*, *Carex coriacea*, *C. maorica*, *Celmisia gracilentia*, *Chionochloa rubra* ssp. *cuprea*, *Coprosma propinqua*, *Dracophyllum oliveri*, *Epilobium brunnescens*, *Halocarpus bidwillii*, *Lagarostrobos colensoi*, *Lepidothamnus intermedius*, *L. laxifolius*, *Myriophyllum triphyllum*, *Potamogeton suboblongus*, *Ranunculus foliosus* and *Uncinia rubra*, the fish *Galaxias argenteus* and *G. fasciatus*, and the birds *Tadorna variegata*, *Aythya novaeseelandiae*, *Haematopus finschi*, *Larus bulleri*, *Chlidonias albostratus* and *Bowdleria punctata*.

Source: Brian Rance.

Dome Mire and Dismal Swamp (71a)

Location: 45°19'S, 167°48'E. On the east side of Lake Te Anau, adjacent to Fiordland National Park and 12 km north of Te Anau Township, northern Southland, South Island.

Area: c.500 ha.

Altitude: c.250-270 m.

Overview: Dome Mire and Dismal Swamp are part of the Te Anau Basin Wetland Complex. This wetland is diverse in vegetation types, and as a consequence, supports a diverse flora and

fauna. The area has high ecological values, and is representative of the Te Anau Basin wetlands.

Physical features: The wetland lies in a melt-water channel between moraine hills which date back to an ancient glaciation period. The north portion is a rain-fed, raised dome mire which drains into Boundary Creek. The southern portion has a high water table with slowly moving water, and is drained by the Eweburn Stream. Lake Te Aroha and other small lakes are included in the site.

Ecological features: The wetland contains two major types of vegetation: Wire Rush *Empodisma minus* and sedge communities. The northern portion consists of a raised dome mire with numerous pools (Dome Mire). Dome Mire is considered by Burrows and Dobson (1972) to be the best of its type in New Zealand. This area is an infertile, rain-fed peatland dominated by Wire Rush. The central portion contains areas of peatland dominated by Wire Rush, and includes Lake Te Aroha within a large area of Manuka *Leptospermum scoparium* shrubland. The southern portion of the wetland has a higher water table and flowing water (Dismal Swamp). This area is more fertile and is dominated by *Carex* species (including *C. secta*, *C. sinclairii*, *C. diandra* and *C. coriacea*), *Baumea tenax*, *B. rubiginosa*, *Carpha alpina*, "*Coprosma sp. cf. intertexta*" and others. There are only limited areas of open standing water.

Land tenure: The wetland is Crown land held as Conservation Area and administered by the Department of Conservation. Much of the surrounding area is Crown land held as National Park or Conservation Area and administered by the Department of Conservation, but there is some private land to the south of the wetland.

Conservation measures taken: The wetland was taken out of a land development block and is now protected as Conservation Area under the administration and management of the Department of Conservation. The area has been fenced to prevent access by domestic livestock.

Conservation measures proposed: The area has been recommended as some form of ecological reserve. This proposal is due to be re-evaluated as part of an overall land status review for Southland Conservancy.

It has been recommended that the Te Anau Wetland Complex be investigated with a view to nomination for listing as a Ramsar Site under the Ramsar Convention. Dome Mire and Dismal Swamp would be included as a part of this site.

Land use: The wetland is managed for conservation purposes. Presently there is no easy access, and use is therefore minimal. A large portion of the surrounding area is either National Park or Conservation Area managed for conservation purposes. Private land to the south of the wetland is used for pastoral agriculture.

Possible changes in land use: None foreseen at the wetland complex or in upstream areas which are protected as National Park or Conservation Area. Continuing land development (ploughing, over-sowing and top-dressing) for increased pastoral use is likely on the private land to the south.

Disturbances and threats: Fires escaping from surrounding areas have the potential to change the vegetation cover and cause loss of habitat for wildlife (fires have been used as a land development tool in the past). Invasion by weed species is a potential threat; woody weed species can over-top some native plant communities.

Hydrological and biophysical values: The wetlands play a significant role in the maintenance of water quality, recharge and discharge of groundwater, flood control and the support of food chains.

Social and cultural values: None known.

Noteworthy fauna: The avifauna is not well known but appears to be limited, with only a few species of waterbirds present. These include Paradise Shelduck *Tadorna variegata*, Mallard *Anas platyrhynchos*, Grey Duck *A. superciliosa*, Australasian Harrier *Circus approximans*,

Black-fronted Tern *Chlidonias albostratus* and South Island Fernbird *Bowdleria punctata punctata*.

Noteworthy flora: The flora is diverse (with in excess of 100 species recorded) and typical of wetlands in the Te Anau Basin. The wetland is the only site east of the main divide where the Silver Pine *Lagarostrobos colensoi* is known to occur. Two uncommon species, the small orchid *Acianthus fornicatus* and the moss *Acrocladium cuppidatum*, are present.

Scientific research and facilities: Dome Mire and Dismal Swamp are one of the study sites used by Burrows and Dobson in their study of wetlands in the Te Anau Basin. In their report, they describe the vegetation history of the area and the general nature and vegetation of the Te Anau Basin (Burrows & Dobson, 1972). Dr Peter Johnson has prepared two unpublished reports discussing the botanical values of the wetland and proposed boundaries for a reserve.

Conservation education: None at present.

Recreation and tourism: None at present.

Management authority: The Department of Conservation (Southland Conservancy) is responsible for management of Conservation Areas, National Parks and wildlife. The Southland Regional Council has statutory responsibilities for water resources under the Resource Management Act 1991.

Jurisdiction: Functional: Department of Conservation. Territorial: Southland Regional Council and Southland District Council.

References: Burrows & Dobson (1972); Johnson (1977, 1984).

Reasons for inclusion:

- 1a Dome Mire and Dismal Swamp are a particularly good representative example of a dome mire and swamp complex, a wetland type characteristic of New Zealand.
- 2a The wetlands support a globally threatened species of bird, *Chlidonias albostratus*.
- 2b The wetlands are of special value for maintaining the genetic and ecological diversity of the region because of the diversity of their plant species and communities. Over 100 species of plants have been recorded from the wetlands.
- 2d The wetlands are of special value for their endemic plants, including *Baumea tenax*, *Cardamine debilis*, *Carex coriacea*, *C. maorica*, *Celmisia gracilentia*, *Chionochloa rubra* ssp. *cuprea*, *Coprosma propinqua*, *Dracophyllum oliveri*, *Epilobium brunnescens*, *Halocarpus bidwillii*, *Lagarostrobos colensoi*, *Myriophyllum triphyllum*, *Potamogeton suboblongus*, *Ranunculus foliosus* and *Uncinia rubra*. At least three endemic bird species are present, *Tadorna variegata*, *Chlidonias albostratus* and *Bowdleria punctata*.

Source: Brian Rance.

Kepler Mire (71b)

Location: 45°31'S, 167°41'E. To the east of the Manapouri-Te Anau Road, 12 km from Te Anau, northern Southland, South Island.

Area: c.941 ha.

Altitude: 220-230 m.

Overview: Kepler Mire is part of the Te Anau Basin Wetland Complex. It is a peatland area with numerous ponds and pools which form a string-bog. It is the largest of the wetlands in the Te Anau Basin, and the largest known string-bog in New Zealand.

Physical features: Kepler Mire lies in a depression between a set of low moraine hills formed by an ancient ice sheet which once covered the area. The wetland is a dome mire with the

central area raised about 3 m above the margin. The southern portion contains an area of string-bog with numerous ponds and long, narrow pools. Kepler Mire has the best string-bog formations of all of the glacially formed wetlands in the Te Anau Basin.

The wetland is fed by direct rainfall and drained by Home Creek. In the north, there is an old stream channel which flows sluggishly to feed the Stevens Tributary of Home Creek. After heavy rainfall, there is a surface flow of water from pool to pool.

Ecological features: Despite ancient fires, the wetland vegetation is diverse and highly representative of the Te Anau Basin Wetland Complex. Areas above the water table are generally dominated by Wire Rush *Empodisma minus*, Turpentine Shrub *Dracophyllum oliveri*, Manuka *Leptospermum scoparium*, Bog Pine *Halocarpus bidwillii* and others. Areas at or near to the water table contain much sphagnum moss *Sphagnum* spp. and *Baumea rubiginosa*. There is an extensive area of sedge vegetation along a sluggish stream, dominated by *Carex secta*, with some *C. diandra* and *C. maorica*.

Land tenure: Crown land held as Conservation Area and administered by the Department of Conservation. Surrounding areas are private land.

Conservation measures taken: The area was taken out of a land development block and protected as Conservation Area. It is administered and managed by the Department of Conservation for conservation purposes. The area has been fenced to prevent access by domestic livestock.

Conservation measures proposed: The area has been recommended as some form of ecological reserve. This proposal is due to be re-evaluated as part of an overall land status review for Southland Conservancy.

It has been recommended that the Te Anau Wetland Complex be investigated with a view to nomination for listing as a Ramsar Site under the Ramsar Convention. Kepler Mire would be included in this site.

Land use: The area is managed for conservation purposes. There is no easy access to the wetland, and there is little use other than some game-bird hunting. The principal land-use activity in surrounding areas is pastoral agriculture.

Possible changes in land use: None foreseen at the wetland. Continuing land development (ploughing, over-sowing and top-dressing) for increased pastoral use is likely on private land in the catchment area.

Disturbances and threats: Fires escaping from surrounding areas have the potential to change the vegetation cover and cause loss of habitat for wildlife (fires have been used as a land development tool in the past). Invasion by weed species is a potential threat; woody weed species can over-top some native plant communities. The weeds, Broom and Gorse, are found around the margins of the moraine hills above the wetland.

Hydrological and biophysical values: The wetland plays a significant role in the maintenance of water quality, recharge and discharge of groundwater, flood control and support of food chains.

