

**Social Assessment of the Waituna Catchment, Southland –
anticipating the impacts of nutrient limits for farming systems**

A report prepared for DairyNZ

**by Nick Taylor and Wayne McClintock of Taylor Baines & Associates, and
Mike Mackay, Lincoln University**

Taylor Baines and Associates

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1 Introduction

1.1 Background

Waituna Lagoon in Southland, New Zealand, is part of a wetland area of international significance. The lagoon is described as ecologically unstable and there are proposals to improve the management of the lagoon including greater control on nutrients that enter it from farming systems in the catchment (including dairy units, dairy support and sheep and beef farms).

Throughout New Zealand, under the guidance of the National Policy Statement for Freshwater Management, regional councils are required to set water quantity and quality limits within their land and water plans. To achieve this goal, most councils have embarked on a collaborative planning process, working with key stakeholders and affected communities while integrating technical analyses from scientists. It is expected that Environment Southland will commence a consultative planning process for the Southland catchments later this year (2015).

In anticipation of future nutrient allocation limits being set for the Waituna Catchment in Southland, DairyNZ commissioned this social assessment of the lagoon, so social values are integrated with other technical analysis and stakeholder engagement, in the collaborative planning.

Social assessment is a process of for predicting and analysing social impacts in advance of a decision being made. It is also applied to the monitoring and management of change once it starts. The process is applied to policy design, as in this case of Waituna Catchment, as well as to project design and implementation. Social assessment typically is applied in an integrated approach along with ecological, economic or other forms of technical assessment and usually has input from affected people as a core part of the process.

The social analysis for Waituna Catchment, in the first instance, comprised a social profiling exercise (baseline study) that drew on existing research and data sources as well as a limited number of stakeholder interviews. The assessment also includes a preliminary social analysis of the initial land-use projections and a number of economic scenarios developed for the catchment by DairyNZ.¹

1.2 Research objectives

The research is iterative, building up an understanding of the catchment and policy developments in a series of steps, including previous research and surveys in Southland, while integrating with economic and ecological assessments.

The following research objectives were established:

1. Scope the social assessment by defining the assessment areas, variables to be assessed, sources of data and key stakeholders
2. Develop a baseline understanding (social profile) of the social-economic context for catchment planning and assessment of land-use/economic scenarios
3. Undertake a preliminary social assessment of land-use and economic scenarios being undertaken by DairyNZ as part of their input to the collaborative catchment planning process

¹ The authors acknowledge the assistance and support of David Burger and Julia Christie in undertaking this research and the input of people in the catchment and other stakeholders who gave time and information.

4. Make recommendations to DairyNZ regarding the collaborative planning process.

1.3 Methodology

Comparative analysis of social change

The assessment used comparative cases of the social impacts of dairy farming from other regions of New Zealand to understand social change scenarios in the catchment. The comparative cases drew on New Zealand research and case studies of rural social change, especially that driven by changes in land uses and farm systems, including farm ownership, workforces and community demographics. An important aspect of this analysis is understanding rural social change associated with different water management regimes. Other changes found in rural areas were also included, for example, changes experienced by rural schools over recent years.

The assessment also investigated changes in recreation activity and amenity values likely with environmentally sustainable river and lagoon systems compared with their current state.

Study area

The primary study area for the assessment comprised the catchment of the Waituna Lagoon as defined by DairyNZ and Environment Southland (see map in Attachment 1). However, physical boundaries, such as a catchment in lowland areas, do not necessarily equate with social or community boundaries and therefore a scoping exercise was required to define the areas for analysis, current land uses (all types) and the particular social variables involved. The scoping of the area included a review of relevant documents and previous research and input from and discussions with DairyNZ staff.

It was deemed necessary to set the catchment in the larger social-economic region of Southland and Southland District, as factors such as labour market areas, and social services (particularly those based in Invercargill) are important to rural areas.

Development of the baseline

The social profile describes the current social status of the assessment area, including key trends. The baseline is a key step as it provides the basis for later assessment of the social outcomes of scenarios and policy packages.

Key sources used in describing the baseline included:

- Secondary data and reports on the study area population, employment, land use, land values, and settlement patterns over time, business activity and economic development
- Studies of recreation and tourism activity in the lagoon and its catchment including any research reports, angler surveys and recreation access maps and brochures
- Census data
- School roll data and other indicators of community change
- Reports and information about the health of the lagoon system and amenity values over time
- Key informant interviews helped identify more recent social changes in the study area and investigate current land-use changes. Advice was sought from DairyNZ staff regarding interviews as they were already involved in engagement with farmers and stakeholders. There was sensitivity entering the field situation given the considerable amount of

consultation and research already undertaken there and to ensure people talked to were comfortable with doing so.

Updating of the profile can continue through the process of catchment planning, capturing wherever possible the views of local people and the aspects of the Catchment they value, to complement the technical and economic analyses that have been carried out.

Assessments of scenarios and policy packages

The scenario assessment used baseline information plus comparative case data from Canterbury and Otago. It should be emphasised that comparison cases are only indicators of social change and local conditions need to be taken into account. In the case of Waituna catchment, the key feature is the lack of irrigation as discussed below. Furthermore, it is important to consider changes predicted as a result of a particular set of policy interventions from changes that would have happened anyway.

The scenario assessment considered scenarios of Nitrogen (N) reduction, and information about the effects of this reduction on farm profitability and employment provided by the economic and farm management analysts at DairyNZ.

The assessment also drew on available analysis and narratives on the likely ecological effects of different levels of N reduction based on ecological guidelines for the lagoon ecosystem.

2 Social Profile (Baseline)

2.1 Introduction to the social profile

This social profile summarises the current state of the Waituna Catchment on the southern coast of the South Island of New Zealand. The profile provides a baseline from which future land use scenarios are then assessed. Where available, trends (over the last ten years) are described, in order to provide a picture of recent changes in the Catchment. Historical data are also discussed to provide a sense of longer-term trends.

Where possible, information is provided for the Catchment area, the township of Gorge Road and smaller settlements, where important services such as health, education, retail and other services are delivered. However, for some data it is not possible to separate the Catchment area from the wider Southland Region in which it is located. Much available data are at the District and Regional levels, so while the main focus is on the Catchment, this profile also includes some data from the broader levels of district and region, particularly for land use and economic variables.

This social profile reflects a wide range of social and cultural values present in the Catchment. It is important to note that values vary between people and groups, and change over time as a result of current conditions. Major value areas covered in this profile include those associated with:

- productive and consumptive uses of water which provide reliable irrigation, drinking and stock water supplies, enabling people to meet social needs and gain economic livelihoods from a mix of farming systems
- people and communities of the Catchment, their identities, ways of life and historical linkages to water, and
- recreational, ecological and intrinsic values of rivers, streams, groundwater and drains, lagoons and wetlands, and cultural and aesthetic values associated with them.

2.2 Waituna Lagoon background

Waituna Lagoon, east of the City of Invercargill, in Southland District, is a shallow coastal lagoon within the Awarua Wetlands. The lagoon is situated on a gravel outwash plain into which three major creeks (Waituna, Moffat and Currans) discharge. A barrier beach along the south coast restricts drainage, forming a lagoon and wetlands that cover an area of 3,600 hectares. The Waituna Wetlands Scientific Reserve was designated as being of international significance in 1976 under the Ramsar convention. Seven years later it was established as a scientific reserve, and is administered by the Department of Conservation (DOC).² As the name of the lagoon suggests, it was an important food resource for Maori.³ In addition to being a taonga and source of mahinga kai, the lagoon reserve is a local recreational area where fishing for brown trout, game bird shooting, kayaking on the lagoon, walking and bird watching are frequent activities.⁴

The total Awarua Wetlands comprise nearly 18,000 hectares, with estuarine areas, swamps, forest, tussock land and sand dunes in blocks of land between the New River estuary and Toetoes Bay. It is home to migratory birds from the northern hemisphere, and birds that are native to New Zealand.⁵

The Catchment has been the focus for agricultural development for over a century, with development working its way down the catchment over time. Historic features of the Catchment area include a lignite pit, peat mining, sites of former sawmills and flaxmills and the route of a former railway line that was opened in the 1890s and provided an important economic link to Invercargill.⁶

2.3 Economy and employment

In a rural area such as the Waituna Catchment the economy drives employment, which in turn influences the size and composition of the population, its growth, and the services and community life that sustain the social and economic wellbeing of residents.

Key drivers of the economy of the Southland Region (Southland District, Gore District and Invercargill City) are dairying, sheep and beef farming, forestry, the Manapouri Power Station which generates 20 per cent of the nation's electricity, the New Zealand Aluminium Smelter at Bluff, and tourism. Businesses in the region are highly export oriented and subject to fluctuations in the commodity price cycle. There has been diversification into food processing, engineering, and construction activities, that helps mitigate the risk from a downturn in commodity prices.⁷

The agriculture, fishing and forestry sector provided 17.5 per cent of employment in the Southland Region in 2010 (cf. 6.6 per cent for NZ). That year the three industries providing the most jobs were meat processing (3,646), dairy cattle farming (3,002), and sheep farming (2,547).⁸ The three industries in the Southland Region which created the most positions between 2009 and 2010 were dairy cattle farming (236), dairy product manufacturing (140) and hospitals (114).⁹ The contribution

² Thompson and Ryder (2003): 6-8.

³ Literally "eel stream" - as noted in the LEARNZ virtual field trip the lagoon was an important food source for Maori and an alternate name is Wai-parara (water of the grey duck) see <http://www.es.govt.nz/environment/land/wetlands/waituna-lagoon/learnz-virtual-field-trip/> Another interpretation of Wai-tuna is that the twisting black water creek that ran into the wetland was shaped like an eel (interview).

⁴ Venture Southland (2012): 13.

⁵ Grant (2012).

⁶ Venture Southland (2012): 13

⁷ Ministry of Business, Innovation and Employment (2013): 48.

⁸ Infometrics (2012): 14-15.

⁹ Infometrics (2012): 17.

of the agriculture, fishing, and forestry sector of \$591 million (18.1 per cent) to the GDP of the Southland Region in 2010 was second only to the manufacturing sector's output of \$949 million.¹⁰

The main types of farms in Southland District as recorded by the Agricultural Survey of 2012 are sheep (39%), dairy cattle (28%), beef cattle (8%), other crops (6%), and sheep and beef cattle (5%).¹¹ While all these agricultural activities provide significant income and employment for residents, there has been a significant shift of land use since 2007; with many sheep and sheep and beef cattle properties having been converted to dairy and crop production (see Table 1 below). Moreover, a comparison of numbers of types of farms between 2007 and 2012 indicate there has been a trend to consolidate properties into larger production units during this period.

