

15 November 2011

Living Lake Symposium

Monitoring and enhancing the lake's
ecosystem services

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Bio-Protection

Bioprotection science for New Zealand




What are ecosystem services?

Ecosystem functions for which mankind sees a value e.g.

- pollination
- biological control of pests, weeds and diseases
- soil formation and drainage
- carbon capture
- mitigation of the effects of climate
- mitigation of farmland runoff
- provision of food, including fish
- aesthetics
- culture, including kaitiakitanga







and mitigate runoff and direct
pollution from intensive agriculture,
especially dairy – but, we are not
alone



Hypoxic zone off Mississippi River delta



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Lake Ellesmere was an estuary, and still is
when Kaitorete Spit is opened





Current state of the lake?

Second most polluted lake in New Zealand

High concentrations of nitrogen and phosphorus and high turbidity – and recent sewage inputs

Who is monitoring the lake?

Can monitors nutrients but what about the lake's living things and the ecosystem services they provide?

e.g. WET's important planting work, bird and fish populations, lake invertebrates etc?





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Which ecosystem services associated with riparian plantings should be monitored?

- reduction of turbidity
- trapping of silt runoff
- improvement of stream invertebrate and fish populations
- reduction of water temperature
- improved aesthetics
- improved kaitiakitanga



What is the economic value of Lake Ellesmere?

In 1997, Costanza *et al.* evaluated ecosystem services in the world's biomes

Table 2 Summary of average global value of annual ecosystem services

Biome	Area (ha × 10 ⁶)	Ecosystem services (1994 US\$ ha ⁻¹ yr ⁻¹)																	Total value per ha (\$ ha ⁻¹ yr ⁻¹)	Total global flow value (\$ yr ⁻¹ × 10 ⁹)
		1 Gas regulation	2 Climate regulation	3 Disturbance regulation	4 Water regulation	5 Water supply	6 Erosion control	7 Soil formation	8 Nutrient cycling	9 Waste treatment	10 Pollination	11 Biological control	12 Habitat/ refugia	13 Food production	14 Raw materials	15 Genetic resources	16 Recreation	17 Cultural		
Marine	36,302																		677	20,949
Open ocean	33,200	36							116			5		16	0			76	252	8,381
Coastal	3,102			86					3,677			38	8	93	4		82	62	4,052	12,568
Estuaries/ Seagrass/ algae beds	180			567					21,000			78	131	621	26		381	29	22,832	4,110
Coral reefs	200								19,002						2				19,004	3,801
Shelf	62			2,750						58		5	7	220	27		3,008	1	6,075	375
	2,660								1,431			39		68	2			70	1,610	4,283
Terrestrial	15,323																		804	12,319
Forest	4,665		141	2	2	3	96	10	361	67		2		43	136	16	66	2	969	4,706
Tropical	1,900		223	5	6	8	245	10	902	67				32	315	41	112	2	2,007	3,813
Temperate/boreal	2,965		86		0			10		67		4		60	25		38	2	302	894
Grass/rangelands	3,896	7	0		3		29	1		67	25	23		67		0	2		232	906
Wetlands	330	133		4,539	15	3,800				4,177			304	256	106		574	881	14,795	4,879
Tidal marsh/ mangroves	165			1,839						6,696			169	466	162		658		9,990	1,648
Swamps/ floodplains	165	266		7,240	30	7,000				1,669			439	47	40		491	1,761	19,580	3,231
Lakes/rivers	200				5,446	2,117				665				41			230		8,496	1,700
Desert	1,925																			
Tundra	743																			
Ice/mink	1,640																			
Cropland	1,400										14	24		54					92	128
Urban	332																			
Total	51,625	1,341	684	1,779	1,115	1,692	676	53	17,075	2,277	117	417	124	1,386	721	79	815	3,015		33,266

Numbers in the body of the table are in \$ ha⁻¹ yr⁻¹. Row and column totals are in \$ yr⁻¹ × 10⁹. Column totals are the sum of the products of the per ha services in the table and the area of each biome, not the sum of the per ha services themselves. Shaded cells indicate services that do not occur or are known to be negligible. Open cells indicate lack of available information.

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So what is the economic value of Lake Ellesmere?

US\$22,832 x 19,000 ha =

US\$400 million/year

A grossly simplified calculation but based on a fisheries nursery, recreation including boating and birding, ecotourism, aesthetics including mauri for Maori



Wading birds?

