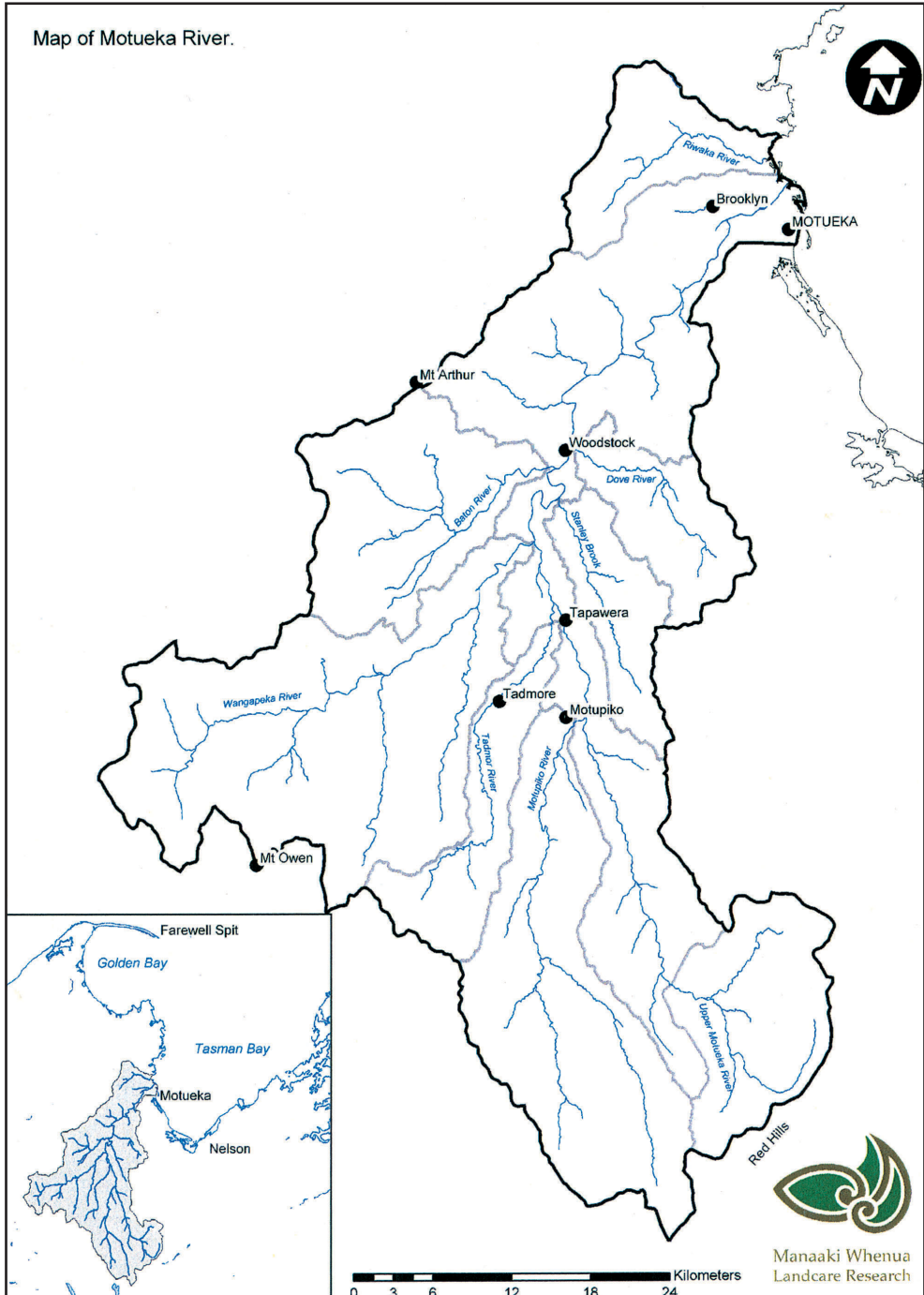


# Motueka River

## Map of River



## Table of Basic Data

<b>Name:</b> Motueka River		<b>Serial No. :</b> New Zealand-6
<b>Location:</b> Nelson Region, New Zealand	S 41° 05' ~ 41° 47'	E 172° 24' ~ 173° 08'
<b>Area:</b> 2,076 km <sup>2</sup>	<b>Length of main stream:</b> 116 km	
<b>Origin:</b> Red Hills, in SE of catchment	<b>Highest point:</b> Mt. Owen, 1,875 m	
<b>Outlet:</b> Tasman Bay	<b>Lowest point:</b> River mouth, 0 m	
<b>Main geological features:</b> Complex geology of: basement igneous, ultramafic and sedimentary rocks, young sedimentary rocks, clay-bound gravels and small, but hydrologically significant areas of younger alluvium.		
<b>Main tributaries:</b> Wangapeka, Motupiko, Baton, Upper Motueka, Tadmor, Dove, Stanley Brook.		
<b>Main lakes:</b> None		
<b>Main reservoirs:</b> None		
<b>Mean annual precipitation:</b> 1,600 mm		
<b>Mean annual runoff:</b> 844 mm		
<b>Population:</b> 12,000	<b>Main cities:</b> Motueka (7,000)	
<b>Land use:</b> Agriculture (pastoral, horticultural) and commercial forestry on lowland and hill areas. Protected Indigenous forests in the mountains.		

### 1. General Description

The Motueka River drains 2,076 km<sup>2</sup> of dominantly mountainous and hilly terrain located about 40 km west of the city of Nelson, South Island, New Zealand. The catchment elevation range is from sea level to 1,875 m. The river rises in the southeast of the catchment and flows north for about 116 km to Tasman Bay. The Motueka is joined by a series of small and medium-sized tributaries that drain hilly alluvial terrain to the east, and by a series of much larger tributaries originating in a complex assemblage of sedimentary and igneous rocks which form the mountainous terrain of the Arthur Range on the western boundary of the catchment.