Table 1: Change in selected types of farms in Southland District 2007 to 2012

Farm type	2007		2012	
	Number	per cent	Number	per cent
Sheep	1341	44.0	1110	38.7
Beef cattle	228	7.5	219	7.7
Sheep-beef cattle	303	9.9	150	5.2
Dairy cattle	534	17.5	798	27.8
Crop growing	66	2.2	171	6.0
Total number	3048	100.0	2871	100.0

Source: Statistics New Zealand: farms-by-farm-type-TLA-2007.xls downloaded 4 November 2012 and farms- farm-type-ta -2012.xls, downloaded 30 April 2014. Note that neither the individual farm types nor their percentages add to the bottom row as they are only selections from the primary data.

Thus the dairy industry is a major contributor to the economy of Southland District, and is expected to continue to be a major driver of growth through primary production and processing. In 1998/99 Southland District had 371 dairy herds, (average herd size of 365) and by 2011/12 there were 696 herds (average herd size of 575) with 419 owner/operators and 277 sharemilkers.¹² As Figures 1 and 2 indicate, the numbers of herds and cows in the District increased rapidly between 2005/06 and 2012/13. Future expansion of dairying will be subject to the availability of suitable irrigated land for dairy cows and the availability of farm properties, or parts of properties, that can be converted from sheep and beef cattle production. A major constraint to future dairy conversions is likely to be the inclusion of nutrient restrictions in the regional plan, in order to maintain or improve water quality in line with the National Policy Statement on Freshwater management.

¹⁰ Infometrics (2012): 35.

¹¹ Statistics New Zealand, farms- farm-type-ta -2012.xls, downloaded 30 April 2014

¹² Livestock Improvement Corporation Ltd (1999) and Livestock Improvement Corporation and DairyNZ (2013). Note that statistics for numbers of owner/operators and sharemilkers are only available from 2009/10 year onwards.

Figure 1

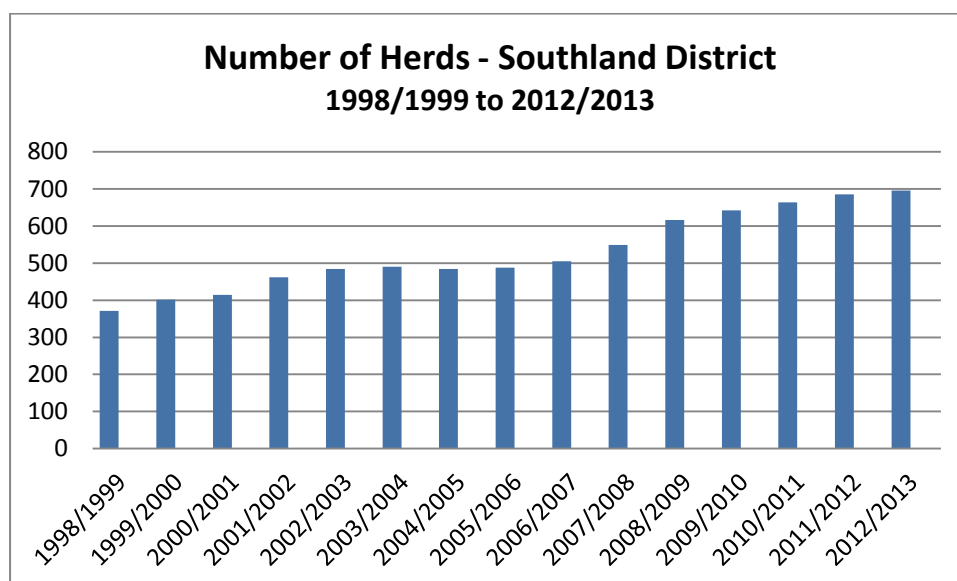
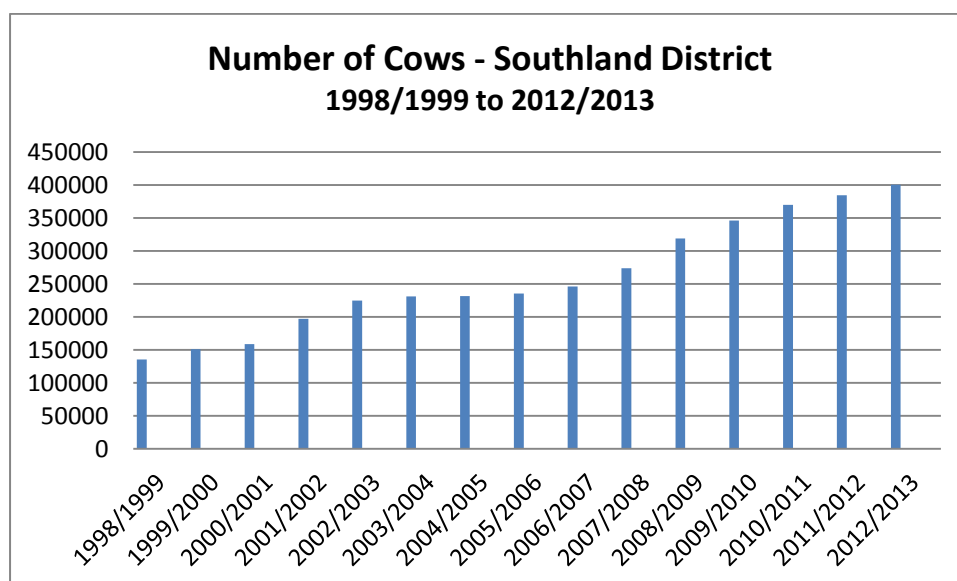


Figure 2



A rapid assessment of 47 dairy operations conducted in the Waituna Catchment during July 2011 ascertained that the area used for dairy farming increased from 12 per cent in 1995 to 36 per cent in 2010. Just over 22,000 dairy cows were carried in the Catchment during the 2010/11 milking season, with an average stocking rate of 2.4 cows per effective milking hectare (cf. 2.7 cows per hectare for Southland).¹³ During the 2010/11 winter the number of cows in the area declined to 11,142, as 8,879 cows were moved to graze on farms outside the Catchment. A much smaller number of cows (587) were bought into the Catchment for wintering. Almost all of the producers who winter stock in the Catchment do so with forage crops. The average cropping area for dairy farms in the Catchment was

¹³ Clark (2011): 21-24.

about 19 hectares, with a few farms being as high as 60 hectares (5 per cent), and other farms not planting any hectares of crop (24 per cent).¹⁴

2.4 People and communities

The construction of the first stages of the Seaward Bush Branch railway from Invercargill to Mokotua in 1892, and to Gorge Road in 1895, opened up land for development in the Waituna Catchment. Mixed trains carried passengers on the Seaward Bush branch until 1960, and the line was eventually closed in 1966 after roads in the district were well developed.¹⁵

The first European settlers established farms, sawmills and flaxmills. Sheep and beef grazing, and cropping became the predominant agricultural activities until the latter part of the 20th century when a number of properties merged to become dairy farms.¹⁶ The pastures often have remnants of lowland forest that previously covered the area.¹⁷

In the 1950s much of the Catchment was bush and swamp, and draining the land was a main task of farm development. The Lands and Survey Department purchased 2,954 acres south of Hodgson Road in 1951. After several years of manuka clearance and ditch digging, this area of land became known as the Waituna Farm Settlement, and by 1956 the first block of 300 acres was ready to farm¹⁸ Most farms had a mixture of livestock, including sheep and herds of up to 50 dairy cows, and grain was also grown. There were several small-scale dairy factories at that time, but they had all closed by the 1970s. The Liquid Fuels Trust Board began exploratory work for lignite deposits in 1985, but plans for development of this industry were abandoned after oil prices declined. Conversion of sheep farms to dairying began in the 1990s, with older farmers selling their properties to newcomers from the North Island.¹⁹

Much of the area of the Waituna Catchment is administered by the Gorge Road and Districts Community Development Area (CDA) which is a subcommittee of the Southland District Council. The CDA has six community members and a Councillor representing the Waihopai Ward. The area for which the CDA is responsible includes "Mokotua and Oteramika in the north, down through Gorge Road township and to the Waituna Lagoon and Wetland complex by Toetoes Bay". On its eastern border is the Mataura River, and it includes the localities of Mokotua, Kapuka, Kapuka South, Oteramika, Ashers, Bush Siding, Gorge Road and Waituna.²⁰

The settlements of Mokotua, Kāpuka, Ashers and Gorge Road are on the main road east from Invercargill. Ōteramika and Waituna are to the north of the main road, and Kāpuka South is located south of the main road.²¹ These settlements provide a limited range of community and business services to residents of the Catchment. Mokotua, for instance, has a store, garage and community hall. There is another community hall, a church and scout den at Oteramika and a community centre at Kapuka South. Waituna has a playcentre. The real community hub of the Catchment, however, is Gorge Road which has a primary school, community centre, swimming pool, squash court, country club and domain.²² Medical and other health services are available in Invercargill, although it is difficult for newcomers to get enrolled with general practices, and only one of them accepts casual patients.

¹⁴ Clark (2011): 21-24.

¹⁵ Churchman and Hurst (1990): 212.

¹⁶ Waghorn in Venture Southland (2012): 4.

¹⁷ Venture Southland (2012): 13.

¹⁸ (Munro 2014:122).

¹⁹ See Munro (2014) for a detailed description of these land use changes in the Catchment.

²⁰ Venture Southland (2012): 9.

²¹ Grant (2012).

²² Venture Southland (2012): 14.

