A scenic view of Lake Ellesmere/Te Waihora, showing the water, distant land, and foreground vegetation. The lake is a light blue color, and there are some small islands or peninsulas visible in the distance. The foreground is dominated by dark, scrubby bushes and grasses. The sky is a clear, pale blue.

# Update on water quality of Lake Ellesmere/Te Waihora

Shirley Hayward  
DairyNZ

# Lake water quality

## Indicators:

- Phytoplankton biomass – chlorophyll *a*
- Nutrients – nitrogen and phosphorus
- Clarity (visual depth)
- Salinity
- Microbial quality

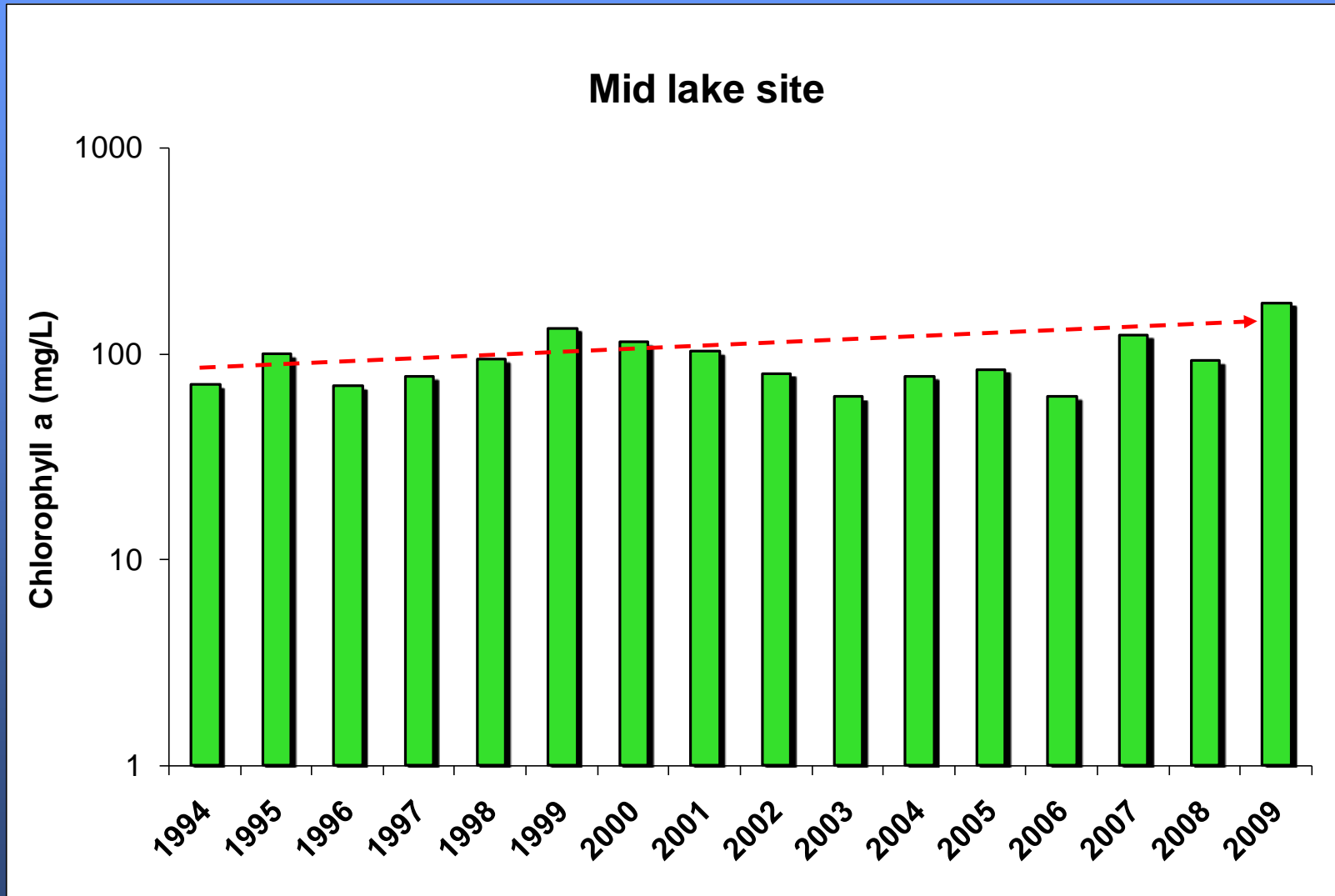
# Current water quality monitoring programme

