

OVERSEER figures: P. MacCormick, pers. comm.

Land use	Area	kg N yr ha	kg P yr ha	kg N yr	kg P yr
<b>Sheep/beef</b>	475.2			5480.0	1556.4
Glenmarie holdings	39.2	13.0	3.0	509.6	117.6
Taharoto	436.0	11.4	3.3	4970.4	1438.8
<b>Forestry</b>					
Glenmarie holdings	38.8	3.0	0.1	116.4	3.9
<b>Dairy</b>					
Taumanu	17.0	28.8	3.9	489.6	66.6

\*note that land use areas do not match exactly the action plan areas used below for some land uses

Full catchment summary

Land cover	Area	kg N yr ha	kg P yr ha	kg N yr	kg P yr	%N	%P
Bare ground	8	5	1	40	8	0.3	0.4
Native forest	643	3.67	0.12	2359.81	77.16	14.8	3.8
-with sheep/beef grazing	24	5	0.15	120	3.6	0.8	0.2
-with dairy grazing	18	10	0.15	180	2.7	1.1	0.1
Exotic forest	265	2.81	0.18	744.65	47.7	4.7	2.3
-with dairy grazing	126	10	0.15	1260	18.9	7.9	0.9
Scrub	59	6	0.6	354	35.4	2.2	1.7
Sheep/beef	415	11.5	3.3	4772.5	1369.5	29.9	66.8
Dairy grazing	16	28.8	3.9	460.8	66.6	2.9	3.2
Recreational area	14	14	4	196	56	1.2	2.7
Wetlands	32	0	0	0	0	0.0	0.0
Urban built	48	3	0.7	144	33.6	0.9	1.6
Septic tanks (336 HUE)	n/a	n/a	n/a	1410.36	141.036	8.8	6.9
Rainfall to lake	1115	3.5	0.17	3902.5	189.55	24.5	9.2
<b>Totals</b>	<b>2783</b>			<b>15945</b>	<b>2050</b>	<b>100</b>	<b>100</b>

Action plan loads

Table 2008 land use export coefficients for the Lake Rotomā catchment

Land cover	Area ha	Export kg/ha/year		Load			
		TN	TP	TN kg/year	%	TP kg/year	%
Bare ground	8	5	1.0	40	0	8	1.1
Native forest	643	3 <sup>19</sup>	0.075 <sup>20</sup>	1,929	11	48	6.5
-with sheep/beef grazing <sup>21</sup>	24	5	0.15	120	1	4	0.5
-with dairy grazing	18	10	0.15	180	1	3	0.4
Exotic forest	265	3	0.095 <sup>22</sup>	795	4	25	3.4
-with dairy grazing	126	10	0.15	1260	7	19	2.6
Scrub	59	3	0.04	177	1	2	0.3
Sheep/beef	415	15 <sup>23</sup>	0.38 <sup>24</sup>	6,225	34	158	21.5
Dairy grazing	16	40 <sup>25</sup>	0.38	640	4	6	0.8
Recreation area <sup>26</sup>	14	4	0.1	56	0	1	0.1
Wetlands	32	0	0	0	0	0	0.0
Urban built <sup>27</sup>	48	3	0.7	144	1	34	4.6
Septic tanks (251 HUE) <sup>28</sup>				2,530	14	250	34.0
Rainfall to lake <sup>29</sup>	1,115	3.6	0.16	4014	22	178	24.2
Waterfowl <sup>30</sup>				100	1	60	2
<b>Catchment total</b>	<b>2,783</b>			<b>18,110</b>	<b>100</b>	<b>736</b>	<b>100</b>