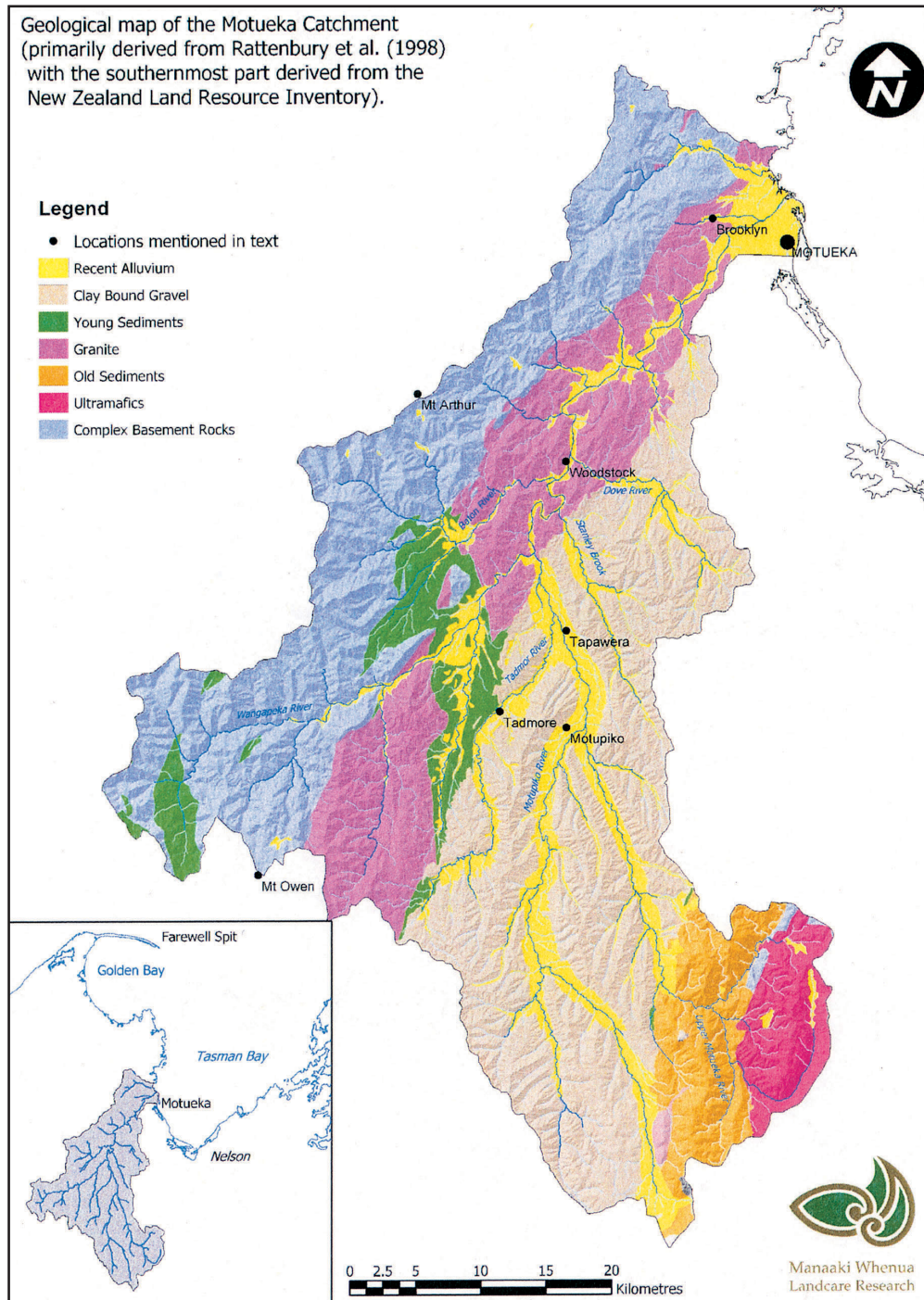
Rainfall is strongly seasonal. Catchment mean annual rainfall is around 1,600 mm. Average monthly maximum temperature (29°C) and average monthly maximum pan evaporation (180 mm) occurs in December and January, respectively. Frosts can occur between April and October and snow can fall during all months at higher elevations. Mean annual sunshine hours (2,407) are among the highest in New Zealand with mean monthly values ranging from 265 to 134 hours in January and June, respectively.

The Motueka River basin is geologically and pedologically very complex. The wide variety of rock types include, complex basement rocks, ultramafic and old sedimentary rocks, granites, young sedimentary rocks, clay-bound gravels and small, but hydrologically significant areas of recent alluvium. The characteristics of the wide variety of soils are closely related to geology, landform and climate.

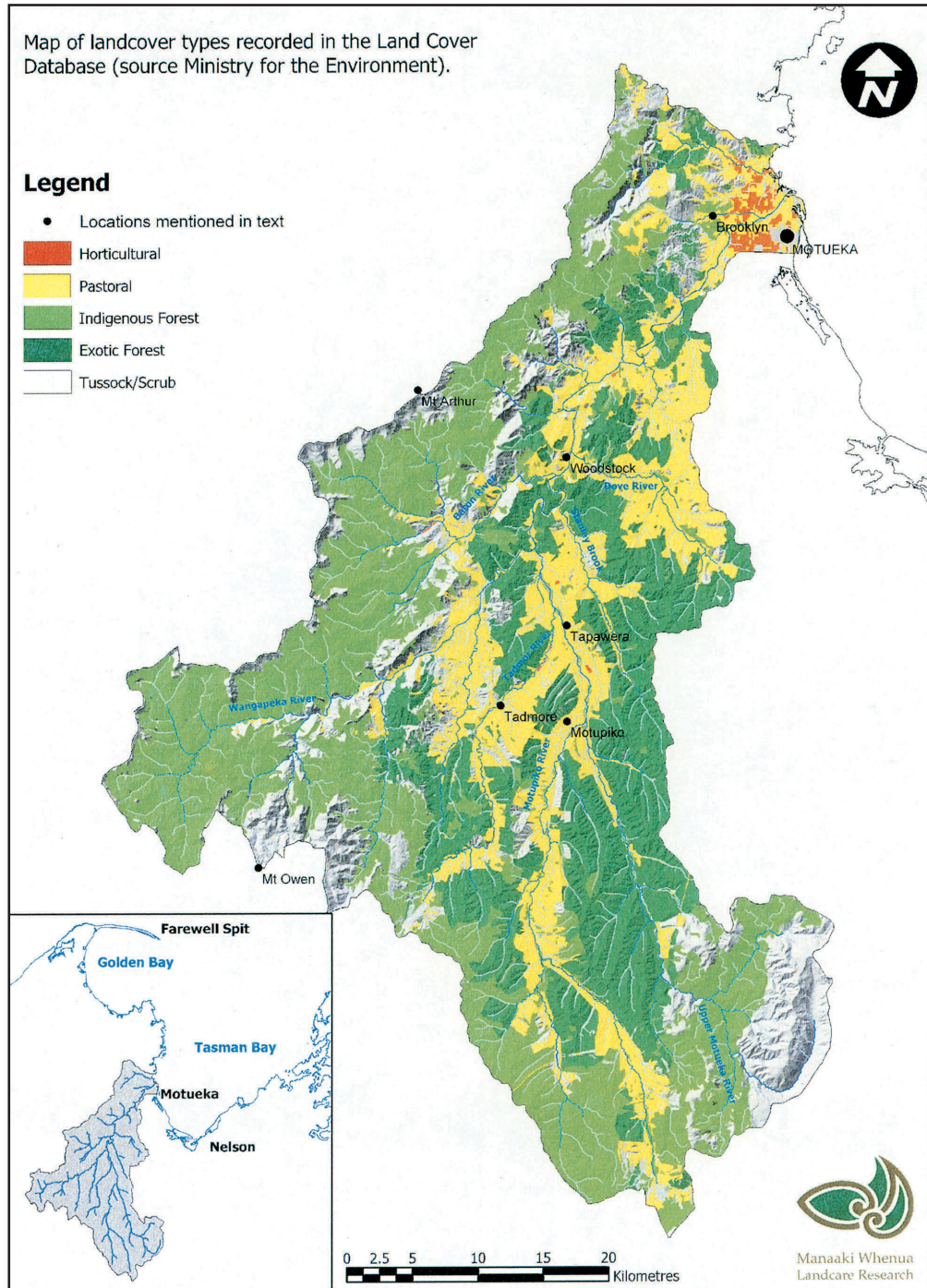
The Motueka Catchment is largely rural. The major productive land uses are commercial forestry (25%), sheep and beef farming (19%) and limited, but increasing dairying. Horticulture, mainly pip-fruit, berry-fruit, hops and market gardening, occupies a small, but expanding area, and is a major surface and groundwater user. The largest areas of indigenous forest are found in the Kahurangi National Park situated in the headwaters of the western tributaries, and in Mt. Richmond Forest Park, in the upper catchment.