Social and cultural values: None known.

Noteworthy fauna: The fauna is limited, but typical of the Te Anau Basin wetlands. It is dominated by Anatidae which include Canada Goose *Branta canadensis*, Paradise Shelduck *Tadorna variegata*, Mallard *Anas platyrhynchos*, Grey Duck *A. superciliosa* and New Zealand Scaup *Aythya novaeseelandiae*. Australasian Bittern *Botaurus poiciloptilus*, Australasian Harrier *Circus approximans* and South Island Fernbird *Bowdleria punctata punctata* utilise the peatland areas.

The freshwater fish and invertebrate fauna are poorly known.

Noteworthy flora: The flora is diverse (with in excess of 100 species recorded), and typical of wetlands in the Te Anau Basin. Of particular note are the shrubs Yellow-silver Pine

Lepidothamnus intermedius and Pygmy Pine *L. laxifolius*, and the mosses *Eucamptodon inflatus* and *Campylopus kirkii*, which are all uncommon either locally or nationally.

Scientific research and facilities: The wetland is adjacent to one of the study sites of Cranwell and von Post, who used pollen analyses to examine the vegetation history of the Te Anau Basin (Cranwell & von Post, 1936). The wetland is also one of the study sites used by Burrows and Dobson in their study of wetlands in the Te Anau Basin. These authors describe the vegetation history of the area and the general nature and vegetation of the Te Anau Basin (Burrows & Dobson, 1972).

Conservation education: None at present.

Recreation and tourism: There is limited use of the wetland, mainly game-bird hunting for the introduced Mallard.

Management authority: The Department of Conservation (Southland Conservancy) is responsible for management of Conservation Areas, National Parks and wildlife. The Southland Regional Council has statutory responsibilities under the Resource Management Act 1991 for water resources. The Southland Fish and Game Council manages sport fishing (trout and salmon) and game-bird hunting.

Jurisdiction: Functional: Department of Conservation and Southland Fish and Game Council. Territorial: Southland Regional Council and Southland District Council.

References: Burrows & Dobson (1972); Cranwell & von Post (1936); Stephenson (1986).

Reasons for inclusion:

- 1a Kepler Mire is a particularly good representative example of a string-bog complex, a wetland type characteristic of New Zealand.
- 2a The wetland complex supports a population of a globally threatened species of bird, *Botaurus poiciloptilus*.
- 2b The wetland is of special value for maintaining the genetic and ecological diversity of the region because of the diversity of its flora. Over 100 species of plants have been recorded.
- 2d The wetland is of special value for its endemic plants, including *Baumea tenax*, *Cardamine debilis*, *Carex coriacea*, *C. maorica*, *Celmisia gracilentia*, *Chionochloa rubra* ssp. *cuprea*, *Coprosma propinqua*, *Dracophyllum oliveri*, *Halocarpus bidwillii*, *Lepidothamnus intermedius*, *L. laxifolius* and *Potamogeton suboblongus*. At least three endemic bird species are present, *Tadorna variegata*, *Aythya novaeseelandiae* and *Bowdleria punctata*.

Source: Brian Rance.

Awarua Plains Wetland Complex (72)

Location: 46°32'S, 168°31'E. Adjacent to Toetoes Bay in Southern Southland, South Island. The area extends from Fortrose in the east to Bluff Harbour in the west.

Area: c.20,500 ha; (Seaward Moss 5,604 ha, Waituna Wetlands Scientific Reserve 3,556 ha, Toetoes 1,648 ha, New River Estuary 3,700 ha, Awarua Bay 2,030 ha, Fortrose Estuary 700 ha).

Altitude: 0-20 m.

Overview: An extensive wetland complex on the southern coast of the Southland Plains. The area contains the estuaries of Awarua Bay, New River Estuary and Toetoes Harbour (described in greater detail as Sites 72a-c, respectively), as well as the peatlands of the Awarua Plain dominated by wire rush and shrubland. This peatland contains Waituna Lagoon and numerous

smaller ponds (described in greater detail as Site 72d). The estuaries combine to provide one of New Zealand's most significant waterfowl habitats, and are also of great importance for fisheries. The extensive, intact peatland vegetation provides habitat for many birds and invertebrates which are highly representative of southern New Zealand peatlands. The wetland complex supports populations of several threatened species. There are intact vegetation sequences from estuarine mudflats through saltmarsh and a mosaic of wetland communities to tall podocarp forest. The wetland complex is most significant for its ecological values, notably its large populations of migratory shorebirds, other wetland birds, fishery values and intact vegetation sequences. The area lies entirely within the Waituna Ecological District. It contains the Waituna Wetlands Ramsar Site, a wetland of international importance listed under the Ramsar Convention.

Physical features: The Awarua Plains Wetland Complex is situated in an extensive area (c.190 sq.km) of low-lying land with gentle ridged topography, adjacent or close to the south coast of Southland. The wetland complex contains the large water bodies of New River Estuary, Awarua Bay, Toetoes Harbour (all estuarine) and Waituna Lagoon (intermittently opened to the sea). The peatland component of the wetland complex is impounded behind a coastal gravel barrier derived in part from river gravels reworked by rising sea level from the shallow (50 m) floor of Foveaux Strait. There has been a progressive seaward progradation of the barrier beach adjacent to Toetoes Bay (between Tiwai Point and the mouth of the Mataura River) since about 6,000 years BP. Evidence for this comes from eroded stump and peat deposits exposed on the coast near the mouth of the Mataura River, and also from truncated backshore beach ridges on the Tiwai Peninsula which lie oblique to the modern shoreline. This suggests the contemporary retreat of the eastern shoreline and a gradual late Holocene reorientation of the shoreline towards the east.

The peatland is fed largely by direct rainfall, with the wetland complex being fed by direct rainfall and a series of small streams. The smaller rivers include the Waihopai, Kingswell Creek, Mokotua, Duck Creek, Muddy Creek, Waituna, Moffat, Currans and Titoroa. The large Oreti River (with a catchment area of 3,510 sq.km) flows into the New River Estuary at the western extent of the wetland, while the Mataura River (with a catchment area of 5,360 sq.km) flows into Toetoes Harbour at the eastern side of the wetland.

Ecological features: There are two major components to the wetland complex, the first being the large water bodies including the estuaries, Waituna Lagoon and rivers, and the other being the extensive peatlands with a wide range of intact plant communities. The vegetation of the estuaries and lagoon includes intact sequences of communities from seagrass *Zostera novazelandica* on the mudflats and sandflats to saltmarsh (the major species being *Samolus repens*, *Selliera radicans*, *Salicornia australis* and *Scirpus cernuus*), rushlands (dominated by Jointed Rush *Leptocarpus similis*), and finally the peatland communities. The extensive peatlands (c.12,000 ha) consist of a rich variety of plant communities and species which are highly representative of the peatlands of the Southland Plains. These communities are largely associated with topographical features which influence drainage and hence the water table.

The major communities in the peatlands are:

- Rushland, dominated by Wire Rush *Empodisma minus*, with Tangle Fern *Gleichenia dicarpa*, Inaka *Dracophyllum longifolium* and Manuka *Leptospermum scoparium*;
- Manuka shrubland, dominated by Manuka *L. scoparium*, with few associated species.

The minor communities are:

- Tussocklands, dominated by Red Tussock *Chionochloa rubra*, with Wire Rush, New Zealand Flax *Phormium tenax*, Cottonwood *Cassinia vauvilliersii*, Manuka and others;
- Open shrubland, dominated by Bog Pine *Halocarpus bidwillii*, with Wire Rush, Tangle Fern and Inaka;

- Cushion bog of *Donatia novae-zelandiae* and Comb Sedge *Oreobolus pectinatus*, with dwarf Manuka, mosses and herbs (both coastal and wetland);
- Infilling ponds, mainly with sphagnum moss and *Baumea rubiginosa*;
- Coastal ephemeral ponds containing an assemblage of herbs including *Mimulus repens*, *Euphrasia repens*, Bachelor's Button *Cotula coronopifolia* and others;
- Podocarp forest, dominated by a mixture of podocarps, mainly Kahikatea *Dacrycarpus dacrydioides*, Matai *Prumnopitys taxifolia* and Totara *Podocarpus totara*.

Land tenure: The wetland complex consists of approximately 11,000 ha of Crown land held as Conservation Area, Scientific Reserve and Scenic Reserve, approximately 6,500 ha of Crown land managed by the Southland Regional Council (New River Estuary 3,800 ha, Awarua Bay 2,030 ha, and Toetoe 700 ha), approximately 3,050 ha of private land, and approximately 10 ha of legal road. Surrounding areas include Crown land held as Conservation Area and Scenic Reserve, and private land.

Conservation measures taken: Approximately 11,000 ha of the wetland complex are Crown land managed and administered by the Department of Conservation in the following reserves:

- Waituna Wetlands Scientific Reserve: 3,556 ha, established in 1983.
- Seaward Moss Conservation Area: 5,604 ha.
- Toetoes Conservation Area: 1,648 ha.
- Waituna Scenic Reserve: 56 ha, established in 1947, 1968 and 1971.
- Bushy Point Conservation Area and part of Tiwai Peninsula Conservation Area.

Other reserves in surrounding areas include the Tiwai Peninsula and Fortrose Spit Conservation Area and Otatara South Scenic Reserve, managed and administered by the Department of Conservation, and Holvey Conservation Covenant, managed and administered by the Southland Regional Council.

The Waituna Wetlands Scientific Reserve was listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention) on 13 August 1976.

Conservation measures proposed: There is a proposal to change the status of Seaward Moss and Toetoes Conservation Area to Scientific Reserve, and Bushy Point Conservation Area to Scenic Reserve. The Department of Conservation is considering expanding the Waituna Wetlands Scientific Reserve Ramsar Site to include the southland estuaries not already included in the Ramsar Site (particularly land administered by the Department of Conservation).