Methodology for catchment loads

Methods	TN	TP
<b>Bare ground</b>	Action plan	Rutherford et al. 1987 (Inland Waters of New Zealand). 0.5 to 1.2 kg P/ha/yr
<b>Native forest</b>	Cooper et al. 1988	Cooper et al. 1988
<b>-with sheep/beef grazing</b>	Action plan	Action plan
<b>-with dairy grazing</b>	Action plan	Action plan
<b>Exotic forest</b>	Inferred from Quinn and Ritter 2003 and Cooper et al. 1988, 22 yr cycle, see table below	Inferred from Quinn and Ritter 2003 and Cooper et al. 1988, 22 year harvest cycle
<b>-with dairy grazing</b>	Action plan	Action plan
<b>Scrub</b>	Cooke 1980 (see Rutherford et al. 1987)	Cooke 1980; 0.12 to 1.2 kg P/ha/yr (see Rutherford et al. 1987)
<b>Sheep/beef</b>	Weighted average from OVERSEER 5.4.3, MacCormick pers. Comm.	Weighted average from OVERSEER 5.4.3, MacCormick pers. Comm.
<b>Dairy grazing</b>	OVERSEER 5.4.3, MacCormick pers. Comm.	OVERSEER 5.4.3, MacCormick pers. Comm.
<b>Recreational area</b>	Action plan	Action plan
<b>Wetlands</b>	Action plan	Action plan
<b>Urban built</b>	Action plan	Action plan
<b>Septic tanks (336 HUE)</b>	Occupancy of RDC annual average = 1.15 people, 3.65 kg/person/yr (K. Bryan pers. Comm.) HUE from RDC, includes equivalent resident allocation to account for recreational facilities	Occupancy of RDC annual average = 1.15 people, load = TN/10 (McIntosh 2012)
<b>Rainfall to lake</b>	Schouten 1983; Timperley et al. 1985; Nicol et al. 1997 (see Hamilton 2005)	Schouten 1983, Parfitt 2006 (see Hamilton 2005)

\*Forest loads, inferred from Quinn and Ritter, 2003

Years from logging	Native kg N yr ha	Exotic kg N yr ha	Native kg P yr	Exotic kg P ha yr
0	3.67	9.18	0.12	0.43
1	3.67	20.92	0.12	1.20
2	3.67	3.30	0.12	0.33
3	3.67	2.94	0.12	0.23
4	3.67	2.39	0.12	0.18
5	3.67	1.94	0.12	0.13
6	3.67	1.50	0.12	0.10
7	3.67	1.31	0.12	0.10
8	3.67	1.31	0.12	0.10
9	3.67	1.31	0.12	0.10
10	3.67	1.31	0.12	0.10
11	3.67	1.31	0.12	0.10
12	3.67	1.31	0.12	0.10
13	3.67	1.31	0.12	0.10
14	3.67	1.31	0.12	0.10
15	3.67	1.31	0.12	0.10
16	3.67	1.31	0.12	0.10
17	3.67	1.31	0.12	0.10
18	3.67	1.31	0.12	0.10
19	3.67	1.31	0.12	0.10
20	3.67	1.31	0.12	0.10
21	3.67	1.31	0.12	0.10
<b>Average</b>	<b>3.67</b>	<b>2.81</b>	<b>0.12</b>	<b>0.18</b>

39.47368

FULL CATCHMENT

MODIFIED CATCHMENT

20% attenuation of P from drystock and dairy

Land cover	Area	kg N yr ha	kg P yr ha	kg N yr	kg P yr	%N	%P
Bare ground	8.00	5.00	1.00	40.00	8.00	0.25	0.45
Native forest	643.00	3.67	0.12	2359.81	77.16	14.80	4.39
-with sheep/beef grazing	24.00	5.00	0.15	120.00	3.60	0.75	0.20
-with dairy grazing	18.00	10.00	0.15	180.00	2.70	1.13	0.15
Exotic forest	265.00	2.81	0.18	744.65	47.70	4.67	2.71
-with dairy grazing	126.00	10.00	0.15	1260.00	18.90	7.90	1.07
Scrub	59.00	6.00	0.60	354.00	35.40	2.22	2.01
Sheep/beef	415.00	11.50	2.64	4772.50	1095.60	29.93	62.28
Dairy grazing	16.00	28.80	3.12	460.80	49.92	2.89	2.84
Recreational area	14.00	14.00	4.00	196.00	56.00	1.23	3.18
Wetlands	32.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban built	48.00	3.00	0.70	144.00	33.60	0.90	1.91
Septic tanks (336 HUE)	n/a	n/a	n/a	1410.36	141.04	8.85	8.02
Rainfall to lake	1115.00	3.50	0.17	3902.50	189.55	24.48	10.77
<b>Totals</b>	<b>2783.00</b>			<b>15944.62</b>	<b>1759.17</b>	<b>100.00</b>	<b>100.00</b>