## 2. Geographical Information

### 2.1 Geological Map



## 2.2 Land Use Map

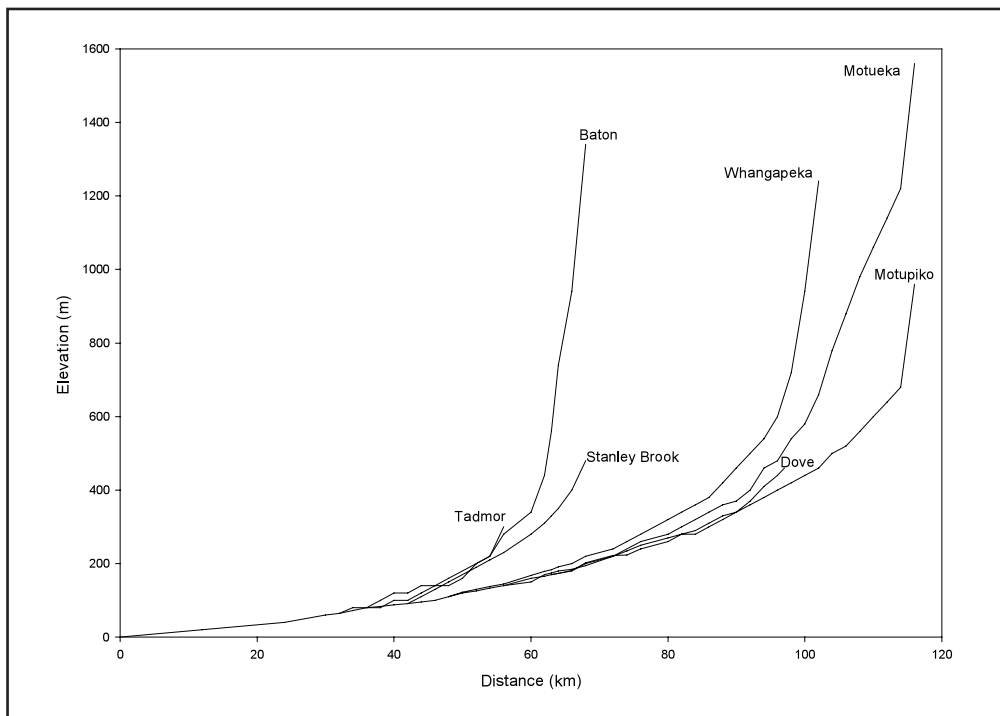


### 2.3 Characteristics of River and Main Tributaries

No.	Name of river	Length [km] Catchment area [km <sup>2</sup> ]	Highest peak [m] Lowest point [m]	Towns population (2001)	Land use [%] (2001)
1	<b>Motueka</b> (Main river)	116 2,076	1,875 0	Motueka 7,000	F 60 A 20
2	<b>Wangapeka</b> (Tributary)	41 483	1,875 130	None	F 80 A 10
3	<b>Motupiko</b> (Tributary)	50 344	1,540 180	None	F 85 A 10
4	<b>Baton</b> (Tributary)	28 212	1,810 90	None	F 90 A 5
5	<b>Upper Motueka</b> (Headwaters)	26 163	1,790 370	None	F 60 S 40
6	<b>Tadmor</b> (Tributary)	40 124	1,200 130	None	F 50 A 45
7	<b>Dove</b> (Tributary)	23 102	450 180	None	F 45 A 50
8	<b>Stanley Brook</b> (Tributary)	27 93	580 90	None	F 60 A 35