Land use: The land administered and managed by the Department of Conservation and Southland Regional Council are managed principally for conservation purposes. Private land contains some drainage ditches and receives some grazing, but serves as an important buffer area for the wetland. Sport fishing and game-bird hunting take place in and around Waituna Lagoon. The land to the north is generally private land developed for pastoral agriculture.

Possible changes in land use: Some of the private land in the wetland complex could be drained and developed for pasture. Land development could continue in the catchment area, and there could be an increase in lignite or coal-mining activities.

Disturbances and threats: Drainage of peripheral areas, fires and the expansion and invasion of noxious weeds are the major threats. Further details are provided in the individual site accounts.

Hydrological and biophysical values: The wetland complex plays a significant role in sediment trapping, the recharge and discharge of groundwater, and the maintenance of water quality, and is of great importance in supporting aquatic and terrestrial food chains, including the maintenance of marine food chains in the Foveaux Strait.

Social and cultural values: The Awarua Plains Wetland Complex is one of the most distinctive parts of Southland, and its scenic and landscape values are very important. The area was traditionally utilised by Maori and was an important source of "kaimoana" (seafood). The muds of the area were used as a dye. Archaeological sites are associated with the shores of some of the estuaries, indicating the importance of the wetlands to the local Maori. There is also a history of early European use, notably around the New River Estuary. Waituna Lagoon is an important recreational fishery and game-bird hunting area.

Noteworthy fauna: The Awarua complex of estuaries and lagoons is one of the five most important waterfowl habitats in New Zealand. The site is unrivalled by any other single habitat in Southland for the diversity of species; of the 81 species of birds recorded, 66 are partially or wholly dependent on the estuarine environment. The wetland complex is particularly important for both international and internal migratory shorebirds. From late spring to early autumn, many hundreds of migratory shorebirds (including 21 species of trans-equatorial migrants) visit the area, many of them occurring here at the southern extremity of their range. Unusual migrants have included Grey Plover *Pluvialis squatarola*, Siberian Tattler *Tringa brevipes*, Sanderling *Calidris alba*, Red-necked Stint *C. ruficollis* and Curlew Sandpiper *C. ferruginea*.

The south side of Awarua Bay is the only regular feeding ground outside Stewart Island for the undescribed Stewart Island subspecies of the New Zealand Dotterel *Charadrius obscurus*. The southernmost breeding colonies of the Caspian Tern *Sterna caspia* are found at New River Estuary.

The estuaries and lagoons are also of considerable importance for Anatidae, and provide safe moulting areas for large numbers of Black Swan *Cygnus atratus*. The peatlands provide extensive habitat for Australasian Bittern *Botaurus poiciloptilus*, Marsh Crake *Porzana pusilla affinis*, Spotless Crake *P. tabuensis plumbea* and South Island Fernbird *Bowdleria punctata punctata*.

The estuaries provide extensive spawning and nursery areas for both marine and freshwater fish species. At least 18 species of fish are known from the estuaries, including five flatfish, whitebait and introduced trout. Notable species include Giant Kokopu *Galaxias argenteus*, Banded Kokopu *G. fasciatus*, Inanga *G. maculatus*, Long-finned Eel *Anguilla dieffenbachii*, Short-finned Eel *A. australis* and Lamprey *Geotria australis*.

The wetlands support a rich diversity of insect life. Over 80 species of moth alone have been found in the Awarua Bay/Waituna Lagoon complex. Many of the insects are typically subalpine species. The area is the type locality for a number of species of moth, some of which are not known to occur elsewhere.

The mudflats support a rich fauna of worms, crustacea and shellfish which make up a major food supply for the waterfowl.

Noteworthy flora: The infertile soils and harsh climate combine to provide conditions which allow several typically sub-alpine or alpine species to occur adjacent to the coast. Such species include *Donatia novae-zelandiae*, Comb Sedge *Oreobolus pectinatus*, *Gentiana lineata* and *Actinotus novae-zelandiae*. The Bog Pine *Halocarpus bidwillii* reaches its southern limit in this area. *Lepidium tenuicaule* has been recorded.

Scientific research and facilities: Scientific research is undertaken on an *ad hoc* basis and is issue driven. Currently there is monitoring of recovery from a fire and monitoring of the effects of a Southern Black-backed Gull *Larus dominicanus* colony on wetland (cushion bog) vegetation. Studies on the geomorphic history and contemporary dynamics of the barrier and lagoon systems are under way. Shorebird counts are undertaken bi-annually on all of the estuaries. No research facilities exist on the Awarua Plains (within the wetland).

Conservation education: Parts of the wetland are regularly used by school groups or for interpretive walks. Visits to the wetland are part of the Department of Conservation's summer

visitor programme. There is potential for greater educational use of the area, combining estuary and wetland ecology.

Recreation and tourism: Use is largely recreational. The major activities are fishing (mainly for trout and whitebait) and duck hunting (mainly for introduced Mallard *Anas platyrhynchos*), with some walking, bird-watching, photography and botanizing. There is very limited tourist use.

Management authority: The Department of Conservation (Southland Conservancy) is responsible for management of Conservation Areas, Scientific Reserves, Scenic Reserves and wildlife. The Southland Regional Council has statutory responsibilities under the Resource Management Act 1991 for resource consents, management of the estuaries and preparation of coastal plans. The Southland Fish and Game Council manages sport fishing (trout and salmon) and game-bird hunting.

Jurisdiction: Functional: Department of Conservation and Southland Fish and Game Council. Territorial: Southland Regional Council and Southland and Invercargill District Councils.

References: Adams (1975); Bruce (1973); Cooper (1989); Crosby Smith (1927); Davis (1987); Department of Conservation (1986, 1990c, undated-b); Department of Lands and Survey (1987); Hubbard (1974); Invercargill City Council (1972); Johnson (1976); Kelly (1968); Martin (1960); Stephenson (1986).

Reasons for inclusion:

- 1a The Awarua Plains Wetland Complex contains good representative examples of a lagoon with associated lagoon edge vegetation such as saltmarsh, and coastal estuaries with associated vegetation. These are wetland types characteristic of New Zealand.
- 1d The wetland complex contains cushion bog (moor-like) vegetation occurring at sea level, a wetland type that is rare in New Zealand. This vegetation is characterised by species adapted to cold peaty conditions, and contains species that are more typically found in montane or subalpine conditions.
- 2a The wetland complex supports an appreciable assemblage of threatened species, including the plant *Desmoschoenus spiralis*, the fish *Galaxias argenteus* and *Galaxias fasciatus*, and the birds *Botaurus poiciloptilus* and *Charadrius obscurus*.
- 2b The wetland complex is of special value for maintaining the genetic and ecological diversity of the region because of the diversity of its flora and fauna. The diverse flora includes species in the cushion bog vegetation typically found in montane or subalpine conditions, interesting sand ridge plant associations, coastal tussock and a locally uncommon species of mat-daisy. The fauna includes over 80 species of moth, 18 species of fish and 81 species of birds.
- 2c The wetland complex is of special value as a wintering area for migratory shorebirds and as a moulting area for *Cygnus atratus* and other Anatidae.
- 2d The wetland complex is of special value for endemic species of plants and animals, including the plant *Desmoschoenus spiralis*, the fish *Galaxias argenteus* and *G. fasciatus*, and the birds *Tadorna variegata*, *Haematopus finschi*, *H. unicolor*, *Charadrius obscurus*, *Larus bulleri* and *Bowdleria punctata*. Several species of moth are known only from this area.
- 3b The wetland complex regularly supports substantial numbers of waterfowl, notably *Cygnus atratus*, *Anas superciliosa*, *A. rhynchotis variegata* and migratory shorebirds.
- 3c The wetland complex regularly supports 1% of the currently undescribed Stewart Island population of *Charadrius obscurus*.

Source: Brian Rance.

New River Estuary (72a)

Location: 46°28'S, 168°19'E. Immediately southwest of Invercargill, Southland, South Island. Parts of the wetland are less than 0.5 km from some Invercargill suburbs; however the centre point of the wetland is 7.5 km from the town centre. The boundaries of the wetland are generally to the estuarine edge (*i.e.* up to Mean High Water Level) except where the vegetation is more intact. Here it extends further inland, usually to practical boundaries (*i.e.* to roads, fences or drainage ditches).

Area: c.3,800 ha.

Altitude: Sea level to 3 m.

Overview: The New River Estuary is included in the Awarua Plains Wetland Complex. It is the largest of a complex of five southern estuaries, and is significant for its waterfowl, shorebirds and fisheries. It is a shallow estuary with extensive mudflats between the few tidal channels. To the northeast is Invercargill City, and to the north the satellite suburb of Otatara. The estuary is of greatest significance for its ecological values (particularly shorebirds and fishery habitat), but also for its cultural and recreational values.

Physical features: The New River Estuary is a large shallow estuary which receives water from the large Oreti River (catchment area 3,510 sq.km) and smaller Waihopai, Otepuni, Mokotua and Waimatua Rivers and streams. These rivers and streams give a total tidal length of some 65 km. The site contains the large Mokomoko Inlet near its mouth (210 ha) and the Oreti Arm (mouth and lowermost reaches of the Oreti River, c.180 ha). Most of the estuary is shallow, and is dominated by extensive mudflats. The entrance is 1,200 m wide, and has a large central sand bar across it at low tide.

Extensive reclamation has occurred around the northern shore in the past. This has reduced the area of the estuary by approx 1,250 ha. Limited reclamation continues at the Invercargill City tip, within an area excluded from the wetland boundary. The reduction in the tidal exchange of waters combined with agricultural development upstream have contributed to the accumulation of fine sediments apparent in the upper reaches of the estuary.