20% ag attenuation

Land cover	Area	kg N yr ha	kg P yr ha	kg N yr	kg P yr	%N	%P
Bare ground	8.00	5.00	1.00	40.00	8.00	0.26	0.46
Native forest	580.60	3.67	0.12	2130.80	69.67	13.66	3.99
-with sheep/beef grazing	24.00	5.00	0.15	120.00	3.60	0.77	0.21
-with dairy grazing	18.00	10.00	0.15	180.00	2.70	1.15	0.15
Exotic forest	223.40	2.81	0.18	627.75	40.21	4.02	2.31
-with dairy grazing	126.00	10.00	0.15	1260.00	18.90	8.08	1.08
Scrub	59.00	6.00	0.60	354.00	35.40	2.27	2.03
Sheep/beef	415.00	11.50	2.64	4772.50	1095.60	30.60	62.81
Dairy grazing	16.00	28.80	3.12	460.80	49.92	2.95	2.86
Recreational area	14.00	14.00	4.00	196.00	56.00	1.26	3.21
Wetlands	32.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban built	48.00	3.00	0.70	144.00	33.60	0.92	1.93
Septic tanks (336 HUE)	n/a	n/a	n/a	1410.36	141.04	9.04	8.09
Rainfall to lake	1115.00	3.50	0.17	3902.50	189.55	25.02	10.87
<b>Totals</b>	<b>2679.00</b>			<b>15598.72</b>	<b>1744.19</b>	<b>100.00</b>	<b>100.00</b>

50% ag attenuation

Land cover	Area	kg N yr ha	kg P yr ha	kg N yr	kg P yr	%N	%P
Bare ground	8.00	5.00	1.00	40.00	8.00	0.25	0.60
Native forest	643.00	3.67	0.12	2359.81	77.16	14.80	5.80
-with sheep/beef grazing	24.00	5.00	0.15	120.00	3.60	0.75	0.27
-with dairy grazing	18.00	10.00	0.15	180.00	2.70	1.13	0.20
Exotic forest	265.00	2.81	0.18	744.65	47.70	4.67	3.59
-with dairy grazing	126.00	10.00	0.15	1260.00	18.90	7.90	1.42
Scrub	59.00	6.00	0.60	354.00	35.40	2.22	2.66
Sheep/beef	415.00	11.50	1.65	4772.50	684.75	29.93	51.50
Dairy grazing	16.00	28.80	1.95	460.80	31.20	2.89	2.35
Recreational area	14.00	14.00	4.00	196.00	56.00	1.23	4.21
Wetlands	32.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban built	48.00	3.00	0.70	144.00	33.60	0.90	2.53
Septic tanks (336 HUE)	n/a	n/a	n/a	1410.36	141.04	8.85	10.61
Rainfall to lake	1115.00	3.50	0.17	3902.50	189.55	24.48	14.26
<b>Totals</b>	<b>0.00</b>			<b>15944.62</b>	<b>1329.60</b>	<b>100.00</b>	<b>100.00</b>