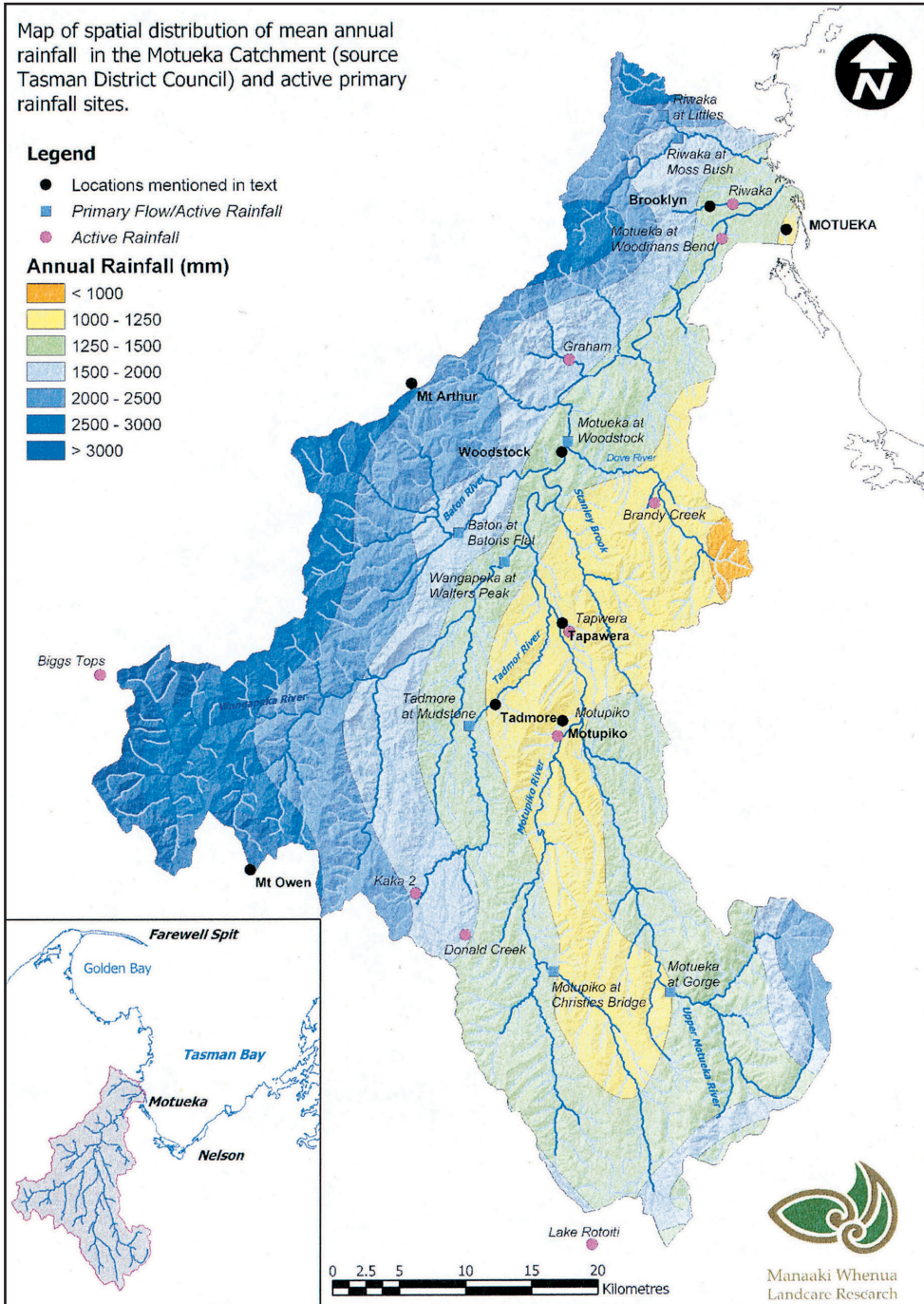
A: Agricultural (pastoral, horticultural) F: Forest (indigenous, commercial) S: Scrub/Tussock

### 2.4 Longitudinal Profiles



### 3. Climatological Information

#### 3.1 Annual Isohyetal Map and Observation Stations



Primary Flow/Active Rainfall means that both flow and rainfall are being measured at the location. Active Rainfall means that only rainfall is being measured.

### 3.2 List of Meteorological Observation Stations

No.	Station	Elevation [m]	Location	Period of record	Mean annual rainfall [mm]	Period of record	Mean annual evaporation <sup>1)</sup> [mm]	Other Items <sup>2)</sup>
G12191	Motueka	8	S 41° 06' E 172° 58'	Jan 1943 Jun 2003	1,376	Jan 1971 Sep 1996	1,050	P, T, TS, SR

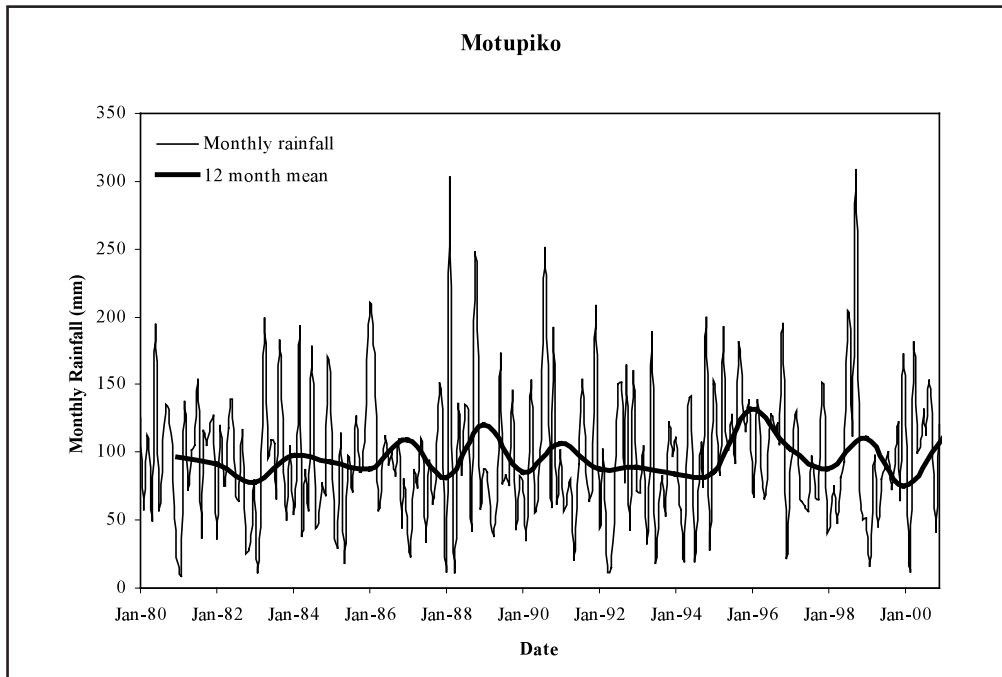
1) Raised pan.