Monthly sampling

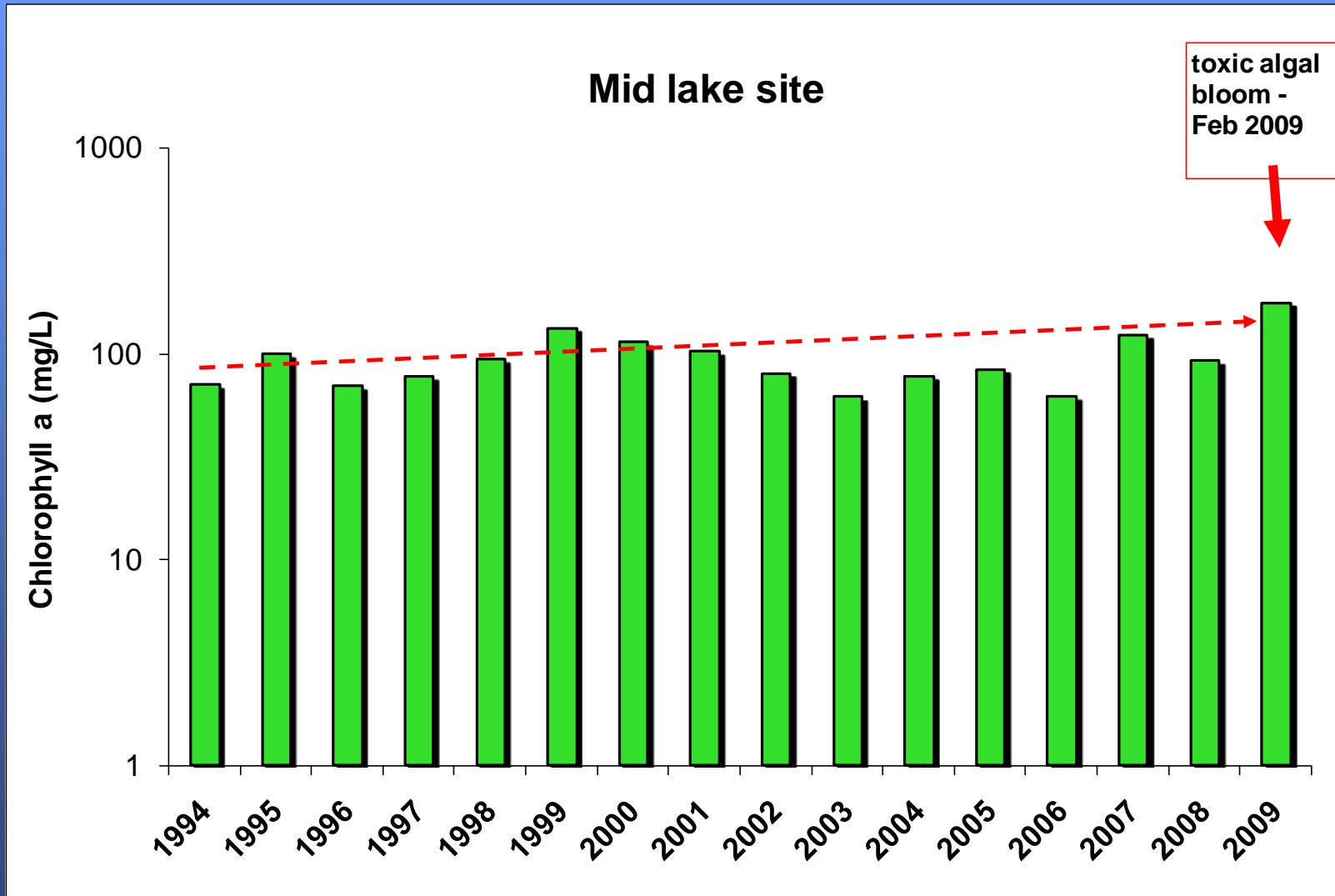
Started 1992



# Phytoplankton biomass



# Phytoplankton biomass