Business activities based in the Catchment include a transport operator, three agricultural contractors, fencing contractors, two excavating firms, a gravel pit operator, a hairdresser and a café and museum located at a former lignite pit.²³ A nursery harvests peat for its potting mixes from its property on the north shore of the Waituna Lagoon.²⁴ The contracting and excavating firms employ a number of locals. The arrival of large scale dairy farms in the Catchment means that the days of farmers undertaking their own tractor work has mostly gone, and during summer the agricultural contractors are busy making hay and silage, cultivating land for cropping, and sowing grass.²⁵

One commercial eeling operator fishes the area on a regular basis. The lagoon was fished heavily in the early 1970s and numbers of both long (*Anguilla dieffenbachii*) and short-finned (*Anguilla australis*) eels quickly reduced. But since then the lagoon was not available for commercial eeling as it was designated a wildlife reserve in 1976. The current eeling operation takes place every two to three years in the main creeks running into the lagoon (Waituna, Moffat and Currans), with access through catchment farms. Eels are supplied to a factory on the outskirts of Invercargill, which takes eels from the Otago-Southland area. The fisher reports that catch per unit effort is steady or improving as is the condition of the creeks since they were fenced and farm practices have improved.

Communities in the district, whose activities were previously focused on schools and community halls are now less locality based,²⁶ and typically comprise groups of people with shared interests rather than geographical proximity per se.²⁷ There is not a lot of overlap between these groups. Filipino people hold social functions at the Oteramika Community Hall, and some of their friends come from Winton and other parts of Southland for these events. Christians in the Catchment travel to Invercargill for church services. While most Filipinos are Catholics, some attend a Pentecostal church in Invercargill. The congregation of the Oteramika Presbyterian Church has recently voted for its closure.

Residents travel to Invercargill for sport and other activities. Interviews suggested that sharemilkers are more interested in production than other residents, but noted some of them are also involved with school and other community activities. The participation of individuals in community activities, however, depends to some extent on their background (e.g. rural, ethnicity) prior to their arrival in the district. It was also suggested that during social functions at the Country Club at Gorge Road there is sometimes a separation between sheep farmers and dairy farmers, including the farming topics they talk about.

2.5 Population change and demographic features

Dairy conversion in the Catchment grew strongly at the end of the 20th century, and dairy support provided good incomes to farmers not wanting to sell or convert their properties. With many new residents from the North Island, and others who were born overseas, the composition of the

²³ Venture Southland (2012): 14. The café and museum at the lignite pit were not open in May 2014, and there was a "For Sale" sign near the entrance.

²⁴ Munro (2014): 204 and interviews.

²⁵ Munro (2014): 243 and interviews.

²⁶ Interviews identified that most of the settlements typically held balls at the community halls and invited people from the wider district. Weddings, farewells, and gift evenings were also held at these halls. When the smaller-sized schools were open in the 1960s, sports competitions enabled people from Tokanui to Woodlands to interact with neighbours over a wide area.

²⁷ Locality based communities may still exist in the Catchment, however, but it is likely that they are more widely spread than before the closure of four schools in 1969. For instance, there was some recognition of a social boundary along Gorge Road separating residents of the upper and lower Catchments. Analysis of communities in Western Southland in the late 1990s found a similar decline in the importance of geographical proximity in defining community, as roads improved and social networks and labour markets extended over wider areas than before.

population changed from the mainly European descendants of early settlers to a broader mixture that included Dutch, Belgian, South African, Irish and English people. The population has also become more transitory; with some dairy properties being operated by sharemilkers with three year contracts, and some employees who might only stay a year.²⁸ The population density of the Catchment is also less than it was when sheep and beef grazing was the dominant land use.²⁹

The usually resident population of the Waituna Catchment³⁰ was 708 in 2013 (Table 2). It had increased by 11 per cent since 2001; that is over three times the growth rate of Southland District over the same period. Between 2001 and 2006 the population of the Catchment declined slightly from 639 to 627, but over the following seven years it grew by 13 per cent (cf. 4% for Southland District). Statistics New Zealand forecast that the population of Southland District in 2031 will range from 26,400 (low) through 29,700 (medium) to 33,000 (high).³¹

Table 2: Changes in usually resident population of Waituna Catchment 2001-2013

Area	2001	2006	2013	Per cent change 2001-2013
Waituna Catchment	639	627	708	10.8
Waituna Area Unit ³²	1644	1629	1683	2.8
Southland District	28716	28440	29613	3.1
New Zealand	3737277	4027947	4242048	13.5

Source: Statistics New Zealand

Key features of the population of Waituna Catchment in 2013 were:³³

- The age structure of Waituna Catchment's population was relatively younger than the District's population, with a higher proportion of children, and a much lower proportion of people aged 65 years and over among its residents.
- Males predominated in the Catchment, and residents aged between 15 and 64 years, who usually are the major component of the workforce, comprised 69 per cent of the population.
- Although the population of Waituna Catchment is still relatively homogeneous in its overall ethnic composition, the presence of significant proportions of residents with Maori, Asian and Pacific ancestry shows it also has a variety of cultural diversity.
- Residents were relatively more mobile than those of Southland District. Fifty-six per cent of them had been domiciled there for less than five years in 2013 (cf. 46% for Southland District).
- 25 per cent of the Catchment's residents possessed tertiary qualifications (31% for Southland District, 35% for New Zealand). A further 24 per cent of residents held no qualifications, which was much higher than the national proportion of 19 per cent.

²⁸ Munro (2014): 188. Other recent migrants to the Catchment include dairy workers from Chile and the Philippines and a dairy farmer and his wife from Borneo (Munro 2014: 172, 201).

²⁹ A farm near Gorge Road School, for instance, has five houses on the property only one of which is now occupied by a family.

³⁰ Meshblocks representing the Waituna Catchment were selected for their best fit to the Catchments' boundaries.

³¹ Statistics New Zealand, Subnational population projections, 2006 (base) - 2031, update October 2012, Table 2. Given that the medium projection of 29,700 was almost matched by the usually resident population of 29,613 in 2013 it is more likely that the population of the District in 2031 will be closer to the high projection.

³² The Waituna Area unit is a statistical unit and all of the catchment lies within it.

³³ Detailed tables of population data for 2013 are available from the authors on request as is a mesh-block map.

- People living in both the Waituna Catchment (78%) and Waituna Area Unit (80%) had higher levels of participation in the labour force when compared with residents of Southland District (73%) and New Zealand (64%).
- The unemployment rate in the Catchment of 1.7 per cent was just over a third of the national rate of 4.5 per cent.³⁴
- The Waituna Catchment had a lower proportion of paid employees and a higher ratio of employers in its workforce; both features of employment status typically associated with primary production and its support services.
- Just under three-fifths of the resident workforce of the Catchment had higher status occupations as managers and professionals, while about a quarter had blue collar occupations. This occupational structure reflects the prevalence of farmers in the Catchment (classified as managers for census purposes), and less skilled workers employed on-farm and with agricultural support services.
- The principal source of employment providing a livelihood for residents of the Waituna Catchment (66%) and Waituna Area Unit (55%) in 2013 was the agriculture, forestry and fishing sector.
- Two parent families were the predominant family type (53%) in the Waituna Catchment, whereas there were relatively fewer couple only (40% cf. 48%) and one parent families (7% cf. 8%) than in Southland District.
- Households in Waituna Catchment and Waituna Area Unit received high incomes by national standards. Both areas had relatively fewer households that reported incomes under \$50,001, and relatively more with incomes between \$50,001 and \$100,000, when compared with households at the district and national levels.
- Residents of Waituna Catchment and the Waituna Area Unit had a relatively low dependence on income received from government sources, reflecting the low level of unemployment and the low proportion of elderly residents. The total number of government payments received by residents of the Waituna Area Unit as a proportion of total number of residents aged 15 years and over was 17 per cent (cf. 25% Southland, 32% New Zealand).
- The Waituna Catchment had a significantly lower level of home ownership (owned or held by a family trust - 45%) than both Southland District (64%) and New Zealand (61%). Almost half (49%) of the dwellings in the Catchment were rented from private landlords or employers.
- Access to motor vehicles was high by national standards; with two-thirds of households in the Catchment (67% cf. 52% for NZ) reporting they had two or more vehicles.

2.6 School rolls

School rolls (Figures 3 and 4) provide an indicator of population trends and social vitality at the community level. Rural schools have large catchments that are defined by their enrolment zones and bus runs. There are three primary schools located within or adjacent to the Waituna Catchment - Gorge Road, Rimu and Tisbury.

Gorge Road School opened in 1889 with 21 pupils. In 1969 it was amalgamated with Kapuka South School, and a year later with Kapuka, Oteramika, and Morton Mains schools. Gorge Road School reached its peak roll of 187 children in 1974 when it had a staff of six teachers.³⁵

Before the closure of these four schools there were several locality based communities in the Waituna Catchment that each had their own hall and /or school. From the 1970s community activities became wider in their focus as more families became associated with the Gorge Road

³⁴ Typically, in rural areas workers leave for other areas, or towns, if there is no work available.

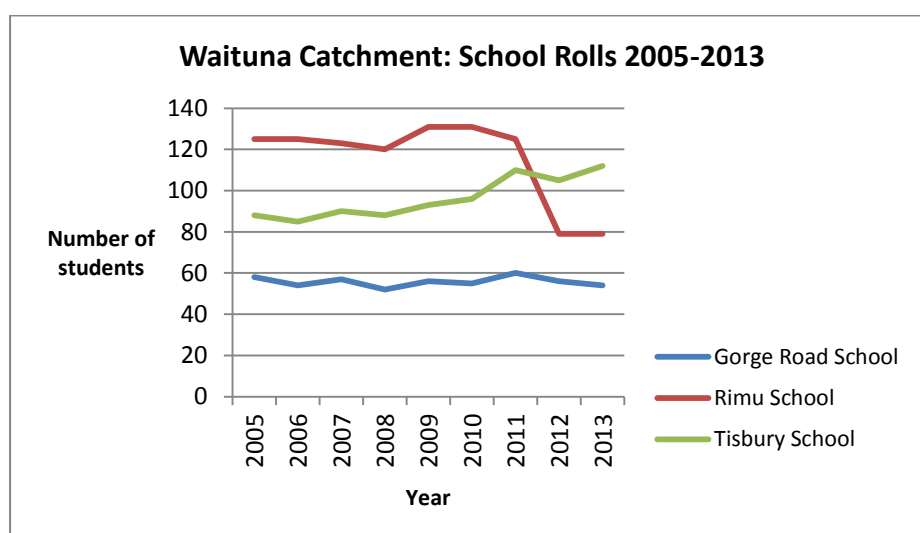
³⁵ <http://www.gorgeroad.school.nz/> 14 April 2014

School and the Gorge Road Country Club (opened 1978) provided a venue for residents from all parts of the Catchment to socialise together. Dances at the local halls became fewer as access to entertainment and other activities in Invercargill became easier due to the improved state of the roads.³⁶ Several families with children at Gorge Road School have lifestyle blocks, and commute to Invercargill for work. Several families in the catchment area of Gorge Road School send their children to other primary schools in the district, and nowadays older children attend intermediate and secondary schools in Invercargill.