2) P = Precipitation, T = Temperature, TS = Total Sunshine, SR = Solar Radiation

### 3.3 Monthly Climate Data

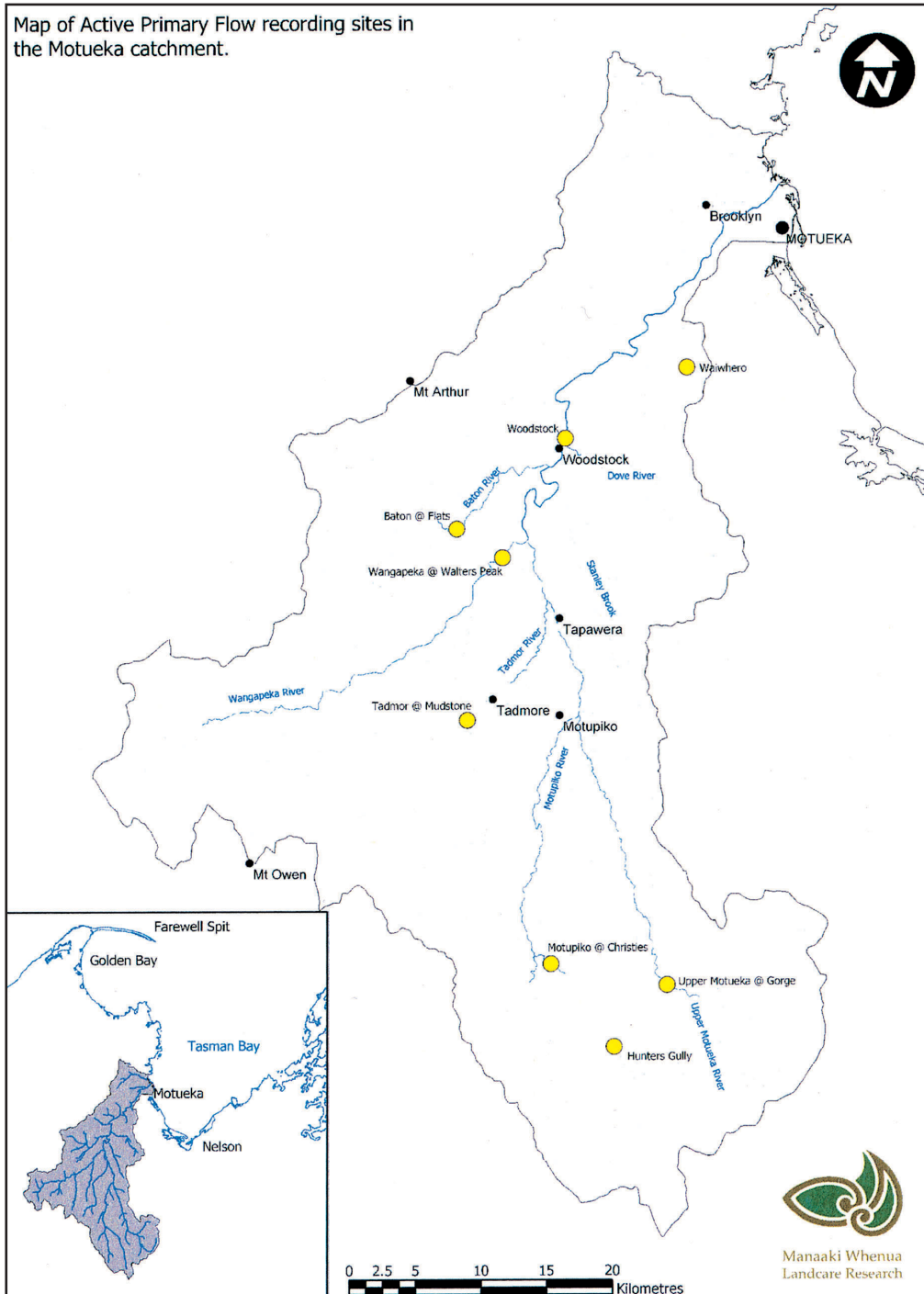
Observation item	Observation station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Period for the mean
Temperature [°C]	Motueka	17.4	17.5	15.9	12.9	10.1	7.6	6.9	8.1	10.2	12.3	14.2	16.2	12.4	Apr 1956 Jun 2003
Precipitation [mm]	Motueka	75	89	100	123	133	129	144	153	115	121	99	96	1,376	Jan 1943 Jun 2003
Evaporation [mm]	Motueka	168	124	99	61	32	23	27	42	72	105	137	158	1,050	Jan 1971 Sep 1996
Solar radiation [MJ/m <sup>2</sup> /d]	Motueka	23.2	20.4	17.0	10.9	7.6	6.1	6.9	9.4	13.0	17.4	21.3	23.3	14.7	Apr 1995 Jun 2003
Duration of sunshine [hr]	Motueka	265	235	216	186	166	134	153	170	184	222	231	246	2,407	Jan 1965 Jun 2003

### 3.4 Long-term Variation of Monthly Precipitation



## 4. Hydrological Information

### 4.1 Map of Streamflow Observation Stations





## 4.2 List of Hydrological Observation Stations

No.*	Station	Location	Catchment area (A) [km <sup>2</sup> ]	Observation period	Observation items <sup>1)</sup> (frequency)
57009	Motueka @ Woodstock	S 41° 16' E 172° 49'	1,750	1969 ~ 2003	Q, P (15m, 1h)
57025	Wangapeka @ Walters Peak	S 41° 20' E 172° 46'	479	1981 ~ 2003	Q, P (15m, 1h)
57036	Motupiko @ Christies	S 41° 37' E 172° 48'	105	1990 ~ 2003	Q, P (15m, 1h)
57004	Baton @ Flats	S 41° 19' E 172° 43'	168	1971 ~ 2003	Q, P (15m, 1h)
57008	Upper Motueka @ Gorge	S 41° 38' E 172° 55'	163	1965 ~ 2003	Q, P (15m, 1h)
57024	Tadmor @ Mudstone	S 41° 27' E 172° 44'	88	1978 ~ 2003	Q, P (15m, 1h)
57014	Stanley Brook @ Barkers	S 41° 19' E 172° 49'	82	1970 ~ 1994	Q, P (---, ---)

No.*	Q <sup>2)</sup> [m <sup>3</sup> /s]	Qmax <sup>3)</sup> [m <sup>3</sup> /s]	Qmax <sup>4)</sup> [m <sup>3</sup> /s]	Qmin <sup>5)</sup> [m <sup>3</sup> /s]	Q/A [m <sup>3</sup> /s/100km <sup>2</sup> ]	Qmax/A [m <sup>3</sup> /s/100km <sup>2</sup> ]	Period of statistics
57009	59.4	1,442	646	9.4	3.40	82	1970-2000
57025	23.8	605	270	4.6	4.97	126	1983-2000
57036	2.2	45	23	0.4	2.10	43	1991-2000
57004	8.1	242	95	1.6	4.79	144	1983-2000
57008	7.1	212	109	1.5	4.37	130	1965-2000
57024	2.2	69	31	0.2	2.51	79	1980-2000
57014	1.2	76	34	0.0	1.4	94	1970-1994

\*: New Zealand stream gauging site numbers.