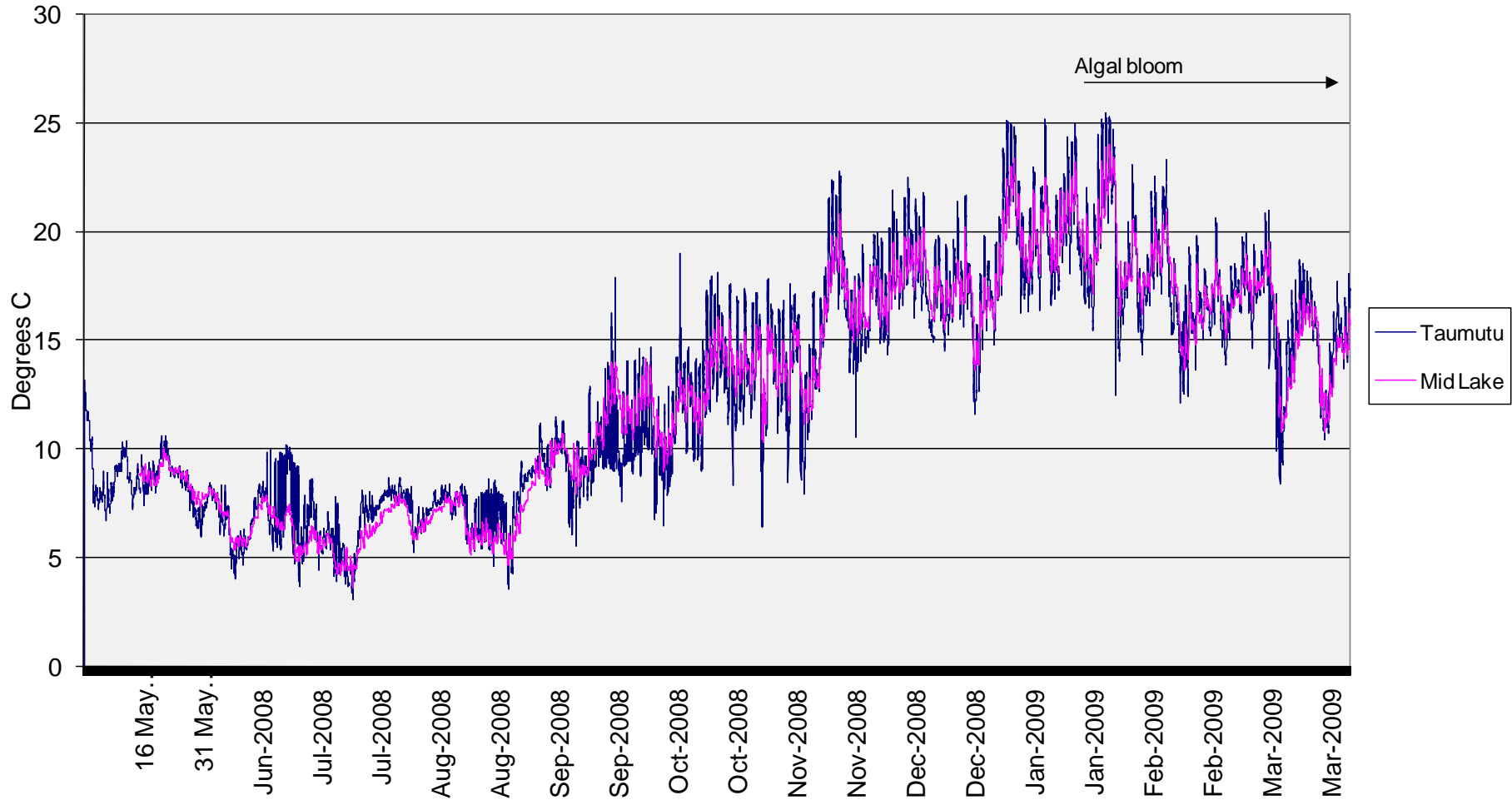
## Bloom of *Nodularia* February 2009

Health warnings  
notified and multiple  