Ecological features: The most significant ecological feature is the extensive mudflats with intersecting tidal channels which form the habitat for the rich variety of wildlife. New River Estuary has the highest usage by trans-equatorial shorebirds of all the Southland estuaries. There are intact sequences of vegetation extending from mudflats with eelgrass *Zostera novazelandica*, through a saltmarsh foreshore, rushland dominated by Jointed Rush *Leptocarpus similis* and shrubland dominated by Manuka *Leptospermum scoparium* to podocarp forest. This sequence is now best represented at Bushy Point.

Land tenure: The bed of the estuary, including all the inter-tidal areas, is Crown land (harbour bed) managed by the Southland Regional Council. The edge of the estuary is largely unformed legal road administered by the Invercargill City Council. Most of the eastern and southern margins are private land. Much of the northern shore is Crown land held as Conservation Area and Scenic Reserve, with some additional private land. To the west is Sandy Point Endowment Land administered by Invercargill City Council (this is to become a Recreational Reserve). To the northeast is Invercargill City (including the Invercargill City refuse dump, industrial land and formed roads). Other land adjacent to the wetland is mainly private land.

Conservation measures taken: The estuary below Mean High Water Springs has no protective status. The northern shore is largely Crown land held as Conservation Area and Scenic Reserve. The Department of Conservation manages and administers these areas which include Bushy Point Conservation Area and Otatara South Scenic Reserve. In addition, there is a Queen Elizabeth the Second National Trust Conservation Covenant over 8 ha of private land at Bushy Point.

The New River Estuary has until recently been managed by two local authorities, each with its own district scheme (Southland County and Invercargill City). However, the wetland now lies entirely within Invercargill City's area of jurisdiction. Parts of the district scheme which cover areas below Mean High Water Level are administered by the Southland Regional Council. These district schemes include objectives identified to preserve and create additional reserves to protect the fauna, flora and habitat values of the estuary. Other objectives are to maintain appropriate water quality and to control and eventually eradicate the exotic cordgrass *Spartina* spp.

Conservation measures proposed: The Southland Conservancy (Department of Conservation) and the Southland Conservation Board have an interest in the area, and are seeking increased protection and the long-term improvement of water quality and the estuarine habitat by means of increased public awareness and input to regional and local plans. The Department of Conservation is considering expanding the Waituna Wetlands Scientific Reserve Ramsar Site to include the southland estuaries not already included in the Ramsar Site, particularly land administered by the Department of Conservation. New River Estuary would be included in this proposal.

Land use: No people live within the wetland itself. Much of the land adjacent to the southern and southeastern boundary of the wetland is subject to at least periodic grazing. The Invercargill City refuse dump is situated within an enclosed portion of the estuary (this lies outside the wetland boundary, but is not physically separated from it). The outfall from the Invercargill City sewage treatment works is into the wetland. The estuary is used for some aquatic recreational activities such as fishing and boating.

The Invercargill City District area includes a population of about 56,000; Invercargill City contains 46,300, with a further 800 in Otatara. This population is concentrated to the north and northeast of the wetland. To the south, north and east, the estuary is generally surrounded by agricultural land. The Sandy Point area to the west is managed predominantly for recreation and forestry.

Possible changes in land use: There are no known local or regional development proposals for the estuary. The two local authority district schemes promote the maintenance of the estuary in its natural state. The Invercargill City refuse dump has a limited life, and will eventually be developed largely for wildlife habitat and recreational purposes. Agricultural land use could intensify in the catchment area. Headwater areas of the Oreti River could continue to be developed.

Disturbances and threats: Pollution from Invercargill City refuse dump, Invercargill Sewage Treatment Plant, Otatara sewage outfalls and industrial and stormwater outfalls all pose a threat to the ecology of the wetland because of their negative effects on water quality. Limited land reclamation continues, notably at the Invercargill City tip. Sedimentation rates have increased as a result of agricultural land development in the catchment area. Continuing sedimentation may be changing the habitat to the detriment of some species, notably shellfish. Cordgrass *Spartina* spp. was first introduced in the 1930s, and has subsequently spread. This has had an adverse effect on the wildlife as a consequence of the change to inter-tidal vegetation. It is now widespread and abundant in the eastern and northern (Waihopai Arm) areas, despite an ongoing control programme.

Competition for nest space between Southern Black-backed Gulls *Larus dominicanus* and tern colonies (Caspian Tern *Sterna caspia* and White-fronted Tern *S. striata*) is threatening the breeding success of the tern populations. This has come about from an increase in the gull population associated with increased food supply from the growth of the Invercargill refuse tip.

Hydrological and biophysical values: The wetland plays a significant role in trapping sediment from the surrounding developed catchment area, and in the support of food chains,

including marine food chains in Foveaux Strait. The wetland also plays a general role in the maintenance of water quality.

Social and cultural values: New River Estuary and surrounding areas were an important Maori cultural site. The estuary was a favoured site for "kaimoana" (seafood gathering), while the adjacent Sandy Point and Omaui areas were settled (there are midden and burial sites present). Sandy Point is also important for its European history; it has an old whaling base and was an early farming site. The New River Estuary was the port for Invercargill City in the past (prior to siltation from land development upstream). It is an important landscape and recreational area because of its close proximity to Invercargill City.

Noteworthy fauna: The New River Estuary was identified as a "Site of Special Wetland Importance" (SSWI) by the Fauna Survey Unit of the New Zealand Wildlife Service. This is a nationwide wildlife habitat ranking system officially recognised by the Department of Conservation. The estuary has also been identified as a "Wetland of National Importance for Fisheries".

The estuary is particularly important for waterfowl, both in terms of numbers of individuals and diversity of species. Although the breeding bird fauna is limited, a total of 74 species of waterfowl has been recorded, including a large number of species of shorebirds. There are particularly high numbers of South Island Pied Oystercatcher *Haematopus finschi*, Pied Stilt *Himantopus leucocephalus*, Bar-tailed Godwit *Limosa lapponica*, Ruddy Turnstone *Arenaria interpres* and Red Knot *Calidris canutus*. The world's southernmost breeding colony of the Caspian Tern *Sterna caspia* is found on a shell bank on the eastern side of the estuary. Bushy Point is well known for its population of South Island Fernbird *Bowdleria punctata punctata*.

The estuary (including Mokomoko Inlet) provides extensive spawning and nursery areas for both marine and freshwater fish species. Five species of flatfish are known (with high numbers of juveniles recorded) as well as eels *Anguilla* spp., introduced Brown Trout *Salmo trutta*, whitebait *Galaxias* spp. and many others. Giant Kokopu *Galaxias argenteus* are known from at least one tributary.

Bushy Point and Sandy Point are the type localities for various species of coastal invertebrates.

Noteworthy flora: The wetland contains a diversity of plant species which are highly representative of the Southland estuaries. The type locality for *Gunnera albocarpa* is on the edge of the estuary.

Scientific research and facilities: There is regular monitoring of water quality associated with the Invercargill Sewage Treatment Plant and refuse tip. The fernbird population at Bushy Point has been the subject of a two-year study by Mrs M. Barlow. The New Zealand Ornithological Society undertakes bird counts twice a year. There are no research facilities at the site.

Conservation education: Sandy Point is regularly used by schools for educational field trips, and part of this is linked with a school estuary study. There is great potential for public education of conservation values of the harbour.

Recreation and tourism: Recreational uses include boating, fishing, duck hunting (mainly of introduced Mallard *Anas platyrhynchos*), rowing, walking and photography.

Management authority: The Department of Conservation (Southland Conservancy) is responsible for management of Conservation Areas, Scenic Reserves and wildlife. The Southland Regional Council has statutory responsibilities under the Resource Management Act 1991 for water resources and the preparation of coastal plans; it is responsible for management of the harbour below Mean High Water Springs. The Southland Fish and Game Council manages sport fishing (trout and salmon) and game-bird hunting. Unformed legal roads are the responsibility of the Invercargill City Council.

Jurisdiction: Functional: Department of Conservation and Southland Fish and Game Council. Territorial: Southland Regional Council and Invercargill City Council.

References: Blakely (1973); Davis (1987); Department of Conservation (1986, 1990c, undated-b); Invercargill City Council (1972); Johnson (1986, 1987).

Reasons for inclusion:

- 1a The New River Estuary is a particularly good representative example of a shallow coastal estuary, a wetland type characteristic of New Zealand.
- 2b The estuary is of special value for maintaining the genetic and ecological diversity of the region because of its high diversity of fish and bird species. Bushy Point and Sandy Point are the type localities for various species of coastal invertebrates.
- 2c The estuary is an important spawning and nursery area for both marine and freshwater fish; it supports the world's southernmost breeding colony of *Sterna caspia*, and is an important wintering area for large numbers of waterfowl, especially migratory shorebirds.
- 2d The estuary is of special value for its endemic plants and animals, notably the plants *Zostera novazelandica* and *Leptocarpus similis*, the fish *Galaxias argenteus*, and the birds *Haematopus finschi* and *Bowdleria punctata*.
- 3b The estuary regularly supports substantial numbers of waterfowl, particularly international and internal migratory shorebirds.

Source: Brian Rance.

Awarua Bay (72b)

Location: 46°34'S, 168°28'E. East of the Tiwai causeway and approximately 8 km east of Bluff, in southern Southland, South Island. The boundary of the wetland is generally formed by legal roads (both formed and unformed).

Area: c.2,100 ha.

Altitude: 0-2 m.

Overview: Awarua Bay wetland is included in the Awarua Plains Wetland Complex. Awarua Bay is a large estuarine area (an eastern extension of Bluff Harbour) with extensive mudflats containing the inter-tidal seagrass *Zostera novazelandica*. The bay is largely in a natural state with limited threats. It is adjacent to extensive areas of intact vegetation administered by the Department of Conservation (including Waituna Wetlands Scientific Reserve and Tiwai Peninsula Conservation Area). The bay is important for its ecological values (particularly as waterfowl habitat), recreational values and cultural values.