Volunteers assist with combined school cross-country events, but there is not much voluntary help available for working bees at Gorge Road School. The school has an active PTA, but none of its members are dairy farmers. Yet it does have a dairy farmer (chair), a sharemilker (treasurer), a contractor/former farmer, a dairy worker and a draughtswoman whose husband drives a milk tanker on its Board of Trustees. Gorge Road School has 3.5 staff positions (including a teaching principal), teacher's aide, cleaner, and office manager.

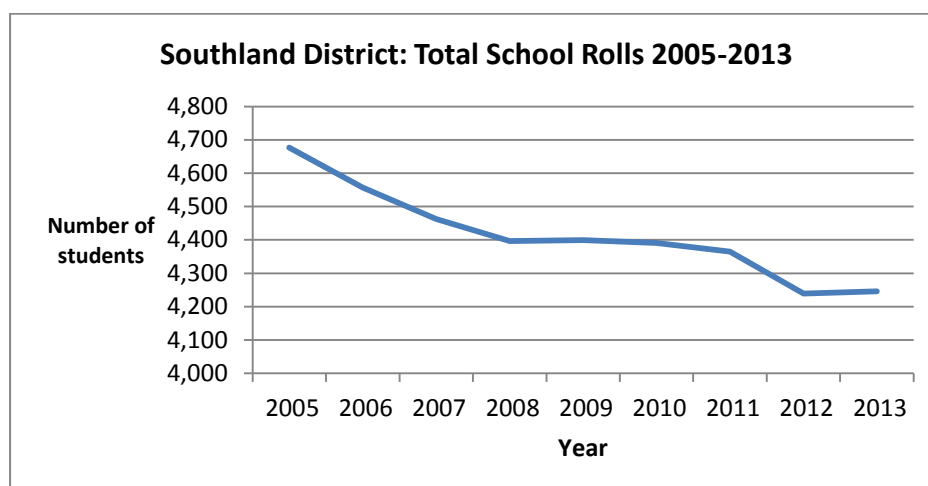
Fourteen children, of Gorge Road School's present school roll of 53, were born outside of New Zealand (i.e. South Africa, Zimbabwe, Philippines, and other SE Asian countries). The Education Department provides extra money for their ESOL studies. Nine pupils at the school were leaving on "gypsy" day (1 June 2014). While one new family was expected by the school at that time, it was possible that others could turn up unannounced. There is a general pattern for parents to get their children enrolled following gypsy day without previously notifying the school. The contrasting fortunes of the three schools that serve the Waituna Catchment are illustrated by Figure 3. Since 2005 the roll of Gorge Road School has slowly declined from 58 to 54 in 2013. By comparison the number of pupils at Rimu School fell sharply from 125 to 70 (44 per cent) over the same period. Tisbury School, however, which is located closer to the city of Invercargill, increased its roll by 27 per cent to 112. The experiences of these three primary schools are in the context of an overall decline of 9 per cent in the rolls of all schools located in the Southland District as shown by Figure 4 and are probably explained by local factors.

Figure 3



³⁶ Munro (2014): 145.

Figure 4



2.7 Stock, drinking and wastewater

Stockwater in the Catchment is sourced from wells and bores. This ground water is unsuitable for human consumption due to the high iron content of laterite soils. Farms filter iron from the groundwater so it can be drunk by livestock. Rain water stored in household tanks is used for drinking and other domestic use.

2.8 Outdoor recreation

The special ecological character of Waituna Lagoon and the Awarua wetland complex provides residents of the Catchment, and visitors to it, with the natural resource-base for a variety of outdoor recreation activities,³⁷ both active and passive. The Concept Plan for Gorge Road and Districts identifies a number of them. They include angling for trout in the lagoon and creeks, surfcasting on the foreshore, shooting ducks, canoeing/kayaking on the lagoon, walking on tracks and foreshore, and ornithological (birdwatching) opportunities³⁸. The Concept Plan also records a variety of heritage assets in the Catchment that are of historical interest to visitors (sightseers): these include the sites of sawmills, flaxmills, lignite pits, single men's camps from the depression, a former railway bridge over the Mataura River, a former railway house, two former dairy factories at Mokotua and Oteramika, two war memorials at Gorge Road and Mokotua, and two former school buildings at Mokotua and Oteramika.³⁹ Some projects developed under the Concept Plan relate to heritage and nature conservation including the collection of oral histories from the older generation by the Invercargill library, and the establishment of a walking track near Gorge Road School with trees planted by various community organisations under the guidance of Gay Monro of the local Landcare Group.

As a destination, the Waituna Lagoon and Awarua Wetland complex are growing in popularity as destinations for both domestic and international visitors. Increasing numbers have come to the lagoon as a result of signs being erected to indicate access to the Waituna Wetland complex.⁴⁰ Some people stay in camper vans near the DOC area, while others stay near "Ray's old woolshed" for as much as two weeks.⁴¹ They are from all parts of the world. Local schools (e.g. Gorge Road) visit the

³⁷ The Ministry for the Environment (2004) has included Waituna Lagoon and surrounding wetlands in the inventory of *Potential Water Bodies of National Importance for Recreation*.

³⁸ Interviewees also mentioned sailing small boats on the lagoon and whitebaiting in Waituna Creek (although whitebait were seldom caught in large numbers).

³⁹ Venture Southland (2012): 13-14.

⁴⁰ Interview data.

⁴¹ Interview data.

DOC track and access bridge. A telephone survey of 500 residents of the Southland region in August and September 2009 found that 20 per cent of them (n=100) had visited the Waituna Lagoon/Awarua Wetland during the previous 12 months.⁴² Twenty-eight of those residents had visited the area on 2 to 4 occasions, and another 20 on at least 5 occasions.⁴³ The survey also identified the types of recreational activities which take place at the setting. The most popular activities for the 100 visitors (in descending order of frequency) were short walks under three hours, sightseeing, and family outings.⁴⁴ The main reasons mentioned for visiting the Waituna Lagoon/Awarua Wetland were “good/safe for children” and “good picnic areas”.⁴⁵

Waituna Lagoon is a highly valued recreational fishery,⁴⁶ with brown trout the main target specie.⁴⁷ It is different from other fisheries in New Zealand because of its “wind-swept” vegetation and offer of a remote wilderness fishing experience close to town⁴⁸. Among anglers, the lagoon has developed a reputation for large-size sea-run brown trout, although it is also known for a low catch rate.⁴⁹ This rate, which is one of the lowest in the region,⁵⁰ has now reached six hours per fish.⁵¹ A measure of the use of Waituna Lagoon for recreational fishing can be found in the New Zealand National Angling Survey⁵² administered by NIWA for Fish and Game New Zealand in 1994/95, 2001/2002 and 2007/2008. The 2008 national angling survey recorded that 1840 (plus or minus 410) trout fishers visit the Waituna Lagoon annually. This indicates that there has been an increase in angler days since the early to mid-1990s, from 1130 days (plus or minus 320) in the 1994/95 to the 2007/2008 total of 1840. Anglers are mainly from Invercargill, but some are tourists (e.g. from Australia). Trout catches from the creeks seem to have improved in recent years.

Local fishermen who have long term knowledge of Waituna Lagoon consider that when it is open to the sea the ecosystem is healthier, trout have more feed⁵³ and the flounder catch is better. Dependant on the time of opening, some whitebaiting is reported in the mouth of the lagoon and the main creeks flowing into it, but the nearby Mataura River and streams are a much more significant fishery.

⁴² Murray (2010): 5-6, 8.

⁴³ Murray (2010): 26.

⁴⁴ Murray (2010): 29.

⁴⁵ Murray (2010): 34.

⁴⁶ Some farm families in the Catchment have caught fish and eels in the lagoon and streams or shot ducks for several generations. See Munro (2014: 134, 173-175) for two examples of these farm families.

⁴⁷ Thompson and Ryder (2003).

⁴⁸ <http://southland.fishandgame.org.nz/sites/default/files/Fishing%20Surrounds%20Invercargill%20Brochure.pdf> 23 June 2014.

⁴⁹ Thompson and Ryder (2003, p.21) state that “Trout were liberated in the Lagoon in 1900, and had formed a self-sustaining population by 1918 ... Fish as large as 8 kg have been caught in the Lagoon, but fish average 2.2 to 2.8 kg (Southland Acclimatisation Society 1964), although catch rates tend to be low (Riddell et al. 1988).” An interviewee commented that over the last 10-15 years, the average size of the trout caught had declined, with very few 10-12lb browns now captured (Interview data).

⁵⁰ <http://southland.fishandgame.org.nz/sites/default/files/Fishing%20Surrounds%20Invercargill%20Brochure.pdf> 23 June 2014.

⁵¹ Interview data.

⁵² This longitudinal research estimates the relative annual use of all rivers and lakes managed by FGNZ. While limited to fishing, the survey is the only national dataset for river and lake use and the only source of total (national) use for all rivers and lakes. NIWA note that “...angler usage [or angler fishing days] is one of the most fundamental parameters needed to characterise a fishery, as well as being relatively easy to define and measure” (See Unwin, M., 2009).

⁵³ Interview comments suggested that some trout may migrate in and out of the lagoon on a frequent basis.

The lagoon is used for game bird hunting all around the shore.⁵⁴ The view of Fish and Game is that the lagoon is locally and regionally significant for this type of activity, with the vast majority of shooters coming from Invercargill or other parts of Southland. Shooters believe the pattern of duck movements in the area have changed.

Some families have had recreational baches near the lagoon for several generations. Drawing on research from the late 1980s⁵⁵ it has been observed that “by 1971 when Waituna Lagoon and wetlands were designated as a Reserve for Wetland Management purposes by the Department of Lands and Survey (Ridell et al., 1988) there were approximately 34 huts on or near the borders of the lake for recreational users (Waghorn and Thomson, 1989)”. Some current recreational baches are historic and do not have consents.⁵⁶

Children from Gorge Road School visit the DOC track and use the access bridge as part of their educational activities.