signs placed around  
the lake

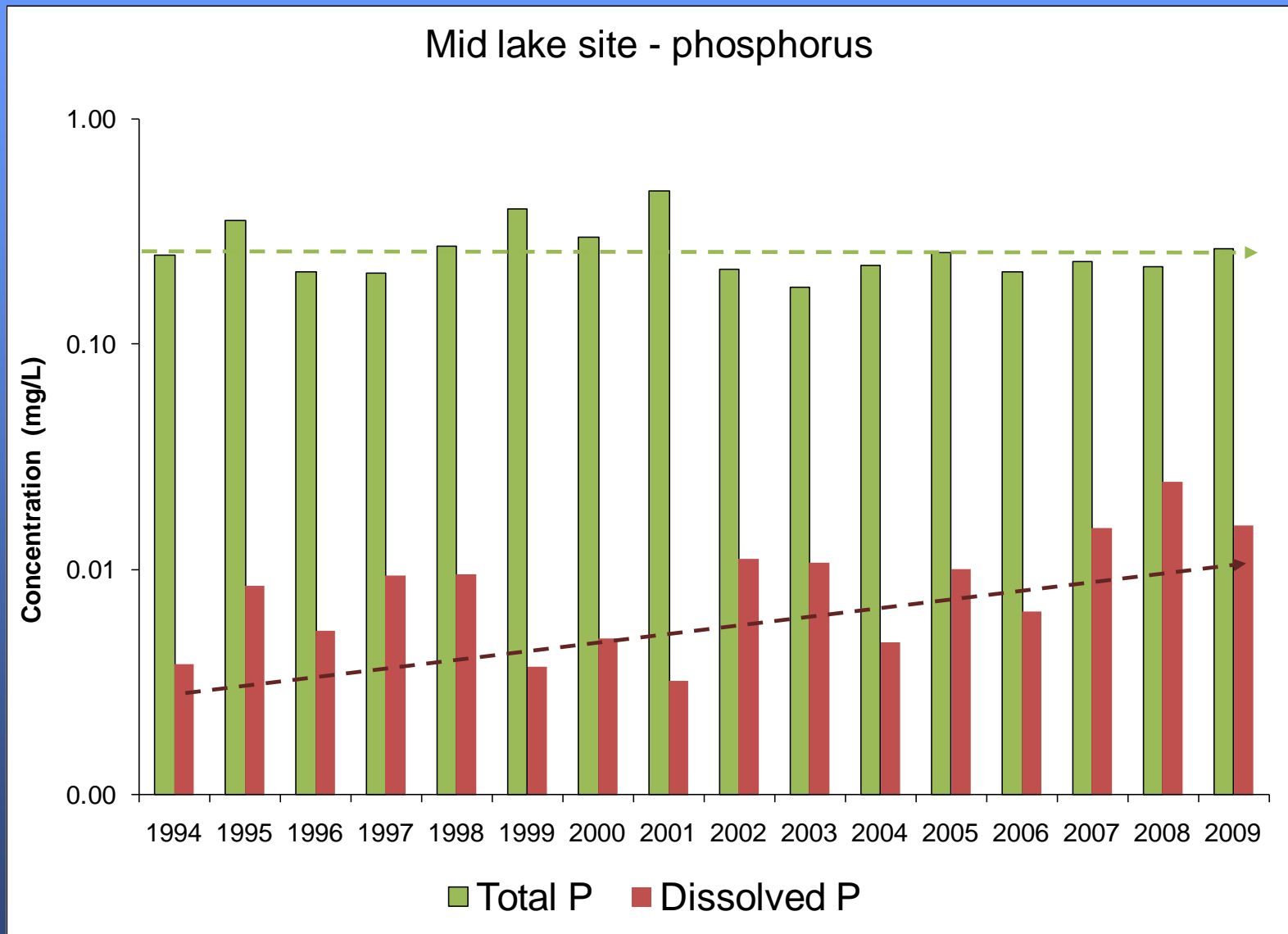
Warnings remained  
in place for several  
months