Physical features: Awarua Bay is an estuarine arm of Bluff Harbour, some 12 km in length. The bay is separated from the coast (to the south) by the Tiwai Peninsula. The wetland receives no major rivers. Muddy Creek, which flows into the northeast of the bay, is the largest stream. Most of the bay is shallow, with extensive inter-tidal flats exposed at low tide. The shore is formed of quartz gravel pebbles. To the north are the extensive low-lying peatlands of Awarua Plain, sited atop a gravel bench probably of marine origin from 5 to 20 m above sea level.

Ecological features: Two intact vegetation sequences are present in the bay:

- mudflats with eelgrass *Zostera novazelandica*, through saltmarsh (mainly *Selliera radicans*, *Samolus repens*, *Scirpus cernuus* and *Salicornia australis*) and rushlands dominated by Jointed Rush *Leptocarpus similis*, into wetland edges with New Zealand Flax *Phormium tenax*, Red Tussock *Chionochloa rubra*, shrubs and rushes and a

range of wetland types. This sequence is generally best represented in the east, adjacent to the Waituna Wetlands Scientific Reserve.

- mudflats with eelgrass to coastal edge with Silver Tussock *Poa cita* and Red Tussock communities. This sequence is best represented on Tiwai Peninsula.

Land tenure: Areas below Mean High Water are Crown land managed by the Southland Regional Council. That part of Tiwai Peninsula included within this site is Crown land administered and managed by the Department of Conservation. Formed and unformed legal roads around the shoreline are managed by Invercargill City Council.

Tiwai Peninsula (to the south) and Waituna Wetlands Scientific Reserve (to the east) are Crown land administered and managed by the Department of Conservation. Some of Tiwai Peninsula is leased to the Aluminium Smelter operated by Comalco. The northern boundary is formed by legal road.

Conservation measures taken: Areas below Mean High Water have no protective status. That part of Tiwai Peninsula included within this site is Crown land held as Conservation Area and administered and managed for conservation purposes by the Department of Conservation. Tiwai Spit (part of Tiwai Peninsula Conservation Area) is a Wildlife Refuge administered and managed by the Department of Conservation.

Awarua Bay is classified as Harbour Zone within the Invercargill City Council's district plan. The relevant policy objectives of this district plan are:

- To preserve and promote the recreational use of the zone.
- To protect significant wildlife areas from undesirable development. It is recognised, however, that water-based recreation activities will cause some disturbance to wildlife.
- To protect the shoreline and tidal areas from the unauthorised removal of sand and gravel.

Conservation measures proposed: No major proposals exist. The Department of Conservation is considering expanding the Waituna Wetlands Scientific Reserve Ramsar Site to include the southland estuaries not already included in the Ramsar Site, particularly land administered by the Department of Conservation. Awarua Bay would be included in this proposal.

Land use: There is no human habitation in the wetland. Some recreational activities, such as fishing and boating, take place in the bay. The club rooms of the Invercargill Yacht Club are located on the north shore. The Awarua Bay Road on the north side of Awarua Bay is a formed road, and is used for access to the Waituna Wetland Scientific Reserve. Unformed legal roads allow legal access around the shore.

Tiwai Peninsula Conservation Area, to the south of the bay, and Waituna Wetland Scientific Reserve, to the east, are managed for conservation purposes, although a small area (c.4 ha) is grazed as part of a monitoring programme associated with the Tiwai Point aluminium smelter. Private land to the north of the bay is used for agricultural purposes.

Possible changes in land use: There are no local or regional development proposals known for Awarua Bay. Further land drainage and development of peatlands and increased intensification of land use are likely in the catchment area.

Disturbances and threats: Motorbikes damage the fragile saltmarsh vegetation; this is largely restricted to unformed legal roads, and is therefore difficult to prevent. The introduced aggressive plant cordgrass *Spartina* spp. is known from Bluff Harbour, and is a threat to Awarua Bay (all known sites are currently being progressively removed). A prospecting licence over the whole of the Tiwai Peninsula is currently being processed. The effects on the wetland of gas emissions (especially fluorides and SO₂) from the Tawai Point Comalco aluminium smelter at the west end of the peninsula are not fully known.

Hydrological and biophysical values: Awarua Bay plays a significant role in sediment trapping, the maintenance of water quality and the support of terrestrial and aquatic food chains.

Social and cultural values: Awarua Bay has high cultural values, largely in terms of its landscape. The area was traditionally utilised by Maori as an important source of "kaimoana" (seafood).

Noteworthy fauna: Awarua Bay is of great importance for waterfowl, in terms of both numbers of birds and species diversity. Fifty-four species of birds have been recorded from the wetland, and 43 of these are directly associated with the waters of the bay. The bay is the second most important area for migratory shorebirds in Southland, after the New River Estuary. Trans-equatorial migrants are particularly diverse, with 19 species present; the most significant are Grey Plover *Pluvialis squatarola*, Siberian Tattler *Tringa brevipes* and Sanderling *Calidris alba*, all of which regularly use this area. The mudflats also provide considerable feeding and loafing areas for Anatidae. The south side of the bay is the only regular feeding area (in autumn and winter) on the mainland for the undescribed Stewart Island subspecies of New Zealand Dotterel *Charadrius obscurus*. Caspian Tern *Sterna caspia* and White-fronted Tern *S. striata* breed on Tiwai Spit.

The mudflats, especially those at the head of the bay, support a rich and diverse invertebrate fauna in the form of worms, crustacea and small shellfish which form the major food supply for the birds.

Noteworthy flora: The flora is representative of Southland estuaries. Some areas of saltmarsh are particularly diverse. *Lepidium tenuicaule* (a species which is uncommon throughout its range) has been observed along the southern shore.

Scientific research and facilities: Scientific research is undertaken in an *ad hoc* manner and is mostly issue driven. There are no long-term studies taking place except for a bi-annual census of waterfowl, carried out by the local branch of the New Zealand Ornithological Society. There is an extensive monitoring programme associated with any possible pollution sources from the Tiwai Point aluminium smelter. The Tiwai Point aluminium smelter laboratories are the only research facilities which exist adjacent to the harbour.

Conservation education: Awarua Bay is regularly used by schools for estuarine studies. There is much potential for increased use.

Recreation and tourism: Awarua Bay is a popular yachting and wind-surfing area. The club rooms of the Invercargill Yacht Club are on the edge of the bay. Bird-watching, picnicking, duck hunting and walking are other recreational activities.

Management authority: The Department of Conservation (Southland Conservancy) is responsible for management of Conservation Areas, Scientific Reserves and wildlife. The Southland Regional Council has statutory responsibilities under the Resource Management Act 1991 for water resources and the preparation of coastal plans; it is responsible for management of the harbour below Mean High Water Springs. The Southland Fish and Game Council manages sport fishing (trout and salmon) and game-bird hunting. Unformed legal roads are the responsibility of Invercargill City Council.

Jurisdiction: Functional: Department of Conservation and Southland Fish and Game Council. Territorial: Southland Regional Council and Invercargill City Council.

References: Cooper (1986a); Department of Conservation (1986, 1990c, undated-b); Patrick (1983).

Reasons for inclusion:

- 1a Awarua Bay is a particularly good representative example of a coastal estuary, a wetland type characteristic of New Zealand.
- 2a The bay supports a significant number of a globally threatened species of bird, *Charadrius obscurus*.

- 2b The bay is of special value for maintaining the genetic and ecological diversity of the region because of the diversity of its birdlife (54 species recorded).
- 2d The bay is of special value for its endemic plants, notably *Zostera novazelandica*, *Leptocarpus similis* and *Chionochoa rubra*.
- 3b The bay regularly supports substantial numbers of waterfowl, particularly international and internal migratory shorebirds.
- 3c The bay regularly supports 1% of the currently undescribed Stewart Island population of *Charadrius obscurus*.

Source: Brian Rance.

Toetoes Harbour (72c)

Location: 46°34'S, 168°46'E. Adjacent to Fortrose, approximately 28 km southeast of Invercargill, on the south coast of Southland, South Island.

Area: c.740 ha.

Altitude: 0-2 m.

Overview: Toetoes Harbour is included in the Awarua Plains Wetland Complex. It is a medium-sized estuary at the mouth of the Mataura River (a large river) and Titiroa River (a small river). Toetoes Harbour is most significant for its ecological values as an estuarine system with adjacent floodplain wetlands along the Mataura River. It contains mudflats which are an important habitat for waterfowl, especially shorebirds, while the river and estuary are important for their fishery values.

Physical features: Toetoes Harbour is the smallest of a series of estuaries along the Southland coast. The harbour is fed by the Mataura and Titiroa Rivers. The catchment of the Mataura River is 5,360 sq.km. The estuary covers about 280 ha, most of which is tidal mudflats. The estuarine area extends westwards along the Mataura River which flows parallel to the coast for 5 km before entering the sea. The Fortrose Spit separates both the estuary and the Mataura River from the sea. The wetlands to the north of the Harbour are on the floodplain of the Mataura River.

Ecological features: Toetoes Harbour contains important sequences of vegetation extending from mudflats with inter-tidal seagrass *Zostera novazelandica*, through the estuarine edge which contains areas of saltmarsh and more widespread areas of Jointed Rush *Leptocarpus similis*, into wetland communities on the floodplain areas to the north.

Land tenure: The estuarine zone below Mean High Water Springs is Crown land, managed by the Southland Regional Council. That part of the floodplain wetland along the Mataura River included within the site is owned by the Southland Regional Council and subject to a grazing lease. Legal roads (both formed and unformed) are managed by the Southland District Council.

Fortrose Spit is Crown land held as Conservation Area and administered by the Department of Conservation. Wetland on the floodplain of the Mataura River to the north of the site is owned by the Southland Regional Council and subject to a grazing lease. Legal roads (both formed and unformed) are the responsibility of the Southland District Council.