1) Q: Discharge P: Precipitation

15m: 15 minutes, 1h: 1 hour

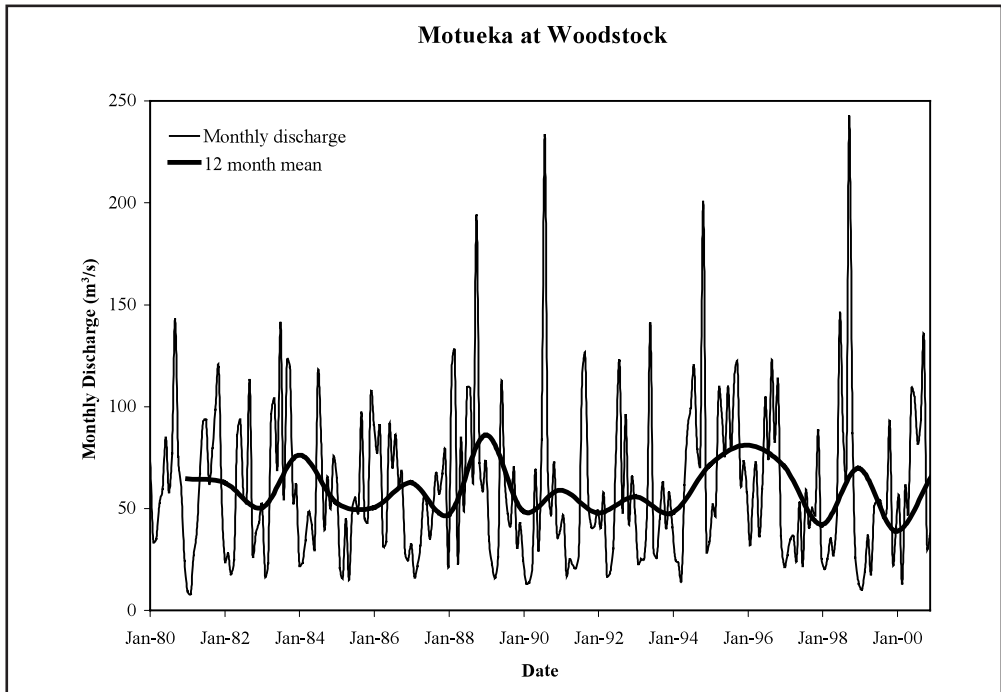
2) Mean annual discharge

3) Maximum daily discharge

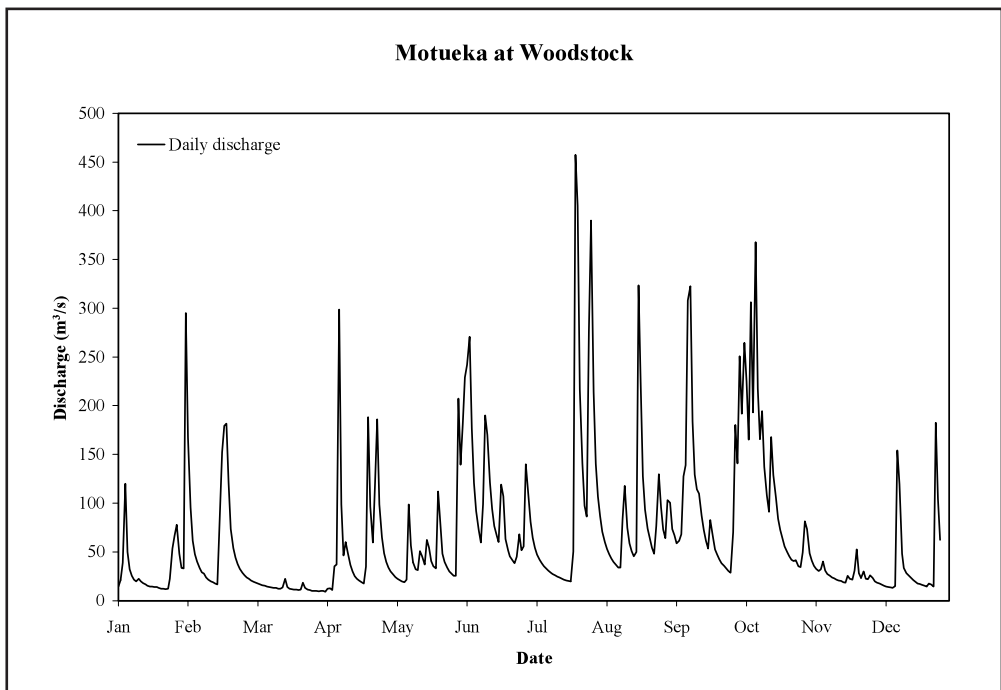
4) Mean maximum daily discharge

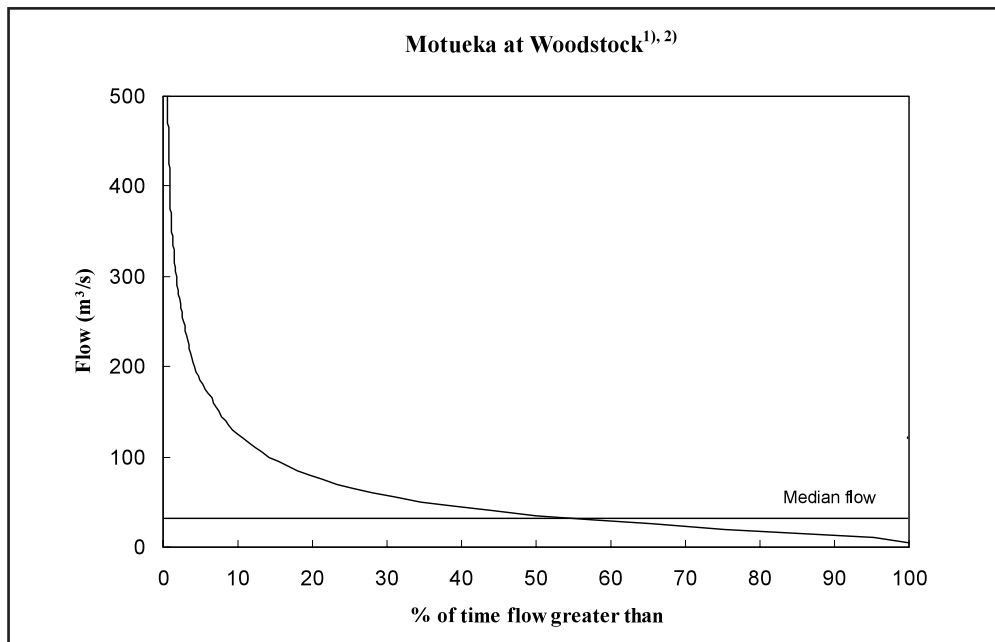
5) Mean minimum daily discharge

### 4.3 Long-term Variation of Monthly Discharge



### 4.4 Annual Pattern of Discharge





1) Located 36 km upstream from the river mouth.