50% ag attenuation

Land cover	Area	kg N yr ha	kg P yr ha	kg N yr	kg P yr	%N	%P
Bare ground	8.00	5.00	1.00	40.00	8.00	0.26	0.61
Native forest	580.60	3.67	0.12	2130.80	69.67	13.66	5.30
-with sheep/beef grazing	24.00	5.00	0.15	120.00	3.60	0.77	0.27
-with dairy grazing	18.00	10.00	0.15	180.00	2.70	1.15	0.21
Exotic forest	223.40	2.81	0.18	627.75	40.21	4.02	3.06
-with dairy grazing	126.00	10.00	0.15	1260.00	18.90	8.08	1.44
Scrub	59.00	6.00	0.60	354.00	35.40	2.27	2.69
Sheep/beef	415.00	11.50	1.65	4772.50	684.75	30.60	52.09
Dairy grazing	16.00	28.80	1.95	460.80	31.20	2.95	2.37
Recreational area	14.00	14.00	4.00	196.00	56.00	1.26	4.26
Wetlands	32.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban built	48.00	3.00	0.70	144.00	33.60	0.92	2.56
Septic tanks (336 HUE)	n/a	n/a	n/a	1410.36	141.04	9.04	10.73
Rainfall to lake	1115.00	3.50	0.17	3902.50	189.55	25.02	14.42
<b>Totals</b>	<b>2679.00</b>			<b>15598.72</b>	<b>1314.62</b>	<b>100.00</b>	<b>100.00</b>