Conservation measures taken: Most of the wetland has no protective status. A small remnant of Silver Beech forest (c.5 ha) has been protected by a Queen Elizabeth the Second National Trust Open Space Covenant. The harbour is closed to any commercial harvesting of shellfish under fishing regulations (under the Fisheries Act). The Toetoes estuary is classified as

"Estuary Management Zone" within the Southland District Council's district plan. The relevant policy objectives within this district plan include:

- To preserve and conserve the flora and fauna and their habitat and the coastlines of the estuaries.
- To create reserve areas to incorporate the most significant wildlife habitats.
- To assist the Regional Council to attain and maintain appropriate water qualities in the estuaries.
- To preserve the views of and aesthetics of the estuaries.
- To control refuse tipping, landfill tipping and other forms of reclamation.

Conservation measures proposed: Toetoes Harbour has been suggested as a "taiapure" site by the local Maori. A "taiapure" is an estuarine or littoral coastal area which is traditionally important to "iwi" (the local Maori people). A "taiapure" protects these local areas, and recognises that local communities have special needs relating to them. They are established under the Fisheries Act (as amended by the Maori Fisheries Act 1989).

The Department of Conservation is considering expanding the Waituna Wetlands Scientific Reserve Ramsar Site to include the southland estuaries not already included in the Ramsar Site, particularly land administered by the Department of Conservation. Toetoes Harbour would be included in this proposal.

Land use: The wetlands north of the estuary are subject to at least seasonal grazing under lease from the Southland Regional Council. Most adjacent private land (including land administered by the Southland Regional Council) is grazed.

Possible changes in land use: Drainage and land development of terrestrial areas (including the upper catchment of the Maitua River) are the most likely forms of future development. Lignite and gold mining are possible in the catchment area.

Disturbances and threats: There are grazing leases over the floodplain wetlands. Grazing causes damage to the vegetation, introduces exotic species and results in pugging of the wetland surface. Floods, which are a periodic but natural occurrence, cause some temporary disturbance.

Hydrological and biophysical values: The harbour plays an important role in sediment trapping, prevention of coastal erosion, maintenance of water quality and support of terrestrial and aquatic food chains, particularly marine food chains in Foveaux Strait.

Social and cultural values: The harbour has high landscape values, being adjacent to the southern scenic road route. The area was traditionally utilised by Maori as an important source of "kaimoana" (seafood). Several archaeological sites have been found around the harbour mouth.

Noteworthy fauna: Toetoes Harbour was identified as a "Site of Special Wildlife Importance" (SSWI) by the Fauna Survey Unit of the New Zealand Wildlife Service. This is a nationwide wildlife habitat ranking system officially recognised by the Department of Conservation. The harbour has also been identified as a "Wetland of National Importance to Fisheries" and ranked as "outstanding". It is an integral part of the complex of Southland estuaries which constitute the southernmost major wintering area for migratory shorebirds from the northern hemisphere. The importance of the harbour for shorebirds increases when Waituna Lagoon is closed to the sea and the lagoon's mudflats are permanently covered by water.

Twenty-one species of waterfowl have been recorded in the harbour, mainly Anatidae and shorebirds. The harbour is the most important site within the Southland estuaries for Far Eastern Curlew *Numenius madagascariensis* and Whimbrel *N. phaeopus* when Waituna Lagoon is closed to the sea. Banded Dotterel *Charadrius bicinctus* also use this area.

At least 18 species of fish have been recorded in the area. The Maitua River is nationally important as habitat for Brown Trout *Salmo trutta* and whitebait *Galaxias* spp. Large numbers

of whitebait travel through the estuary to spawn upstream. The lower reaches of the Maituna River are an important nursery area for Brown Trout while the harbour is an important spawning and nursery area for marine fish, particularly flatfish. The Giant Kokopu *Galaxias argenteus* has been recorded in the river.

Noteworthy flora: There is a good diversity of plant species which are highly representative of the Waituna Ecological District. The floodplain to the north of the estuary contains two patches of forest which are the southernmost stands of Silver Beech *Nothofagus menziesii* in New Zealand.

Scientific research and facilities: There are no scientific studies presently under way or proposed, except for the bi-annual census of waterfowl populations, carried out by the local branch of New Zealand Ornithological Society.

Conservation education: Little at present.

Recreation and tourism: The lower reaches of the Maituna and Titiroa Rivers are popular fishing areas, particularly for whitebait and trout, but also for shellfish and eels. Other recreational activities include boating, bird-watching, water-skiing and duck hunting.

Management authority: The Department of Conservation (Southland Conservancy) is responsible for management of Conservation Areas and wildlife. The Southland Regional Council has statutory responsibilities under the Resource Management Act 1991 for water resources and the preparation of coastal plans; it is responsible for management of the harbour below Mean High Water Springs. The Southland Fish and Game Council manages sport fishing (trout and salmon) and game-bird hunting. Legal roads are the responsibility of the Southland District Council.

Jurisdiction: Functional: Department of Conservation and Southland Fish and Game Council. Territorial: Southland Regional Council and Southland District Council.

References: Cooper (1986b); Davis (1987); Department of Conservation (1986, 1990c, undated-b).

Reasons for inclusion:

- 1a Toetoes Harbour is a particularly good representative example of a coastal estuary, a wetland type characteristic of New Zealand.
- 2a The wetland supports a population of a threatened species of fish, *Galaxias argenteus*.
- 2b The wetland is of special value for maintaining the genetic and ecological diversity of the region because of the diversity of its fish and bird fauna.
- 2c The wetland is an important spawning and nursery area for both marine and freshwater fish, and is an important wintering area for large numbers of waterfowl, especially migratory shorebirds.
- 2d The wetland is of special value for its endemic plants and animals, notably the plants *Zostera novazelandica* and *Leptocarpus similis*, and the fish *Galaxias argenteus*.

Source: Brian Rance.

Seaward Moss-Waituna-Toetoes (72d)

Location: 46°32'S, 168°30'E. Approximately 20 km south of Invercargill, on the coastal edge of the Southland Plains, extending from Bluff Harbour to Fortrose, South Island.

Area: c.13,850 ha.

Altitude: 0-25 m.

Overview: The Seaward Moss-Waituna-Toetoes complex is part of the Awarua Plains Wetland Complex. It comprises Waituna Lagoon and numerous small ponds within an extensive area of peat wetlands. These peatlands are on the coastal margin of the Awarua Plain. The area is clothed by a mosaic of intact plant communities and sequences highly representative of southern New Zealand and coastal peatland communities. One of the special features of the vegetation is the cushion bog (moor-like) vegetation occurring at sea level (normally a subalpine to alpine feature). These intact plant communities constitute valuable habitat for the associated fauna, particularly invertebrates and waterfowl. The site includes the Waituna Wetlands Scientific Reserve which has been listed as a Ramsar Site.

Physical features: The Seaward Moss-Waituna-Toetoes wetlands are situated on Awarua Plain, a low-lying, glacial fluvial plain of quartz rich gravels. The wetlands consist of extensive peatlands which enclose the Waituna Lagoon and numerous smaller ponds. Several small creeks flow through the peatlands to the coast. Waituna Lagoon is 9 km long, some 1,400 ha in size, and impounded behind the coast by a gravel bar, created as the sea has progressively eroded the coast. When this gravel bar is breached, the lagoon becomes tidal (the bar is usually breached artificially once a year).

Ecological features: The principal ecological values of the site are the extensive peatland communities consisting of moor-like vegetation characterised by plants adapted to cold, wet, peaty conditions. These communities contain sequences governed by the height of the water table and drainage. The most extensive community is dominated by Wire Rush *Empodisma minus*, with Tangle Fern *Gleichenia dicarpa*, Manuka *Leptospermum scoparium* and Turpentine Shrub *Dracophyllum longifolium*. Better drained areas are dominated by Manuka shrubland or Red Tussock *Chionochloa rubra*. Low-lying moist sites are generally dominated by sedges or rushes and bryophytes. One of the special features is the presence of many typically subalpine to alpine species; these culminate in a cushion (moor-like) community adjacent to the coast.

Land tenure: A large part of the wetland is Crown land held as Scientific Reserve, Scenic Reserve and Conservation Area, and administered by the Department of Conservation. Legal roads (both formed and unformed) are administered by the Southland District Council. The remainder of the wetland is private land.

Part of the surrounding area is Crown land held as Conservation Area and administered by the Department of Conservation. Crown land administered by Southland Regional Council includes the seabed of Awarua Bay and Bluff Harbour. Legal roads (both formed and unformed) are administered by the Southland District Council. The majority of land to the north is private land.

Conservation measures taken: Crown land administered by the Department of Conservation includes the following reserves: Waituna Wetlands Scientific Reserve (3,556 ha), formerly a Reserve for Wetland Management Purposes but given Scientific Reserve status in 1983; Seaward Moss Conservation Area (5,604 ha); Toetoes Conservation Area (1,648 ha); Waituna Scenic Reserve (56 ha); and Joeys Island Scenic Reserve (11 ha). Waituna Wetlands Scientific Reserve is managed by the Department of Conservation (Southland Conservancy) in accordance with a draft management plan. Entry to the reserve is not restricted, but there is limited hut accommodation. Marked routes and the relative isolation and difficulty of access ensure minimum disturbance. The lagoon is artificially opened to the sea on an annual basis, and then becomes estuarine for a time. No other management actions have been required within the wetland, although monitoring of lagoon levels, the effects of past fires and the impact of nesting gulls on the cushion bog vegetation continues. The Waituna Wetlands Scientific Reserve was listed as a Ramsar Site under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention) on 13 August 1976.

Conservation measures proposed: The wetland has been suggested as a "taiapure" site by the local Maori. A "taiapure" is an estuarine or littoral coastal area which is traditionally important to "iwi" (the local Maori people). A "taiapure" protects these areas, and recognises that local communities have special needs relating to them. They are established under the Fisheries Act (as amended by the Maori Fisheries Act 1989).