2) Contributing area = 1,750 km<sup>2</sup>

#### 4.5 Annual Maximum and Minimum Discharges

##### Motueka at Woodstock<sup>1), 2)</sup>

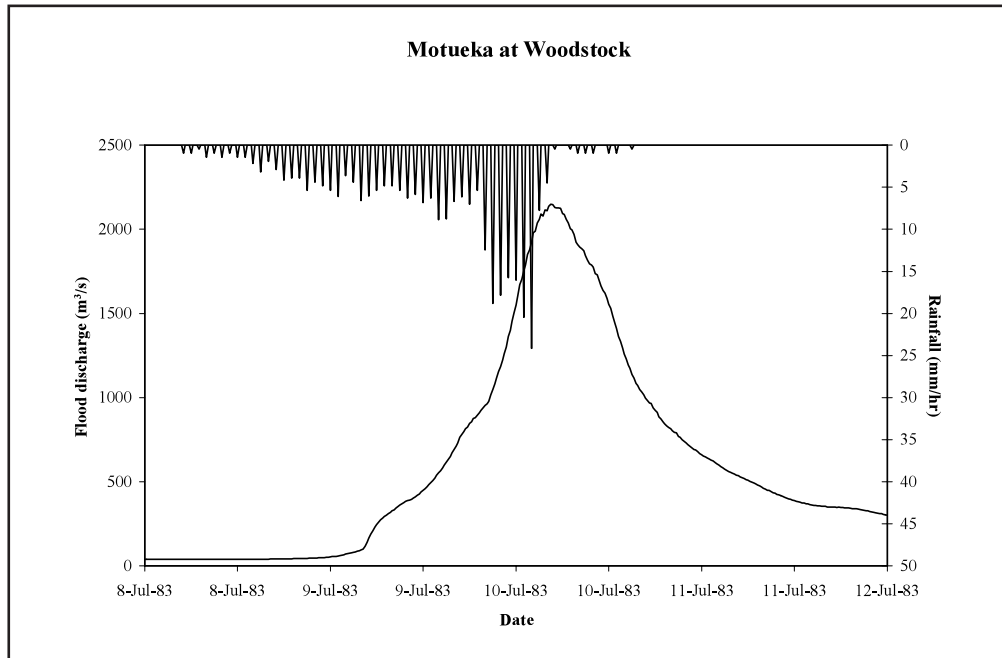
Year	Maximum <sup>3)</sup>		Minimum <sup>4)</sup>		Year	Maximum <sup>3)</sup>		Minimum <sup>4)</sup>	
	Date [d/m]	Flow [m <sup>3</sup> /s]	Date [d/m]	Flow [m <sup>3</sup> /s]		Date [d/m]	Flow [m <sup>3</sup> /s]	Date [d/m]	Flow [m <sup>3</sup> /s]
1970	1/9	621.8	21/2	6.512	1986	26/1	626.5	14/12	12.96
1971	7/6	616.1	21/2	6.873	1987	21/5	312.4	23/2	11.6
1972	13/8	934.0	3/3	6.558	1988	6/10	984.3	2/2	11.21
1973	22/11	527.1	12/3	5.256	1989	11/6	485.9	29/4	10.95
1974	17/4	1,013	1/4	7.399	1990	13/8	1,355	15/4	7.437
1975	14/3	656.0	7/1	6.759	1991	8/8	485.7	17/7	10.13
1976	28/1	474.4	27/3	10.48	1992	9/7	424.8	6/6	10.22
1977	29/6	587.5	23/4	9.839	1993	14/6	725.2	9/5	11.33
1978	21/10	396.4	18/3	6.512	1994	8/11	704.3	19/4	9.299
1979	1/11	837.3	11/2	9.354	1995	24/12	599.7	22/1	12.14
1980	6/6	544.3	31/12	13.73	1996	14/11	423.9	30/12	16.39
1981	16/11	825.3	1/3	6.254	1997	19/6	420.1	7/11	11.00
1982	23/6	409.2	17/2	9.143	1998	3/7	792.1	6/3	10.6
1983	10/7	1,442	23/3	6.959	1999	16/6	275.3	25/2	6.337
1984	7/7	336.6	2/3	11.05	2000	22/7	457.5	1/4	9.360
1985	5/9	568.8	17/4	8.984					

1) Located 36 km upstream from the river mouth.

2) Contributing area = 1,750 km<sup>2</sup>

3), 4) Daily mean values

## 4.6 Hyetographs and Hydrographs of Major Floods



## 5. Water Resources

### 5.1 General Description

By New Zealand standards the Motueka is a reasonably large river with a long-term mean annual flow of  $59 \text{ m}^3/\text{s}$  (7-day running mean at Woodstock) and a measured flow range of  $6 \text{ m}^3/\text{s}$  to greater than  $2,100 \text{ m}^3/\text{s}$ . River flow is lower than the long-term mean annual flow about 70% of the time. Like rainfall, mean monthly flow shows a distinct seasonal fluctuation, with higher values in winter and spring, and lower values during the summer months. This seasonality is more marked for low flows.

River flow generation is controlled by rainfall distribution and geology. The largest contributors to flow in the lower Motueka are the west and southeast mountain catchments (Wangapeka, Baton, Upper Motueka). Collectively they cover a large area, have the highest rainfall and are underlain by basement rocks that provide sustained water yields of up to  $0.05 \text{ m}^3/\text{s}/\text{km}^2$ . These catchments provide a large proportion of the mean annual flow for the Motueka as measured at Woodstock.

Periodic large floods are a characteristic feature of the hydrology of the Motueka River basin, and were a severe hazard to transport and land use prior to the implementation of the Motueka Catchment Control Scheme, which was initiated in 1982. The largest post-European-settlement flood occurred in February 1877. It caused many landslides, widespread erosion and sedimentation, and changed the character of the river in many areas. The maximum flow at Woodstock was estimated to lie between  $2,500\text{-}3,500 \text{ m}^3/\text{s}$ . Other large historical floods occurred in January 1895, July 1929, June 1954 and April 1957.

No significant natural or man-made water storage facilities exist in this river basin. The Tadmor River summer flows are heavily used for horticultural irrigation and have been augmented by diverting water from the Hope River, a tributary of the Buller River (see: Catalogue of Rivers for Southeast Asia and

Pacific-Volume I (1995)). The Hope River diversion scheme, operational from October through to April, can contribute up to 0.5 m<sup>3</sup>/s.