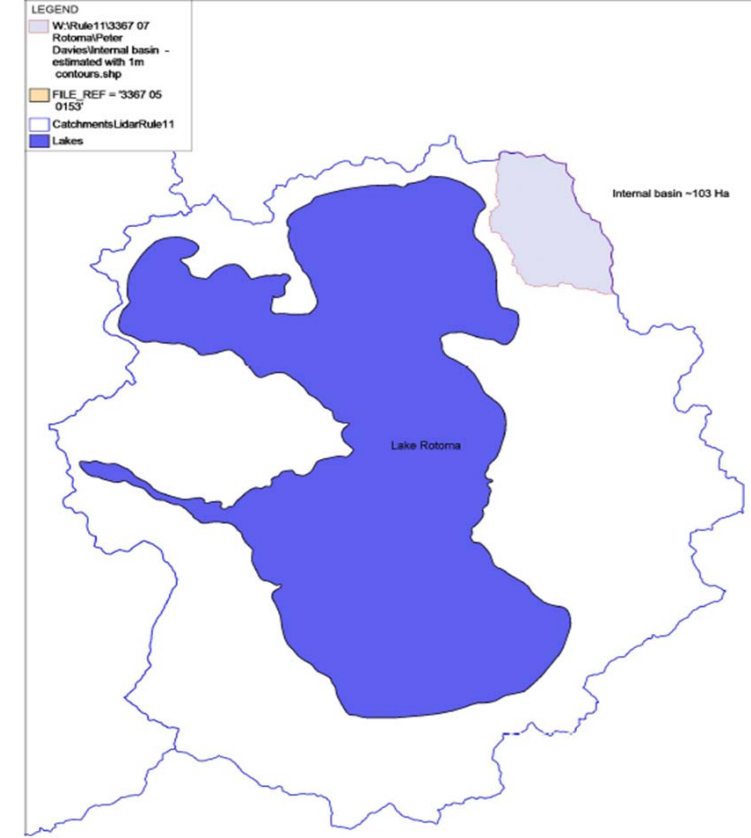
80% ag attenuation

Land cover	Area	kg N yr ha	kg P yr ha	kg N yr	kg P yr	%N	%P
Bare ground	8.00	5.00	1.00	40.00	8.00	0.25	0.89
Native forest	643.00	3.67	0.12	2359.81	77.16	14.80	8.57
-with sheep/beef grazing	24.00	5.00	0.15	120.00	3.60	0.75	0.40
-with dairy grazing	18.00	10.00	0.15	180.00	2.70	1.13	0.30
Exotic forest	265.00	2.81	0.18	744.65	47.70	4.67	5.30
-with dairy grazing	126.00	10.00	0.15	1260.00	18.90	7.90	2.10
Scrub	59.00	6.00	0.60	354.00	35.40	2.22	3.93
Sheep/beef	415.00	11.50	0.66	4772.50	273.90	29.93	30.43
Dairy grazing	16.00	28.80	0.78	460.80	12.48	2.89	1.39
Recreational area	14.00	14.00	4.00	196.00	56.00	1.23	6.22
Wetlands	32.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban built	48.00	3.00	0.70	144.00	33.60	0.90	3.73
Septic tanks (336 HUE)	n/a	n/a	n/a	1410.36	141.04	8.85	15.67
Rainfall to lake	1115.00	3.50	0.17	3902.50	189.55	24.48	21.06
<b>Totals</b>	<b>3.67</b>			<b>15944.62</b>	<b>900.03</b>	<b>100.00</b>	<b>100.00</b>

80% ag attenuation

Land cover	Area	kg N yr ha	kg P yr ha	kg N yr	kg P yr	%N	%P
Bare ground	8.00	5.00	1.00	40.00	8.00	0.26	0.90
Native forest	580.60	3.67	0.12	2130.80	69.67	13.66	7.87
-with sheep/beef grazing	24.00	5.00	0.15	120.00	3.60	0.77	0.41
-with dairy grazing	18.00	10.00	0.15	180.00	2.70	1.15	0.31
Exotic forest	223.40	2.81	0.18	627.75	40.21	4.02	4.54
-with dairy grazing	126.00	10.00	0.15	1260.00	18.90	8.08	2.14
Scrub	59.00	6.00	0.60	354.00	35.40	2.27	4.00
Sheep/beef	415.00	11.50	0.66	4772.50	273.90	30.60	30.95
Dairy grazing	16.00	28.80	0.78	460.80	12.48	2.95	1.41
Recreational area	14.00	14.00	4.00	196.00	56.00	1.26	6.33
Wetlands	32.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban built	48.00	3.00	0.70	144.00	33.60	0.92	3.80
Septic tanks (336 HUE)	n/a	n/a	n/a	1410.36	141.04	9.04	15.94
Rainfall to lake	1115.00	3.50	0.17	3902.50	189.55	25.02	21.42
<b>Totals</b>	<b>2679.00</b>			<b>15598.72</b>	<b>885.05</b>	<b>100.00</b>	<b>100.00</b>

MODIFIED CATCHMENT SHADED IN BLUE



ACTION PLAN LOADS

Table 2008 land use export coefficients for the Lake Rotomā catchment

Land cover	Area ha	Export		Load			
		TN	TP	TN	TP	%	
		kg/ha/year		kg/year		kg/year	
Bare ground	8	5	1.0	40	0	8	1.1
Native forest	643	3 <sup>19</sup>	0.075 <sup>20</sup>	1,929	11	48	6.5
-with sheep/beef grazing <sup>21</sup>	24	5	0.15	120	1	4	0.5
-with dairy grazing	18	10	0.15	180	1	3	0.4
Exotic forest	265	3	0.095 <sup>22</sup>	795	4	25	3.4
-with dairy grazing	126	10	0.15	1260	7	19	2.6
Scrub	59	3	0.04	177	1	2	0.3
Sheep/beef	415	15 <sup>23</sup>	0.38 <sup>24</sup>	6,225	34	158	21.5
Dairy grazing	16	40 <sup>25</sup>	0.38	640	4	6	0.8
Recreation area <sup>26</sup>	14	4	0.1	56	0	1	0.1
Wetlands	32	0	0	0	0	0	0.0
Urban built <sup>27</sup>	48	3	0.7	144	1	34	4.6
Septic tanks (251 HUE) <sup>28</sup>				2,530	14	250	34.0
Rainfall to lake <sup>29</sup>	1,115	3.6	0.16	4014	22	178	24.2
Waterfowl <sup>30</sup>				100	1	60	2
<b>Catchment total</b>	<b>2,783</b>			<b>18,110</b>	<b>100</b>	<b>736</b>	<b>100</b>