The Department of Conservation is considering expanding the Ramsar Site to include all of the southland estuaries not already included in the site, particularly land administered by the Department of Conservation. Seaward Moss and Toetoes would be included in this proposal.

Land use: Areas administered by the Department of Conservation are managed for conservation purposes. Some of the private land contains drainage ditches (from adjacent farmed areas), and is at least seasonally grazed, but serves as an important buffer area for the wetland. Waituna Lagoon is artificially opened to the sea on a regular basis (usually once a year). Sport fishing and game-bird hunting take place in and around the lagoon. Land to the north of the wetlands has generally been developed for pastoral agriculture.

Possible changes in land use: Some of the private land could be drained and developed for pasture. An intensification of land development and agricultural use is likely in the catchment area. An increase in lignite or coal mining activities is also possible.

Disturbances and threats: Drainage of peripheral areas has affected the ecology of the wetlands by lowering the water table and thereby favouring the growth of woody species including weeds, and will continue to do so. Fires represent an ongoing threat to the wetland. There have been four large fires over parts of the wetland in recent years. There has been some encroachment by noxious weeds; Gorse and Broom have invaded peripheral areas and disturbed sites, and Spanish Heath has spread within the wetland. A weed control programme has been implemented by the Department of Conservation for these weed infestations. The present regular artificial opening of Waituna Lagoon has resulted in a change in the estuarine edge vegetation. Southern Black-backed Gulls *Larus dominicanus* are establishing new colonies and introducing weed species. A recent increase in the gull population is probably linked to the presence of Invercargill City refuse tip nearby. Lignite mining in the catchment area could influence water quality in the wetland.

Hydrological and biophysical values: The wetlands are fed by a combination of direct rainfall and by streams passing through them to the coast. These streams drain into Waituna Lagoon which traps sediment. The wetlands play a general role in the recharge and discharge of groundwater and in the maintenance of water quality, and are of great importance in supporting aquatic and terrestrial food chains.

Social and cultural values: The wetlands, especially Waituna Lagoon, were traditionally utilised by the local Maori, mainly as a food source (especially fish), although the muds were also used as a dye. Waituna Lagoon is a popular trout fishing area, and is also used for game-bird hunting. In the past, some commercial eel fishing occurred at the lagoon.

Noteworthy fauna: The Seaward Moss-Waituna-Toetoes wetlands support a very rich and diverse bird fauna. Seventy-six species of birds have been recorded. A particular feature of the avifauna is the diversity of migratory shorebirds associated with the lagoon. These include 18 species of migratory shorebirds from the northern hemisphere, the most abundant being Pacific Golden Plover *Pluvialis fulva*, Far Eastern Curlew *Numenius madagascariensis*, Bar-tailed Godwit *Limosa lapponica*, Ruddy Turnstone *Arenaria interpres*, Red Knot *Calidris canutus* and Red-necked Stint *C. ruficollis*. Many of the migrant shorebirds recorded at the site are uncommon or rare visitors to New Zealand; they have included Grey Plover *Pluvialis squatarola*, Lesser Sand Plover *Charadrius mongolus*, Asiatic Whimbrel *Numenius phaeopus variegatus*, Marsh Sandpiper *Tringa stagnatilis* and Sanderling *Calidris alba*.

The wetlands support a wide range of breeding birds, including Black Shag or Great Cormorant *Phalacrocorax carbo*, Little Shag or Little Pied Cormorant *P. melanoleucos*,

White-faced Heron *Egretta novaehollandiae*, Black Swan *Cygnus atratus*, Paradise Shelduck *Tadorna variegata*, Pukeko or Purple Swamphen *Porphyrio porphyrio melanotus*, South Island Pied Oystercatcher *Haematopus finschi*, Variable Oystercatcher *H. unicolor*, Pied Stilt *Himantopus leucocephalus*, Banded Dotterel *Charadrius bicinctus*, Southern Black-backed Gull *Larus dominicanus*, Black-billed Gull *L. bulleri*, Red-billed Gull *L. scopulinus*, Caspian Tern *Sterna caspia*, and White-fronted Tern *S. striata*.

Waituna Lagoon provides an important summer refuge for migratory birds when it is open to the sea. The lagoon is the principal breeding area for Black Swan in Southland, and is one of the most important sites for Grey Duck *Anas superciliosa* in the far south. It is also an important moulting area for New Zealand Shoveler *A. rhynchotis variegata*. The peatlands are the Southland stronghold for several wetland birds including Australasian Bittern *Botaurus poiciloptilus*, Spotless Crake *Porzana tabuensis plumbea*, Marsh Crake *P. pusilla affinis* and South Island Fernbird *Bowdleria punctata punctata*. Other regular visitors to the wetlands include White Heron or Great Egret *Egretta alba*, Royal Spoonbill *Platalea regia*, Grey Teal *Anas gracilis* and New Zealand Dotterel *Charadrius obscurus*.

The wetlands support a rich and diverse native fish fauna, including Giant Kokopu *Galaxias argenteus*, Banded Kokopu *G. fasciatus*, Inanga *G. maculatus*, Long-finned Eel *Anguilla dieffenbachii* and Short-finned Eel *A. australis*. Waituna Lagoon has been identified as a "Wetland of National Importance to Fisheries", and ranked as "outstanding". The lagoon supports a large population of introduced Brown Trout *Salmo trutta*, which migrate to and from the sea when the lagoon is tidal; the streams provide spawning grounds for trout and native fish species.

The extensive peatland communities provide important habitat for a host of invertebrate species, including over 80 species of moth. As with the flora, many of the insects are typically subalpine species. The area is the type locality for a number of species of moth, some of which are not known to occur elsewhere.

The Common Skink has been recorded in the area.

Noteworthy flora: The flora is very diverse and highly representative of southern Southland and coastal peatland communities. There is a diversity of intact plant communities and sequences which illustrate the effects of variations in the water table. The peatlands are particularly important for their unique moor-like vegetation (cushion bogs), characterised by herbs and shrubs adapted to cold peaty conditions. Some of these species are more typically found in montane or subalpine conditions and not at sea level. These include the cushion plants *Donatia novae-zelandiae* and *Oreobolus pectinatus*, along with *Gentiana lineata* and *Actinotus novae-zelandiae*, sundews *Drosera* spp., Grass Lily *Oreostylidium subulatum* and Comb Sedge *Carpha alpina*.

The coastal vegetation is a striking feature of the area, and forms a distinct assemblage not found north of Southland. This includes the white-flowered Shore Gentian *Gentiana saxosa*, which can form dense turf with *Selliera* sp. Interesting features of the sand ridge include the presence of Pingao *Desmoschoenus spiralis* and Coastal Tussock *Austrofestuca littoralis*, along with a locally uncommon species of mat-daisy *Raoulia* spp.

Bog Pine *Halocarpus bidwillii* is found at the southern limit of its distribution.

Scientific research and facilities: Scientific research is largely undertaken on an *ad hoc* basis and is issue driven. Studies are currently being undertaken on the geomorphic history and contemporary dynamics of the barrier and lagoon systems. The Ornithological Society of New Zealand carries out bi-annual counts of waterfowl at Waituna Lagoon. The effects of a Southern Black-backed Gull colony on cushion bog vegetation are being monitored, as is the recovery of vegetation after a fire on Seaward Moss.

Conservation education: Currently there is limited use for conservation education because of a lack of board-walks, tracks, interpretation material and other facilities. The wetland is an

important part of the Department of Conservation's summer visitor programme.

Recreation and tourism: There is little recreational use, reflecting the limited hut accommodation and marked routes, and the relative isolation of the site and difficulty of access. The major activities are duck hunting and trout fishing; other activities include walking, bird-watching, nature photography and botanizing.

Management authority: The Department of Conservation (Southland Conservancy) is responsible for management of Conservation Areas, Scientific Reserves, Scenic Reserves and wildlife. The Southland Regional Council has statutory responsibilities under the Resource Management Act 1991 for water resources and the preparation of coastal plans. The Southland Fish and Game Council manages sport fishing (trout and salmon) and game-bird hunting.

Jurisdiction: Territorial: Southland District Council, Invercargill City Council, Southland Regional Council. Functional: Department of Conservation, Southland Fish and Game Council.

References: Adams (1975); Bruce (1973); Crosby Smith (1927); Davis (1987); Department of Conservation (1986, 1990c, undated-b); Department of Lands and Survey (1987); Hubbard (1974); Johnson (1976); Kelly (1968); Martin (1960); Stephenson (1986).

Reasons for inclusion:

- 1a The Seaward Moss-Waituna-Toetoes wetlands contain a good representative example of a lagoon with associated lagoon edge vegetation such as saltmarsh, a wetland type characteristic of New Zealand.
- 1d The wetlands contain cushion bog (moor-like) vegetation occurring at sea level, a wetland type that is rare in New Zealand. This vegetation is characterised by species adapted to cold peaty conditions, and contains species that are more typically found in montane or subalpine conditions.
- 2a The wetlands support an appreciable assemblage of threatened species, including the plant *Desmoschoenus spiralis*, the fish *Galaxias argenteus* and *Galaxias fasciatus*, and the birds *Botaurus poiciloptilus* and *Charadrius obscurus*.
- 2b The wetlands are of special because of the diversity of their flora and fauna. The diverse flora includes species in the cushion bog vegetation typically found in montane or subalpine conditions, interesting sand ridge plant associations, coastal tussock and a locally uncommon species of mat-daisy. The fauna includes over 80 species of moth and 76 species of birds.
- 2c The wetlands are of special value as a wintering area for migratory shorebirds and as a breeding and/or moulting area for *Cygnus atratus* and other Anatidae.
- 2d The wetlands are of special value for endemic species of plants and animals, including the plant *Desmoschoenus spiralis*, the fish *Galaxias argenteus* and *G. fasciatus*, and the birds *Tadorna variegata*, *Haematopus finschi*, *H. unicolor*, *Charadrius obscurus*, *Larus bulleri* and *Bowdleria punctata*. Several species of moth are known only from this area.
- 3b The wetlands regularly support substantial numbers of waterfowl, notably *Cygnus atratus*, *Anas superciliosa*, *A. rhynchotis variegata* and migratory shorebirds.