2.9 Contextual factors influencing future changes of land use

Monro, a local historian, observes that: “Agriculturally, the area has never been so productive, however, this intensive land use brings ... its own challenges. For the farmers in the Waituna Catchment, the values of the lagoon at its base have highlighted an issue that all land managers in New Zealand must address - that of the effect our land use has on water quality. However there are ways to minimise this impact and as has been the case in the past, new techniques come to the fore as farmers look to manage the situation to the best of their ability.”⁵⁷

Land development during the late 1950s and 1960s was a catalyst for a lot of environmental issues in the lagoon as this activity was located in the south of the Catchment. A lot of sediment came into the lagoon from a drainage programme, which continued until the mid 1980s. Until farm subsidies for fertiliser were removed during the 1980s a lot of nitrates and phosphates from fertiliser also came into the lagoon.

Older farmers sold to incoming dairy farmers from the North Island and overseas countries from 1990, and there has been a loss of local knowledge of the Catchment’s environment. Farm managers and sharemilkers often stay for only a short time so their experience is neither passed on, nor accumulated, while absentee owners are focused on financial returns rather than the regulatory requirements of Environment Southland.

Monitoring of water quality by Environment Southland revealed “a regime change” in the Waituna Lagoon, as publicised by the Southland Times in 2011. This regime change became widely known as “flipping”,⁵⁸ and Environment Southland initiated an emergency response programme.

After the state of the lagoon emerged as a public issue in 2011, everyday life became more stressful for the Catchment’s farmers as they considered the impacts of reducing cow numbers on debt servicing and the value of their farm land. This stress was experienced by both dairy farmers and sheep/beef farmers who provided dairy support; not only for their own situation but also for their neighbours. There has been a “blaming” of dairy farmers when natural and historical factors may account for a number of the changes in the Catchment (e.g. population of crabs in

⁵⁴ Interview data.

⁵⁵ Cited in Cosgrove, S. (2011).

⁵⁶ Interview data.

⁵⁷ Monro (2014): 267.

⁵⁸ For a visual appreciation of flipping see

<https://www.youtube.com/watch?v=pQxKkm024fo&feature=youtu.be>

lagoon/wetland).⁵⁹ Further stress has arisen from the uncertainty associated with farmers' representatives being excluded from the group managing the lagoon. There have also been positive effects for farmers however. The subsequent formation of Waituna Farmers United (WFU) gave farmers a focus for development of their land (e.g. riparian planting of native plants), and the networking of the WFU strengthened relationships in the farming community.

2.10 Key issues for social assessment of nutrient scenarios

There are a number of current issues identified for the people and communities in the Waituna Catchment that may be significant to the process of community catchment planning, and the management of social change from any planning outcomes. These issues were considered as part of the social assessment of scenarios:

- impacts of new/changing planning rules on the everyday life of farmers (including the flow-on effects of stress and reduced social wellbeing) [e.g. new requirements for dairy farms.]
- impacts of changing landscapes/agricultural practices (including drainage, irrigation, land-use change)
- shift from family to corporate farms and the increasing use of migrant labour and need to accommodate newcomers
- sustainability of population growth and school rolls, including a churn factor from turnover of agricultural workers
- impacts of changing communities (including new migrants of diverse ethnicity, school rolls, social cohesion, resilience etc.)
- changes in social capital with the intensification of agriculture and longer working hours etc., including levels of participation in community organisations and voluntary and sporting activities
- effects on stream and drain flow levels, lagoon ecosystems and recreational opportunities
- less/more diversified district economy, agricultural support services, primary processing facilities (milk, seeds, crops)
- traffic volumes safety, and maintenance on rural roads
- value conflicts between resident farmers and new arrivals from other parts of New Zealand or from overseas
- impacts of changing water quality (for drinking-water, recreation, stock water, ecosystem health and biodiversity, cultural values, etc).

⁵⁹ For example from the accumulative effects of land development and drainage in the 1950s and 1960s that occurred several decades before the large-scale dairy conversions of the 1990s.

3 Waituna assessment by scenario

Three economic scenarios were developed by DairyNZ and are assessed here in broad terms for their social impact. This assessment builds on the social profile prepared for Waituna catchment.

3.1 The scenarios

The scenarios are based on achieving a level of nitrogen (N) reduction in the catchment with expected benefits in terms of environmental outcomes rising with each higher level of reduction. The levels considered were a 10 percent reduction, 25 percent reduction and 35 percent or greater (up to 50%) reduction.

Assumptions about land use and management systems for achieving these reductions are as follows:

- 1) The assessment is based on current land uses. There is no underlying trend assumed of ongoing conversions in the scenarios.
- 2) The scenarios assume that cows will be wintered in catchment, although, as discussed below, the effect of the scenarios on farm systems may require a reconsideration of this strategy and some farmers already winter cows elsewhere.
- 2) Changes in FTEs reflect the direct relationship between stock counts (herd size) in order to reduce nutrient outputs. The FTEs do not reflect any adoption of advanced mitigation practices (noting that some of these could be more labour intensive than current practices).
- 3) Sudden changes in effects on FTEs and farm profitability in the scenarios are explained by a reduction in cropping land (25%) and stock numbers (35%).
- 4) Calculations of total FTEs per land use type were based on Farmax assumed FTEs per stock unit ratios. Differences between full dairy support operations and dairy support as part of sheep and beef operations were not examined.
- 5) There are 24 dairy support and 24 sheep and beef units, which are separate farm operations.
- 6) There was no assumption that dairy stock would be wintered outside the catchment to achieve N reductions.

The scenarios have the following projected impacts on profitability (base operating profit) and on-farm workforce (FTEs) as indicated in Tables 3 and 4.

Table 3: Catchment impacts on farm profitability (excludes tax, debt servicing etc.)

Cluster approach all farms

Farm Type	Base operating profit (\$/yr)	Estimated % reduction per scenario			
		N -10%	N -25%	N -35%	N -50%
Dairy	\$20,560,174	3%	9%	18%	34%
Dairy S	\$2,703,545	3%	46%	98%	100%
Sheep & Beef	\$2,081,143	5%	9%	100%	100%
Whole catchment	\$25,344,862	3%	13%	34%	46%

Table 4: Catchment impacts on FTE

Cluster approach all farms					
Farm Type	Base FTE	Estimated % reduction in FTE per scenario			
		N -10%	N -25%	N -35%	N -50%
Dairy	225	3%	8%	11%	12%
Dairy S	20	1%	7%	50%	100%
Sheep & Beef	23	1%	3%	1%	100%
Whole catchment	268	2%	8%	13%	26%

Source: Confidential, preliminary economic analysis from Dairy New Zealand.

The overall effect on farms will depend on the relative state of the economy during the various commodity price cycles for milk products, wool, lamb and beef, fertilizer, fuel and interest rate adjustments.

3.2 Assessment framework (on farm and regional)

Our comparative case data on the social impacts of an increase in dairy farming activity and conversion of farms from sheep and beef, arable and mixed cropping to dairy was originally based on experiences with irrigation developments during the 1990s.⁶⁰ However, further experience has shown there are numerous influences which require the modification of the original model of land-use change.

The original model focused on generational change in farming, either by sale of a property or farm succession, which resulted in a major shift in land use such as dairy conversion and consequent social changes. Yet, as the Opuha case in South Canterbury indicates, conversion to dairying can take place during the first five years after irrigation is introduced to an area.⁶¹ While in Hinds (Mid Canterbury) the change to dairy seems to have been gradual at the start – the RDR has been there a long time – then other factors came into play to cause accelerated change.⁶² Subsequent to applying the model to irrigation development, the authors have reconceptualised it to understand better the implications for various scenarios of changes in land uses and farming practices in response to nutrient limits, including catchments throughout Canterbury.

A large set of factors influence the current context for applying the model of land-use change to changes in farming practices for irrigated areas such as Canterbury and also to non-irrigated areas such as the Waituna catchment. The following are noted as important factors to consider:

- Commodity price cycles and the globalisation of the dairy industry; including the emerging strength of Fonterra as a global player, with extended periods of high milk prices (payouts) that have provided farm owners with greater certainty of higher returns to invested capital over time.
- The establishment of new and expanded processing plants in the lower South Island (as at Edendale, Darfield, Glenavy and recently proposed for Studholme) operated by Fonterra and other companies such as Synlait, including full or part ownership of the value chain by overseas companies with direct market linkages. This new processing capacity adds value by

⁶⁰ Ford (2002), McClintock et al. (2002), McCrostie Little, H. et al, (2001).

⁶¹ Harris, et al. (2006).

⁶² Rawlinson (2011), Taylor et al., (2014).

providing sophisticated products, such as baby formula, to emerging markets in Asia and established markets in other continents.

- The increased scale of dairy farming (herd size), intensification of primary production (cows per ha), and a trend to more diverse forms of ownership (e.g. equity partnerships and corporate ownership), with integrated operations involving milking herds, wintering of cows and feed production in different farm units.
- Dairy conversions are widely accepted in rural areas such as Southland as a means of generating wealth and facilitating farm retirement and succession by enhancing the value of rural land.
- Reduced negative views of rural residents about the social status of dairy farming.
- Immigrant workers are widely employed and accepted by dairy farmers as a way to reduce reliance on the labour of the farm family and local labour market, and increase the supply of affordable labour for expanding production.⁶³
- Introduction of a wide range of new technologies to increase production and enhance farm sustainability (including significant new irrigation systems with centre pivots), and farm system changes such as the indoor housing of cows and all-year round milking.
- The regulatory framework has become stricter in response to increased public awareness of environmental issues and scientific evidence of the effects of farming in sensitive landscapes (particularly nutrient loss into waterways).
- The requirements of nutrient management under the NPS on Freshwater are changing farmer attitudes and practices with an evident shift to good management practices in the use of irrigation water and the application of effluent and other nutrients; and some further movement towards advanced farm mitigation.
- Increased research and technology transfer by DairyNZ, Fonterra, Crown Research Institutes and universities including around best and advanced farm mitigation measures.
- The scarcity of water resources and frequent drought events in eastern parts of New Zealand that intensify competition for uses of ground and surface water and have placed focus on finding better water sources and storage options.
- Politicisation of local, regional and national debates about water and related environmental issues, with increasing public concern about the effects of increased dairy farming and the intensification of land uses.
- Central Government support for water storage and irrigation scheme development (i.e. the Ministry of Primary Industry's Irrigation Acceleration Fund).
- The emergence of a significant number of localised irrigator collectives in the form of companies charged with governing water use among shareholders (under a single resource consent, for example).
- Increased diversification of the rural economy in general, for instance through rural tourism, and a high level of rural entrepreneurship and openness to new ideas such as the operation of multiple enterprises on farms.