## 5.2 Map of Water Resource Systems

Not applicable.

## 5.3 List of Major Water Resources Facilities

### Major Reservoirs

There are no reservoirs in this river basin.

### Major Interbasin Transfer

Name of transfer line	Names of rivers and places connected		Length [km]	Maximum capacity [m <sup>3</sup> /s]	Purpose <sup>1)</sup>	Year of completion
	From	To				
<b>Hope River Diversion</b>	Hope River, Subcatchment of Buller River	Tadmor River, Subcatchment of Motueka River	0.11	0.5	H, N.	Scheme proposed 1989

1) H: Horticultural use N: Maintenance of normal flows

## 5.4 Major Floods and Droughts

### Major Floods Recorded at Woodstock<sup>1), 2)</sup>

Date	Mean daily discharge [m <sup>3</sup> /s]	Rainfall duration [mm]	Meteorological cause	Dead and missing	Major damages to
<b>10 July 1983</b>	1,442	177 24 h	No details	0	Property
<b>13 August 1990</b>	1,355	132 24 h	No details	0	Property
<b>17 April 1974</b>	1,013	74 24 h	No details	0	Property
<b>7 April 1974</b>	1,003	91 24 h	No details	0	Property
<b>6 October 1988</b>	984	105 24 h	No details	0	Property

1) Located 36 km upstream from the river mouth.

2) Contributing area = 1,750 km<sup>2</sup>

## Major Droughts. Flows Recorded at Woodstock<sup>1), 2)</sup>

Year <sup>3)</sup>	Flow <sup>4)</sup> (m <sup>3</sup> /s)	Return Period (yrs)	Rainfall <sup>5)</sup> (mm)	Return Period (yrs)	Days below 10 yr. low flow <sup>6)</sup>	Major damages and counteractions
2000 - 2001	5.6	23	62	131	14	Dry streams in eastern catchments, Motueka river warm, irrigation water rationed.
1972 - 1973	5.9	15	66	92	23	Dry streams in eastern catchments, Motueka river warm, irrigation water rationed.
1980 - 1981	6.5	9	111	7	3	Dry streams in eastern catchments, irrigation water rationed.
2002 - 2003	6.6	8	----	----	1	Dry streams in eastern catchments, irrigation water rationed.
1977 - 1978	6.7	8	73	54	0	Dry streams in eastern catchments, irrigation water rationed.

1) Located 36 km upstream from the river mouth.

2) Contributing area = 1,750 km<sup>2</sup>

3) Year from 1 August to 31 July.

4) 7 day running mean low flow.

5) 3 month total.

6) The 10 year, 7 day running mean low flow = 6.4 m<sup>3</sup>/s.

### 5.5 River Water Quality

As part of the ICM programme, an environmental sampling network was initiated to provide an improved understanding of the influence of land-use and geology on the variation in water quality throughout the catchment. The sampling sites, arranged to cover the longitudinal profile of the river, are located in the key geological and land-use types.

Water quality is generally high throughout the catchment, though much depends on adjacent land use. Faecal coliform bacteria and increased nitrate and phosphate levels are associated with the increased agricultural land use in the lower catchment. Nutrient and suspended sediment concentrations tend to be relatively low when compared to other New Zealand rivers. Although any increase in suspended sediment concentrations is often associated with commercial forestry activities, particularly harvesting. Water clarity is high in streams draining indigenous or commercial forests, but tend to be lower in streams draining pasture and horticultural land. Clarity is also lower in streams draining the catchments underlain by granite. Water quality and clarity are particularly high in rivers draining the western ranges and in the headwater-rivers of the upper catchment.

## Motueka River Water Quality at Woodstock<sup>1, 2)</sup> from October 2000 to September 2001

Date of observation	18 Oct	15 Nov	13 Dec	11 Jan	13 Feb	13 Mar	9 Apr	16 May	11 Jun	11 Jul	14 Aug	18 Sep
pH	8.1	-	7.3	7.9	8.2	8.7	8.9	8.5	6.7	7.9	8.3	8.0
Turbidity [NTU]	3.7	0.8	2.3	1.5	0.7	1.0	0.5	2.1	4.8	0.5	0.7	0.8
E. coli [cfu/100ml]	50	60	310	560	40	30	56	68	75	5	55	10
TSS <sup>3)</sup> [g/m <sup>3</sup> ]	5.0	2.0	4.0	2.0	0.7	0.7	0.7	3.0	6.0	0.6	0.5	0.9
NO <sub>3</sub> -N [g/m <sup>3</sup> ]	0.11	0.03	0.09	0.04	0.05	0.04	0.02	0.11	0.25	0.48	0.30	0.30
Discharge <sup>4)</sup> [m <sup>3</sup> /s]	107.1	20.8	46.6	31.6	10.6	6.3	10.8	41.2	59.6	18.7	20.5	23.9

1) Located 36 km upstream from the river mouth

2) Contributing area = 1,750 km<sup>2</sup>

3) Total Suspended Solids

4) Discharge on the date of observation

## 6. Socio-cultural Characteristics

There are approximately 12,000 people living within the Motueka River basin. The main population centres are the town of Motueka (7,000) and the villages of Tapawera, Tadmor and Brooklyn. The rural population density is about 2/km<sup>2</sup>.

The median age is 38 years, with 13% of the population being older than 65 (retirement age) and 12% younger than 15 (minimum school leaving age). Life expectancy is around 78 years. About 96% of the inhabitants identify themselves as European and 7% as Maori. Some people claim dual ethnicity. Population growth is estimated to be about 2% per annum.

The median annual income is \$NZ16,100. For those fully employed, the primary source of income is from salary and wages (57%) and from self-employment (23%). A further 23% of the population receive some form of Government assisted benefit. The unemployment rate in the area is approximately 4%.

For people over 15 years, 53% are married, 24% have never married, 7% are divorced, 6% are widowed and 3% are separated.

The information above was extracted from the 2001 New Zealand Census.

## 7. References, Databooks and Bibliography

The Motueka and Riwaka Catchments, 2003: A technical report summarising the present state of knowledge of the catchment, management issues and research needs for integrated catchment management. Compiled by L.R. Basher, Lincoln, Canterbury, New Zealand.: Landcare Research New Zealand. 120 p.

Rattenbury, M.S.; Cooper, R.A.; Johnston, M.R., 1998: Geology of the Nelson area. Institute of Geological and Nuclear Sciences 1:250,000 geological map 9. Institute of Geological and Nuclear Sciences, Wellington, New Zealand.