Highest populations in Australasia of banded dotterel, pied stilt and caspian tern



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and an important staging post for wrybill



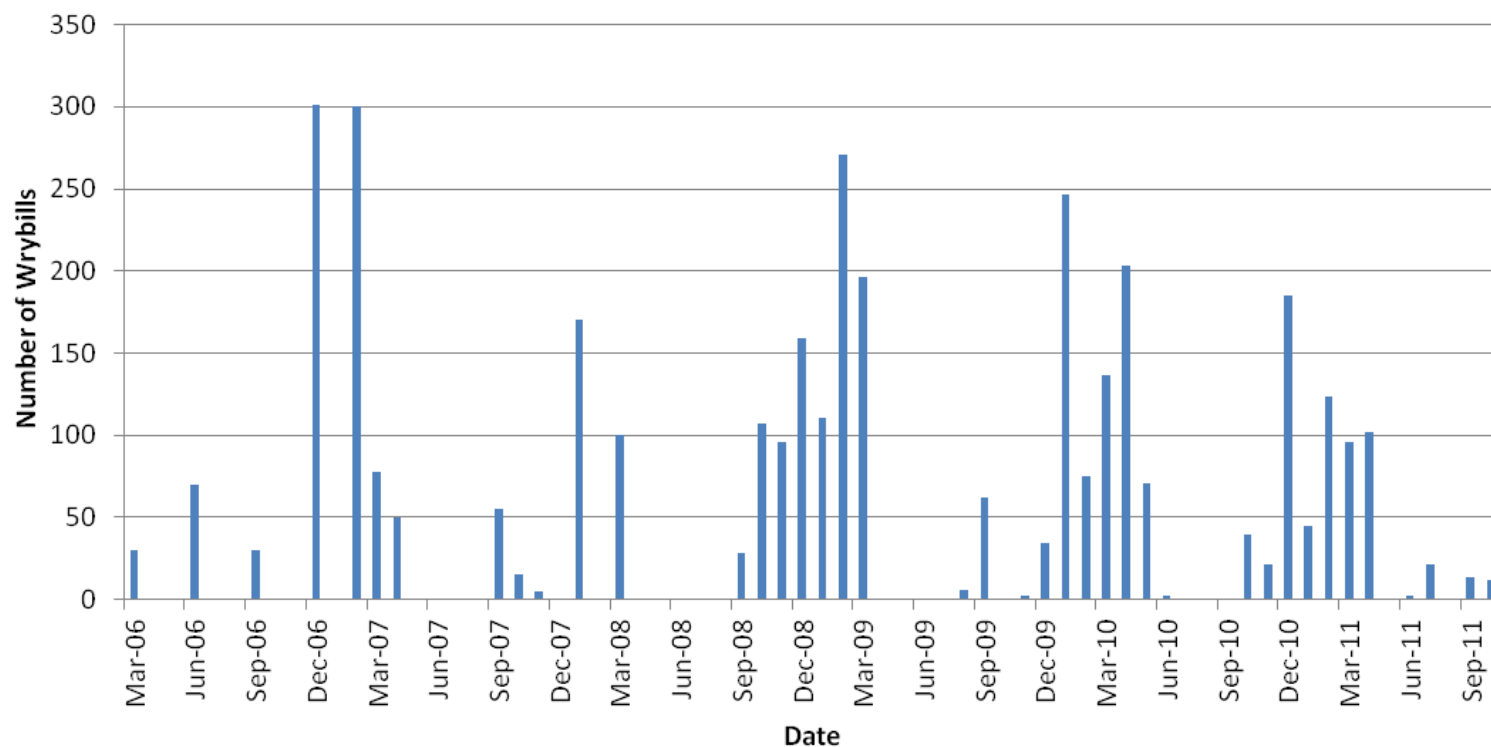
4,000 wrybills in NZ in 2011, and declining



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Monthly Wrybill (*Anarhynchus frontalis*) counts at Te Waihora - Lake Ellesmere

Data from Colin Hill and Steve Wratten



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The future:

- Taumutu marae to house a Te Waihora environmental display
- Benjamin Bradley from Victoria University, Wellington to be a LU-funded Summer Scholar quantifying ecosystem services from riparian plantings
- Continuing pollution of the lake?
- Serious funding for monitoring including mud invertebrates and flounder and eel ecology and population dynamics
- Whakaora te Waiora needs to fund mud invertebrate, fish and bird monitoring and other ecosystem services, including those in the lake's feeder streams. Do not only concentrate on the Halswell River.

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