It is evident that irrigation is only a major driver for land-use change for dairying, cropping or horticulture in areas where a shortage of water (e.g. Wairarapa, Central Hawkes Bay, Central Canterbury) prevents these new or expanded land uses from being economically and environmentally sustainable. In areas where water is more readily available, such as Southland, other factors such as global commodity prices and the price of land are the major drivers of change. Even in areas where irrigation is the major driver of change the rate of land use change depends on commodity prices, technological innovation, availability of suitable labour at the time of farm conversion, and increasingly on the ability of farms to accommodate new environmental rules.

⁶³ Rawlinson et al. (no date).

3.3 Assessment framework: environmental impacts beyond the farm gate

Outdoor recreation activity in any area is affected by environmental changes arising from local land-use change. Experience with land-use change in New Zealand suggests there are **two** potential sources of social effects in respect to recreation.

The first can result from the intensification of land use in an area (irrigated and non-irrigated) and any associated changes to public access and/or altering of the ecological status of streams, rivers, lakes and lagoons, and their riparian zones. Of particular concern for social science is any decline (or increase) of water quantity and quality in the water bodies of a catchment. A negative social impact would result, for instance, if there is an increase in public notifications that contact recreation standards are exceeded at popular recreation spots, with temporary restrictions being imposed to protect public health. Such restrictions can be triggered by high levels of faecal bacteria or cyanobacteria meaning humans and animals should avoid using the water for swimming, wading, paddling, taking fish or mahinga kai, or any other contact recreation pursuits. Conversely, positive social impacts can arise if there is any improvement in water quantity, quality or ecological status.

The second set of social impacts can result from new recreational opportunities created by the establishment of new infrastructure in the form of wetlands, ponds or reservoirs, or from stream (or aquifer) augmentation during periods of low stream flow.

These impacts (beyond the farm gate) are very important to consider because outdoor recreation is part of a healthy lifestyle for many New Zealanders, providing opportunities for physical exercise and associated health benefits, rest, enjoyment of nature and escape from daily routine. It also contributes to community cohesion through social interaction. In particular, outdoor recreation activity in freshwater environs, including rivers, lakes, streams and lagoons, is very high value and of considerable cultural significance.⁶⁴

Effects on recreation activity will derive from the ecological status of the Waituna Lagoon and the catchment streams. Ecological guidelines for the lagoon were established to ensure there is high coverage of macrophytes (*Ruppia* spp) and to reduce the likelihood of reaching a “tipping point” towards an “algal-dominated” state. Improvement of the current unstable ecological state will require a mix of two key management measures: better timing of lagoon openings and a reduction in catchment nutrient loads, with a primary focus on nitrogen (N) and phosphorous (P) loads.⁶⁵

3.4 Assessment approach

In the process of assessing social effects it is important to consider how one type of effect flows into others. In some instances the first order of effect obviously has social consequences, such as the flow on from the “economic” effect of employment in a rural area to the area’s population, social services such as local schools, and on to community cohesion. Sometimes less obvious, but still important, are social effects that flow on from a physical effect such as nitrogen or silt in a waterway, to ecological status, to the presence of fish such as whitebait or trout, and therefore to the ability of a stream to sustain recreation activity.

The assessment requires criteria against which the scenarios can be assessed. These criteria were developed from the above model and:

- i) our understanding of the Waituna catchment as described in the catchment social profile (see section 2) and

⁶⁴ Ministry for the Environment (2004), a report that classifies Waituna Lagoon as one of 107 water bodies of national importance for its recreation values.

⁶⁵ Waituna Lagoon Technical Group (2013).

- ii) our experience of catchment planning in Canterbury.⁶⁶

The working list of criteria (below) can be refined as the catchment assessment process unfolds in response to community input and other technical analysis:

- farm type and land-use
- the size and composition of the farm workforce
- the size and composition of the population
- social services and school rolls
- social cohesion and community life
- farm technology and sustainability practices
- farm values and sales
- psychological status of farm households (e.g. responses to stress)
- diversification of local economy and off-farm employment
- outdoor recreation

4 Projected effects of the scenarios

4.1 Effects on farm type and land use

In assessing the scenarios for nutrient reduction, a major factor behind social impacts will be changes in land use, farm type, and farm ownership. Analysis of the social impacts of new dairy farming and dairy support on rural areas (the model discussed above) suggests that the effects of any reduction in dairy farming activity in the catchment will have immediate social impacts.

Potential reduction of nitrogen loads in the Catchment can be achieved by a mix of farm mitigation measures and strategies, including reductions of herd size throughout the catchment and a decline in area under dairy or dairy support. The most important factor in the changes shown in Tables 1 and 2 is a reduction in herd size not a decline in the area used for dairying. The reduction in herd size will have an impact on both farm profitability and the number of people employed on farm.⁶⁷

An important indication from this set of nutrient reduction scenarios is that the area in sheep and beef farming appears to reduce significantly above a N-35% threshold, suggesting that for this level of reduction to be achieved some land will have to be taken out of production; with a comprehensive fall in profitability and employment. As a result, a number of changes are possible: some land could revert to conservation land under a land-retirement programme and be converted to wetland; some land could change to other, less intensive uses such as low density deer farming;⁶⁸ and, perversely, some land might be converted into dairy farming by acquisition of sections of land⁶⁹ or by new conversions, unless there are rules in place to prevent this happening.

In addition, opportunities for further land development, conversions to dairying, and further increases of herd size, would be lost under the higher end of the scenarios.

⁶⁶ Including assessments in the Hurunui, Selwyn/Waihora, Hinds, Southern Coastal Streams and Waitaki catchments.

⁶⁷ Typically a decision based on the number of cows milked.

⁶⁸ Whereas low-intensive small holdings are an alternative, low-intensity land use in parts of the South Island this is not a likely trend for Waituna Catchment.

⁶⁹ Increasing size of dairy farm units is an underlying trend in the sector.

4.2 Effects on the size and composition of the farm workforce

An indication of the potential loss of employment (expressed as FTEs) with the nutrient-reduction scenarios is provided in Table 4 (page 17). The table indicates potential loss of employment ranging from just 5 FTE across the Catchment at N-10% to a loss of 70 FTE for the N-50% scenario. Of further interest is that the effect of the nutrient reductions on land uses means that between the N-35% and N-50% reduction scenarios the number of FTE in sheep and beef farming falls to zero. As discussed above, there may then be some compensatory increase in employment if any additional **area** is converted to dairy farming given that any reductions previously considered are based only on the number of cows.

4.3 Effects on the size and composition of the population

Effects on the size of the farm workforce will flow into effects on the size of the population in the catchment. The analysis by DairyNZ indicates that this effect is relatively small at the lower end scenarios of N reduction (N-10% to N-25%) with up to 20 fewer FTEs. But the impact could increase to 35-70 FTE for the higher end scenarios (N-35% plus).

It should be noted that to allow for part-time work, one FTE is generally considered to equate to 1.5 working people. An estimate of the total population impact is found by applying a multiplier to these working people to allow for non-working partners and children. Based on a 2013 working population of 396 and a total usual resident population of 708 a multiplier of 2⁷⁰ can be used to calculate the change of population in the catchment due to the expected loss of employment under all four scenarios. This calculation suggests that the usual resident population of the Catchment would fall by 16 people for N-10%, 43 for N-25%, 70 for N-35% and 140 for N-50%. Thus the latter two scenarios would result in an overall decline of 10 to 20 per cent of the Catchment's population in 2013.

Furthermore, changes to the composition of the population are likely. As most of the worker loss is likely occur in the dairy sector, which tends to employ younger workers (who frequently have children of school age) than sheep and beef farming, any reversion of land-use, including shifting land-use into conservation, will cause a decline in school-aged population and an increase in the number of older workers.

The ethnic composition is only likely to change should there be a strong shift out of dairy and/or sheep-beef to dairying. Migrant workers are likely to be retained on existing dairy farms as for many operators they have become a preferred option. They could be expected to retain their representation in the Catchment's workforce under the N-10% and N-25% scenarios, but then as more stringent reductions are enforced ethnic networks may alert migrant workers to better job opportunities in Southland or other regions of New Zealand.

4.4 Effects on social services

Any decline in population arising from the N-25% and higher reduction scenarios will have significant effects on the rolls of the Gorge Road and Rimu Schools. Their rolls are likely to decrease further, and have a negative impact on staffing levels and funding. The effect on the roll of Tisbury School, however, is likely to be less significant than the other two schools because some of its pupils are drawn from the city of Invercargill and environs. The expected declines in population are unlikely to affect residents' access to medical and other health services which are based in Invercargill.

⁷⁰ $708 \text{ URP} \div 351 (306 + 45) \text{ FTE} = 2.02$. Based on FTE calculation as used by Statistics NZ i.e. Residents employed FT + 0.5 Residents employed PT.

4.5 Effects on social cohesion and community life

There would also be consequences for social cohesion should the role of the schools as sources of community focus become weakened by the loss of voluntary leadership and labour as residents leave the Catchment. Conversely social cohesion amongst farmers and other residents of the Catchment could be strengthened by a collaborative approach to nitrogen reduction. Such a positive outcome would depend on the targeted reductions being implemented gradually, and set at levels that are both economically and environmentally sustainable, with solid local backing for farmer-led initiatives.

4.6 Effects on farm technology and sustainability practices

Advanced mitigation and management practices required to reduce nitrogen levels will increase demand by farm owners, share milkers, managers and their employees for new skills and participation in learning activities such as on-farm trials, field days, advisory services, and for web-site access to information and decision support services. The adoption rate for “best practice” dairy farming will need to change rapidly, and organisations such as Environment Southland, Venture Southland, Federated Farmers, fertiliser companies, DairyNZ and Fonterra will need to provide strong leadership and technical support. While the introduction of these new practices will enhance environmental sustainability, their cost could reduce the profitability of any dairy support and sheep and beef farms that are already struggling to survive with a high debt/equity ratio.