Source: Brian Rance.

Freshwater (73)

Location: 46°50'S, 167°51'E. At the head of Paterson Inlet, Stewart Island.

Area: c.6,900 ha.

Altitude: Sea level to 40 m.

Overview: The wetlands of the Freshwater River and tidal flats at the head of Paterson Inlet are the largest wetland system on Stewart Island. The wetland extends for some 23 km along the Freshwater Valley to the inter-tidal mudflats at the river mouth. The valley contains a diversity of plant communities with associated wildlife species representative of Stewart Island. Of particular importance is the absence of any introduced fish species. The wetland contains a mosaic of acid bog, pools, infertile sand ridges, Manuka/Wire Rush peatlands, Manuka shrubland, Red Tussock areas, patches of podocarp forest, oligotrophic lands and tidal mudflats. The mudflats are of considerable importance for shorebirds, especially the New Zealand Dotterel *Charadrius obscurus*.

Physical features: The Freshwater Valley lies in a down-faulted depression between the diorite complex of Mount Anglem to the north and the Rakeahua Granite hills to the south. Remnant terraces of the last glacial age flank the valley in the northwest. The valley floor consists of a mosaic of acid bog, pools, infertile peatland flats, infertile ancient sand ridges, more fertile soil areas on the wetland margins, and oligotrophic lakes.

Rainfall is relatively high (approximately 1,500 mm) and frequent. The climate is mild compared to the South Island, and frosts are uncommon. Strong westerly winds are prevalent.

Ecological features: The Freshwater Valley has a distinct ecological character and is the core of the Freshwater Ecological District. The extensive wetlands contain a diverse array of vegetation communities with significant intact vegetation sequences. The major plant communities within the valley are: Wire Rush *Empodisma minus* and Manuka *Leptospermum scoparium* peatlands; *Baumea rubiginosa* and *Lepidosperma australe* rushlands; Red Tussock *Chionochloa rubra* ssp. *cuprea* tussocklands; Manuka shrublands; and forest containing Kahikatea *Dacrycarpus dacrydioides*. The mudflats beyond the river mouth support eelgrass *Zostera novaezelandica* and an estuarine saltmarsh fringe of Jointed Rush *Leptocarpus similis* and *Carex* spp.

Land tenure: The area above Mean High Water Spring is Crown land held as Conservation Area and administered by the Department of Conservation. The area below Mean High Water Springs is Crown land administered by the Southland Regional Council. Surrounding areas are Crown land held as Conservation Area and administered by the Department of Conservation. The seabed of Paterson Inlet is Crown land administered by the Southland Regional Council.

Conservation measures taken: Part of the wetland is Crown land held as Conservation Area and administered by the Department of Conservation. The area is managed for conservation purposes. The Southland District Council's district plan regarding conservation and preservation activities for Stewart Island is "to preserve the undisturbed nature of the greater part of the district, especially those areas viewed from scenic walks and tourist launches, and to preserve certain areas of historical or special interest".

Conservation measures proposed: The upper valley had been proposed as an Ecological Area by the former New Zealand Forest Service. This proposal is due to be re-evaluated as part of an overall land status review for Stewart Island in the future.

Land use: There are no permanent human inhabitants within the wetland, but a hut provides temporary accommodation for trampers. Walking tracks extend along the Freshwater Valley and along the Scott Burn to Masons Bay. There has been some commercial eel fishing. There are two huts adjacent to the wetland, and these are associated with the Stewart Island track network. The area is managed for conservation purposes.

Possible changes in land use: None foreseen.

Disturbances and threats: Fire could destroy large areas of vegetation. Commercial eeling could affect freshwater food chains, while introduced salmonoid fish could affect both the freshwater fauna and the food chains. Introduced whistling frogs are spreading through the Freshwater Valley, but their effect upon the freshwater fauna and food chains is little known.

Hydrological and biophysical values: The wetland plays a significant role in sediment trapping, erosion control and maintenance of water quality, and is of great importance in supporting aquatic and terrestrial food chains.

Social and cultural values: The wetland has important landscape values and scenic qualities, and was used by Maori as a "kaimoana" (seafood) gathering site. An archaeological site has been found in the lower Freshwater Valley. This was associated with a seasonal "kaimoana" gathering site.

A Pastoral Lease was let over 13,000 acres in 1904, but no more than 750 acres of this lease were ever used. This was the earliest run on Stewart Island. Attempts were made to drain parts of the wetland, and there was some burning and sowing of pasture grasses associated with farming activities, but the land has rapidly reverted back to its natural state. The Freshwater flax mill operated at the junction of the Freshwater River and Scott Burn. A road was built up the Scott Burn to Masons Bay during the 1930s depression by the Public Works Department as an employment scheme. The present walking track largely follows this route.

Noteworthy fauna: The wetlands of the Freshwater Valley are not particularly rich in fauna, but the area has not been extensively surveyed. The avifauna is best known, and includes Stewart Island Kiwi *Apteryx australis lawryi*, Australasian Bittern *Botaurus poiciloptilus*, Grey Duck *Anas superciliosa*, Marsh Crake *Porzana pusilla affinis*, Spotless Crake *P. tabuensis plumbea*, Stewart Island Fernbird *Bowdleria punctata stewartiana*, Stewart Island Robin *Petroica australis rakiura* and other forest species. The mudflats at Paterson Inlet are frequented by Pacific Reef Egret *Egretta sacra*, South Island Pied Oystercatcher *Haematopus finschi*, Variable Oystercatcher *H. unicolor*, the currently undescribed Stewart Island subspecies of New Zealand Dotterel *Charadrius obscurus*, Banded Dotterel *C. bicinctus*, Bar-tailed Godwit *Limosa lapponica*, Ruddy Turnstone *Arenaria interpres* and Red Knot *Calidris canutus*.

The aquatic fauna of the Freshwater Valley is still poorly known. Eight indigenous species of fish are known to occur: Giant Kokopu *Galaxias argenteus*, Banded Kokopu *G. fasciatus*, Inanga *G. maculatus*, Common Smelt *Retropinna retropinna*, Red-finned Bully *Gobiomorphus huttoni*, Giant Bully *G. gobioides*, Short-finned Eel *Anguilla australis* and Long-finned Eel *A. dieffenbachii*. One of the features of the freshwater fisheries is the lack of introduced salmonoid fish species.

Noteworthy flora: Three species of plants are restricted to this area of Stewart Island, *Carmichaelia virgata*, *Oreomyrrhis ramosa* and *Schizeilema trifoliolatum*. Other notable species include Lowland Ribbonwood *Plagianthus regius* and Kahikatea *Dacrydium dacrydioides*.

Scientific research and facilities: Cowie, *et al.* (1978) carried out a survey of the freshwater invertebrates of the Freshwater Valley. A Master of Science thesis by Chadderton on the freshwater invertebrates and fish of Stewart Island included the Freshwater River (Chadderton, 1990). There has also been a Bachelor of Forestry Science dissertation on podocarp and hardwood regeneration on the Rugged Flats at the head of the Freshwater Valley (Lovelock, 1982). There are no research facilities in the area.

Conservation education: There is limited potential for conservation education because of the isolation of the area.

Recreation and tourism: A walking route extends the length of the valley, and a walking track extends along the Scott Burn to Masons Bay as part of the Stewart Island track network. A trappers hut adjacent to the Freshwater River is associated with this track network.

Management authority: The Department of Conservation (Southland Conservancy) is responsible for management of Conservation Areas and wildlife. The Southland Regional Council has statutory responsibilities under the Resource Management Act 1991 for water resources and the preparation of coastal plans. The Regional Council is also responsible for management of the area below Mean High Water Spring.

Jurisdiction: Functional: Department of Conservation. Territorial: Southland Regional Council and Southland District Council.

References: Chadderton (1988, 1990); Cowie *et al.* (1978); Davis (1987); Department of Conservation (1986, 1990c); Lovelock (1982); Sansom (1982); Sanson (1983); Wilson (1987).

Reasons for inclusion:

- 1a The Freshwater Valley contains a particularly good representative example of a mosaic of wetland types (including acid bog, pools, infertile peatland flats, infertile ancient sand ridges, oligotrophic wetlands and tidal mudflats), characteristic of New Zealand.
- 2a The wetlands support populations of two threatened species of fish, *Galaxias argenteus* and *G. fasciatus*, and two threatened species of birds, *Botaurus poiciloptilus* and *Charadrius obscurus*.
- 2b The wetlands are of special value for maintaining the genetic and ecological diversity of the region because of the diversity of their fish and bird fauna (including threatened and endemic species). A special feature of the wetlands is the absence of introduced salmonoid species.
- 2c The mudflats at the head of Paterson Inlet are an important wintering area for migratory shorebirds.
- 2d The wetlands are of special value for their endemic plant and animal species, notably the plants *Chionochoa rubra* ssp. *cuprea*, *Dacrycarpus dacrydioides*, *Zostera novazelandica*, *Leptocarpus similis*, *Carmichaelia virgata* and *Oreomyrrhis ramosa*, the fish *Galaxias argenteus* and *G. fasciatus*, and the birds *Apteryx australis lawryi*, *Haematopus finschi*, *H. unicolor*, *Charadrius obscurus* and *Bowdleria punctata stewartiana*.
- 3b The wetlands regularly support substantial numbers of waterfowl, including both international and internal migratory shorebirds.
- 3c The mudflats regularly support over 1% of the currently undescribed Stewart Island population of *Charadrius obscurus*.

Source: Brian Rance.