# Lake temperature

Lake Ellesmere/Te Waihora - continuous recorder data - Temperature

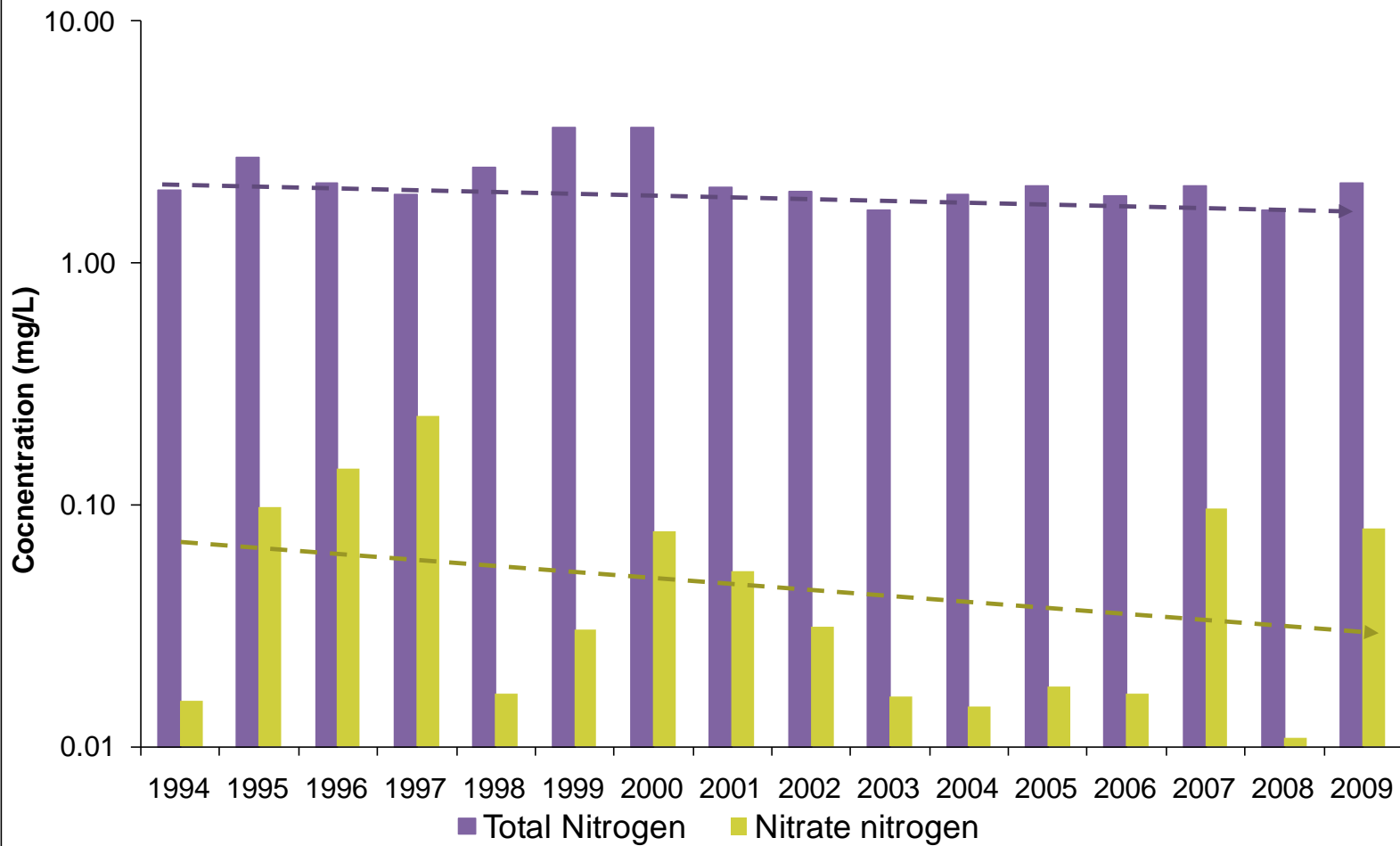


# Nutrients





# Mid lake site - nitrogen



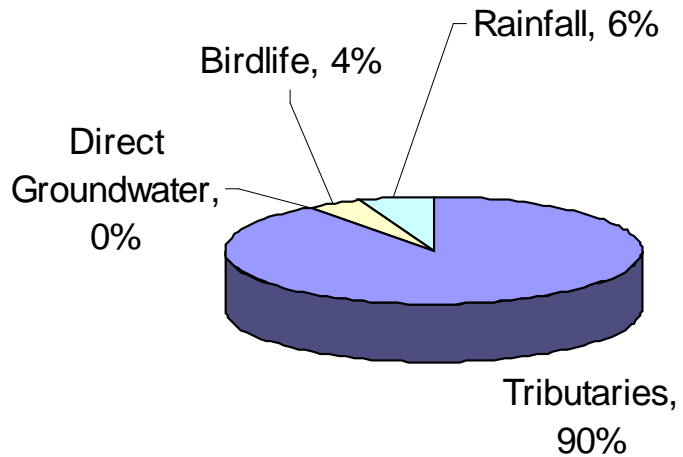
# Nutrient inputs from tributaries

		Doyleston D	Halswell	Hanmer Rd	Harts C	Irwell R	Kaituna	LII R	Selwyn R
<b>Flow</b>		▽	▽	▽	▽	▽	-	▽	▽
<b>Nitrate nitrogen</b>	concentration	▽	▽	△	△	▽	-	-	△
	load	▽	▽	-	▽	▽	-	▽	▽
<b>Total nitrogen</b>	concentration	▽	▽	△	△	▽	▽	-	△
	load	▽	▽	-	▽	▽	▽	▽	▽
<b>Dissolved R phosphorus</b>	concentration	△	△	△	△	-	-	▽	△
	load	▽	-	▽	-	▽	-	▽	▽
<b>Total phosphorus</b>	concentration	-	-	-	▽	-	-	▽	-
	load	▽	-	▽	▽	▽	-	▽	▽