4.7 Effects on farm values and sales

It can be assumed that under all scenarios the impact of reducing dairy herd size (reduced profitability), and potentially removing some farming activity, will have the reverse effect to the conversion effect on demand and land values, whereby land and buildings on dairy farms are typically more than double the value of sheep and beef farms in the same area.⁷¹ In this case the destocking of dairy farms and conservation methods to reduce the nitrogen levels leached to streams and the lagoon is likely to reduce the profitability of farms thereby reducing the value of agricultural land in the catchment. Furthermore, interviews indicated that the threat of major nutrient limits has already had a depressing effect on land values.

4.8 Effects on local employment and economic diversification

Reduced on-farm economic activity and employment under all the scenarios will have flow-on effects for income and employment in the non-farm sectors of the Catchment; including, agricultural and fencing contractors, excavating firms, a transport operators and food outlets; which employ a number of residents. However, most farm expenditure is outside the Catchment and any effect of reduced on-farm activity on the much larger Invercargill economy will be very minor.

A stronger positive focus on the conservation and recreation values of the Waituna Lagoon could enhance visitor activity as discussed below. Any such activity would have a small flow-on effect into local retail activity. There is some potential for small accommodation or tour businesses based on the lagoon and these would benefit and help to diversify the local economy.

⁷¹ A study of the impacts of conversion to dairy farming in Taupo found the following variation in values <http://maxa.maf.govt.nz/mafnet/rural-nz/profitability-and-economics/trends/dairy-conversions/dairyco1.htm>

	Sheep & Beef (\$/ha)	Dairy (\$/ha)	Variance (\$/ha)
Land	3,844	8,931	5,087
Buildings	1,080	2,541	1,461
Total	4,924	11,472	6,548

The strongest base for the local economy remains, however, a mix of dairy and sheep and beef production, as these provide resilience in the face of different commodity cycles and strong household incomes, and expenditure.⁷²

4.9 Effects on psychological status of farm households

The scenarios are likely to see an increase in uncertainty and increase in the stress levels of farmers and farm families. This trend is evident in North Island research, for example. It can be anticipated that stress will be particularly evident in any highly leveraged farms.⁷³

The financial pressure from increased costs of production and the demands of advanced farm management practices and investments to reduce nutrient loads are likely to place pressure on farmers and farm families to cope psychologically,⁷⁴ with an increased demand for mental health services and support programmes. This level of pressure on farmers could create demands for support services as experienced in the late 1980s when the Rural Support Trust was formed.⁷⁵ The stress will also have flow-on effects for people providing farm advice such as nutrient models and budgets, and to the finance sector including rural supply firms and banks. Schools and health services could also experience effects of these higher levels of stress on pupils and clients respectively.

5 Effects on conservation values and outdoor recreation

5.1 Defining a water quality narrative for the scenarios

Effects on recreation and conservation values will follow from reduction in nitrogen and other nutrients, siltation and subsequent changes to the ecological status of the streams and lagoon. Furthermore, the water quality and ecological state of Waituna Lagoon is highly dependent on whether it is closed or open to the sea, and which attribute is being examined.

Lagoon water levels have been artificially managed since 1908. Management was initially carried out to enhance recreational fishing, and more recently to manage high water levels and associated impacts on surface and sub-surface drainage of agricultural land in the lower catchment. Openings also have a positive impact on lagoon water quality (reduce water column N and P concentration due to flushing and dilution) but, at certain times of the year, openings can have a negative impact on macrophyte (*Ruppia*) biomass. *Ruppia* is considered a key indicator of overall lagoon ecosystem health and total *Ruppia* biomass and cover has declined significantly over recent years for which monitoring data is available. While *Ruppia* has a high tolerance to salinity, one of the two species present in the lagoon requires a spring-summer freshwater environment to ensure germination. Any “solution” to the problems in the lagoon therefore need to take into consideration catchment nutrient management plus lagoon water level management, with the final management regime depending on which values are most desired.

⁷² Pomeroy and Newell (2011).

⁷³ The Governor of the Reserve Bank, Dr Graeme Wheeler (2014) reported that a small proportion of dairy farms (10%) hold a high proportion of \$32 billion of dairy farm debt nationally.
http://www.rbnz.govt.nz/research_and_publications/speeches/2014/5721595.html

⁷⁴ See, for example Botha and White (2012).

⁷⁵ The Southland Rural Support Trust still assists “rural individuals and their families to get back on their feet following challenging circumstances such as financial, personal or climatic adverse events.” The Trust is part of a national network that is linked into other local rural networks.

A water quality modelling study by Waikato University⁷⁶ estimated the likely impact of various catchment nutrient reduction scenarios on lagoon water quality (concentration) and *Ruppia* health (biomass). The results of the study provide estimates of the likely water quality outcomes associated scenario and these estimates are applied in this social assessment. Given the complexities and importance of lagoon opening, a combination of catchment load and hydrological scenarios were looked at (Table 3).

Model predictions of mean annual N, P and Chl-a concentrations for six scenarios from Hamilton et al. (2012) were compared to the numerical and narrative attribute states for lake ecosystem health described in the NOF (2014). As ICOLS are currently excluded from NOF, the NOF lake guidelines were applied. Modelled mean annual *Ruppia* biomass for the same scenarios were compared to average and minimum values assumed to be associated with abundant and stable *Ruppia* populations.⁷⁷

The model predictions indicate that different scenarios of nutrient reduction verses the current state will have different social impacts depending on particular sets of social values, with values relating to recreational activity, including food harvesting and mahinga kai,⁷⁸ the main focus of this section of the assessment.

In general, the assessment found that an improvement in water quality and ecological values will improve recreational values. However, it is also evident that due to the complex set of interactions around the timing of lagoon openings not all expectations of all sets of values are likely to be met. For example, timing of the lagoon opening in late spring and summer would most likely enhance numbers of sea-run trout, whitebait and flounder, and wading birds, all important for recreational activity (i.e., fishing, mahinga kai, bird watching and nature viewing). Whereas, this time for opening the Lagoon is not the maximum option for maintaining the *Ruppia* beds it is good for flushing and dilution of nutrients. Runs of sea-run trout, or potentially trout moving in and out of the lagoon on a regular basis to feed, will almost certainly increase the number and size of the sport fishery in the lagoon and also the lower reaches of streams running into the lagoon. This improved fishery will appeal to local, national and international visitors.

⁷⁶ Hamilton et al. (2012).

⁷⁷ As defined in Hamilton et al. (2012).

⁷⁸ Food harvesting for non-Maori covers similar species to Maori, such as whitebait and flounder, but also non-native species such as sea-run trout. Mahinga kai represents a broader range of species for harvest and also the cultural values around the processes of collecting, preparing, sharing and consuming food in a sustainable manner.

Table 5 Estimated water quality narrative for each load reduction scenario Waituna Lagoon

Hydrological regime	Scenario (from Hamilton et. al. 2012)	Corresponding NOF Attribute state ⁷⁹			Corresponding NOF ecosystems health narrative state ⁸⁰	Ecosystem health based on <i>Ruppia</i> state ⁸¹
		TN	TP	Chl-a		
Natural opening regime	Current situation	D	C	B	Lake ecological communities are at a high risk of a regime shift to a persistent, degraded state, due to impacts of elevated nutrients leading to excessive algal and/or plant growth, as well as from losing oxygen in bottom waters of deep lakes	Low abundance and unstable population
	N&P -10%	C	C	B	Lake ecological communities are moderately impacted by additional algal and plant growth arising from nutrient levels that are elevated above natural reference conditions	Low abundance and unstable population
	N&P -25%	C	C	B	Lake ecological communities are moderately impacted by additional algal and plant growth arising from nutrient levels that are elevated above natural reference conditions	Low abundance and unstable population
	N&P -50%	B	C	B	Lake ecological communities are moderately impacted by additional algal and plant growth arising from nutrient levels that are elevated above natural reference conditions	Abundant and stable population
	N -50%, P -25%	B	C	B	Lake ecological communities are moderately impacted by additional algal and plant growth arising from nutrient levels that are elevated above natural reference conditions	Abundant and stable population
3-month winter opening, closed summer	N&P -50%	B	B	B	Lake ecological communities are slightly impacted by additional algal and plant growth arising from nutrient levels that are elevated above natural reference conditions	Abundant and stable population
	N -50%, P -25%	B	C	B	Lake ecological communities are moderately impacted by additional algal and plant growth arising from nutrient levels that are elevated above natural reference conditions	Abundant and stable population

⁷⁹ Model output reflects annual mean, NOF reflects annual median.

⁸⁰ Based on minimum attribute state of TN, TP and Chl-a state, TN reflects polymictic lakes.

⁸¹ Abundant and stable *Ruppia* biomass based on Hamilton et al. 2014 (mean > 30 g C/m² and min > 20 gC/m²)

The scenario of maintaining the current state, with a high risk of the lagoon shifting to a persistent, degraded state, represents the worst possible outcomes for recreational values. There is a high risk of algal blooms, including noxious or toxic (to humans and pets) blooms such as *Cyanobacteria*. These outcomes will have manifest effects on recreation and visitor activity such as negative press coverage and warning signs about risks to health at lagoon access points. There are likely to be more frequent, observable and undesirable visual effects such as lack of clarity and obvious scums. Some casual visitors will remain unaware of the ecological status and will still visit for the generally wild environment and attractions such as the installed board walk.

The outcomes of nutrient reductions in the range 10 to 25 per cent do not represent significant improvements to lagoon ecological status, although the risk of major instability (“flipping”) is reduced. The outcomes from a 25 to 50 per cent reduction in nutrients, however, provide a stronger positive result for the lagoon’s ecological communities and therefore outcomes for recreation.

If the scenarios were to result in a definite shift away from an ecological “tipping” point, this could result in a major gain for public perception of the lagoon system and its values. A positive perception is likely to flow into visitor numbers and potentially the range of activities undertaken; especially those that do not involve contact recreation (such as photography, walking, picnicking and nature viewing). Furthermore, there would be a positive “story” about catchment management and ecological status to tell visitors through visitor information and pamphlets, information sheets or interpretation panels at the lagoon, potentially drawing in day visitors from Invercargill and people traveling the Southern Scenic Route through the Catlins. In addition, it is likely that specialist recreation magazines and websites, such as “Fish and Game” and “fishing.net.nz”, would report the evidence of positive change, raising the profile of the area among user groups as a site for recreation.

6 Management of social change

Major reductions in nutrients are only likely to be achieved through significant effects on farm productivity, employment and farmer wellbeing as discussed above. Some of the reduced employment will simply mean people leaving the Waituna area to work and live elsewhere. The process of change will therefore need to be managed carefully, with suitable support provided to farmers and farm families.

Support to the farmers, farm families and other residents who remain in the catchment will require careful management and monitoring of the social effects of implementing the reduction of nitrogen levels. They should include measures to enable individuals and communities to cope with financial and other stress, manage recreation activities, communicate effectively, and monitor social issues as they occur.⁸²

6.1 Framework for managing change

Coping with financial and other stress

In addition to managing farm management and technical changes, it is important to establish a programme to assist farmers and communities to adjust to the associated financial challenges and stress. A variety of measures may need to be tested such as:

- Land purchase or financial compensation (e.g. for wetland restoration).
- Assistance with financial management of new technologies.
- Subsidies for activities such as riparian planting, wetland enhancement or fencing.

⁸² These measure which are described in detail below have been revised and adapted from Taylor, N., McClintock, W., Mackay, M. and Goodwin, M. (2014).

Recreation management

It will be important to develop and implement an action plan for enhanced water based recreational activities in the lagoon and streams to maximise the expected benefits from improvements in biodiversity and water quality, consistent with the Lagoon's international status:

- By setting up a working group of representatives of recreational organisations, the Department of Conservation, conservation groups, local government and other stakeholders, to develop the action plan and monitor its implementation.
- By considering the enhancement of recreation and tourism facilities such as board walks and access ways, visitor interpretation, viewpoints, parking and picnic areas, walking and cycling trails, when designing all riparian restoration and flood management.
- By enhancing access to and the use of the lagoon and streams.
- By promoting visitor attractions and related businesses in and around the catchment by highlighting unique ecological values and their enhancement through the action plan.

Communications

Effective communication and ongoing farmer and community participation will assist with the management of change and achieve positive social outcomes. To this end a comprehensive communications policy would support the solutions package, building on the current communications strategies of DairyNZ and Environment Southland:

- By regularly updating information on Environment Southland's Waituna Lagoon website and via regular newsletters to farmers and other ratepayers.
- By developing audio-visual material for community displays at events such as A&P shows and farmer and community field days.
- By continuing regular meetings with affected parties (e.g. newcomers from overseas, farmers, conservation organisations).

6.2 Monitoring

Any mitigation or enhancement strategy requires a social monitoring programme, and the above assessment criteria could be used as an organising framework for such a programme.

The best approach would be to establish a monitoring committee comprised of representatives of DairyNZ, Environment Southland and Venture Southland to identify any social issues as they arise and recommend any specific mitigation and enhancement measures to the appropriate organisation(s), either regarding the implementation of change or the management of its impacts.

6.3 Further research

Further social research could include:

- ongoing analysis of future iterations of the nutrient reduction scenarios and a response to any emerging findings and refinements to the ecological and economic analyses.
- updating of the social profile (baseline).
- involvement of the social assessment team in future community workshops and collaborative dialogue, providing a social perspective to the formation of community solutions and insights from associated discussions with community members.
- analysis of additional catchments in Southland, in order to extend the social science knowledge base of the social impacts of dairy farming in Southland in comparison to other regions, particularly those where dairy farming requires irrigation.

7 Summary and Conclusions

7.1 Summary

The Waituna Lagoon in Southland sits at the bottom of a small catchment that has a mix of dairy, dairy support and sheep and beef farming as its major economic activities. The lagoon is part of an internationally recognised wetland system. It is important for its Maori cultural, recreational and conservation values. However, the lagoon has a declining ecological status as a result of nutrient inflows and sediment. A related issue is the timing of lagoon openings, used to manage drainage on surrounding farm lands. The ecological issues for the lagoon have received considerable public exposure, with concern expressed about the possibility of the Lagoon “flipping”, or moving to a highly eutrophied state that will be difficult to recover from. Farming, and in particular dairy farming, is widely blamed for causing this problem.

As a result, farmers in the Catchment have been proactive in working with Environment Southland and other agencies and organisations to find solutions to the lagoon issues. Like other regional Councils, Environment Southland is directed by the National Policy Statement on Freshwater Management to establish nutrient limits on waterways and to avoid any further deterioration of its waterways. DairyNZ is assisting farmers in their response with technical analysis and support, including ecological and economic analysis. This social assessment was commissioned as part of their work with the intention of developing an integrated, interdisciplinary approach.

The assessment has developed a social profile or baseline for the catchment, focusing in particular on changes over the last 12 years. The profile found that conversion of farms to dairy and dairy support over the last 25 years has brought significant growth in population in the Catchment compared to the rest of Southland. School rolls provide an indicator of population trends and social vitality at the community level. There are three primary schools located within or adjacent to the Waituna Catchment – and of these schools only one has experienced a significant decline, whereas across the region there has been a significant decline. Furthermore, the population in the Catchment has developed considerable dynamism and diversity, with newcomers including migrant workers from overseas, and a regular turnover of dairy farm workers.

In assessing the scenarios for nutrient reduction from a social perspective, a major factor behind social impacts will be any changes in employment. The counterfactual interpretation of a comparative model based on the social impacts of **new** dairy farming and dairy support on rural areas suggests that the effects of any reduction in dairy farming activity in the catchment will have immediate negative social impacts. The scenario analysis undertaken by DairyNZ suggests that reduction of nitrogen loads in the catchment could be achieved by a mix of farm mitigation measures and strategies, including reductions of herd size throughout the catchment versus a reduction in the area used for dairying. The reduction in dairy herd size impacts directly on farm profitability and the number of people employed on farms. In addition, at higher levels of N reduction (N-35%) it appears that the area in sheep and beef farming would reduce significantly, suggesting some land will have to be taken out of production, with a significant fall in profitability and employment in that sector. In addition, opportunities for further land development, such as further conversions to dairying, and further increases of herd size, would be lost under the higher end of the scenarios, affecting the plans of farmers for retirement and succession.

The assessment concludes that at the lower levels of N reduction the social changes would be relatively minor and indeed the efforts at farmer-led and community based initiatives are likely to be positive from the perspective of enhanced community cohesion. However, when the scenarios move to levels of at least one third reduction of nutrients (N-35% plus), which may be necessary to reverse ecological degradation, the net social impacts are likely to be significantly negative, with

considerable stress on farmers and farm families, and reductions in the social and economic wellbeing of people and communities. All levels of social change would benefit from a programme of social change management and this would especially be the case at the higher levels of nutrient reduction.

Further research could include ongoing analysis of future iterations of the scenarios and a response to any emerging findings and refinement of the ecological and economic analyses. The social assessment would also benefit from involvement of the social assessment team in future community workshops and collaborative dialogue. The existing understanding of the social impacts of dairy farming in Southland would benefit from analysis of additional catchments in the region.

7.2 Principal Conclusions

Many changes in the Waituna community over recent years have been the consequence of rural restructuring and national social trends, and are not particularly related to variations in land uses, or different from other parts of rural New Zealand.

Conversion to dairy farming in the Catchment over 25 years has caused significant growth in population compared to other areas of Southland without dairy farming. Strong population growth has supported rural services such as schools.

There is no strong evidence of increasing use of the Waituna Lagoon/Awarua Wetland for water-based recreation. The exception is a small increase in angler days since the mid-1990s, as reported in Fish and Game's national angler survey. Local fishermen who have long term knowledge of Waituna Lagoon suggest that the overall quality of the recreational fishery/experience is enhanced when the lagoon is open to the sea.

There is evidence that the area is growing in popularity as a destination for a range of land-based activities, such as picnicking, walking, family outings, sightseeing and nature viewing. This has coincided with an increased recognition of the wetland system as a site of regional, national and international importance, and infrastructure developments which have enhanced the visitor experience, including a boardwalk, access and interpretation signage.

Any improvements in the ecological status of the lagoon, resulting from different farming practices, targeted lake openings and any restoration work, are likely to enhance recreational use and improve public perceptions of the ecological reserve. A recreation management plan will assist the capture of full benefits from reduced nutrient loads

Scenario analysis shows that high levels of nutrient reduction could have significant impacts on farm profitability and employment, with these impacts potentially flowing into social effects for individuals and the community. The following are the main social impacts assessed for the scenario analysis (emphasising at this point that the analysis is simply intended to assist the development of a package of measures for setting nutrient limits for farming systems):

- 1) Any reduction in dairy herd size will have an immediate impact on farm profitability and numbers employed on farm. The predicted loss of FTEs is up to 70 for the N-50% scenario.
- 2) In addition, opportunities for land development and further dairy conversions will be lost under the high-end scenarios.

- 3) Furthermore, there appears to be a threshold around 35% nutrient reduction where there is a significant impact on sheep and beef units, with a major drop in profitability and viability of some units.
- 4) Any reduction in farm capacity, increased costs and reduced profitability will have a potential impact on farm values and saleability, with consolidation likely for some land areas.
- 5) There will also be a negative impact on off-farm economic activity such as contracting, transport and farm services.
- 6) Any loss of employment will flow directly into the catchment population with a loss of 10-20 per cent of the catchment population likely for the higher-impact scenarios.
- 7) There could be a corresponding loss of younger workers and farm families affecting schools and other services in the area.
- 8) There will be further loss of social cohesion, community viability and social capital (already an underlying trend).
- 9) Countering this impact will be opportunities for leadership and social contact through the trial and adoption of advanced farm mitigation practices, local restoration initiatives, and participation in collaborative planning processes.
- 10) An improvement in water quality and lagoon ecological status should enhance recreational values and increase visitor numbers, dependent on a complex set of interactions around lagoon opening.
- 11) The proposed changes are already creating stress in the community, and the level of stress amongst farmers, farm families and the wider community is likely to increase and require support from agencies such as the Rural Trust and other support organisations.

Any efforts to change land uses and farming practices to improve water quality are likely to be a long-term challenge; one that will cause stress for individuals, families and the community itself. The changes associated with this challenge can be managed and monitored by measures which are described in section 6. Farmers need to be empowered as both key stakeholders and leaders in managing the catchment and lagoon, which can be an important outcome of a collaborative approach.

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Attachment 1 Map