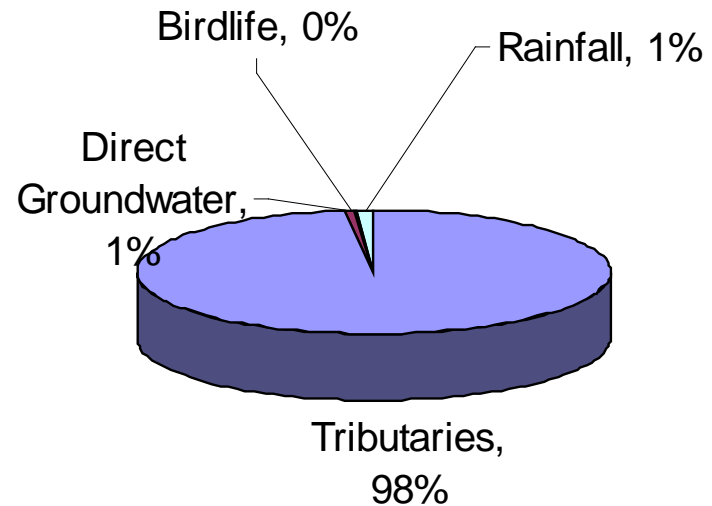
Trends from 1992 to 2009

# Nutrients inputs

## Total phosphorus load



## Total nitrogen load

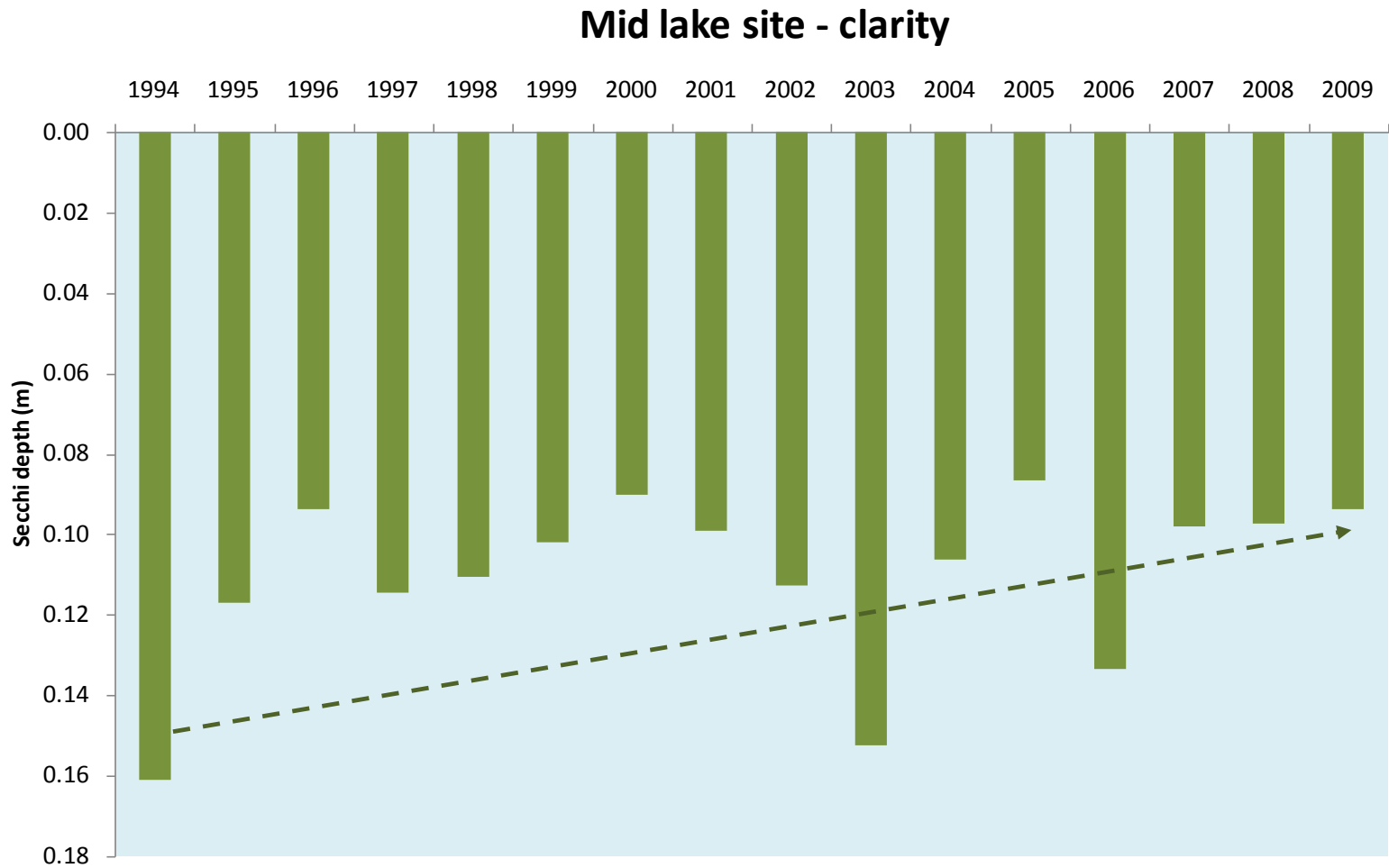




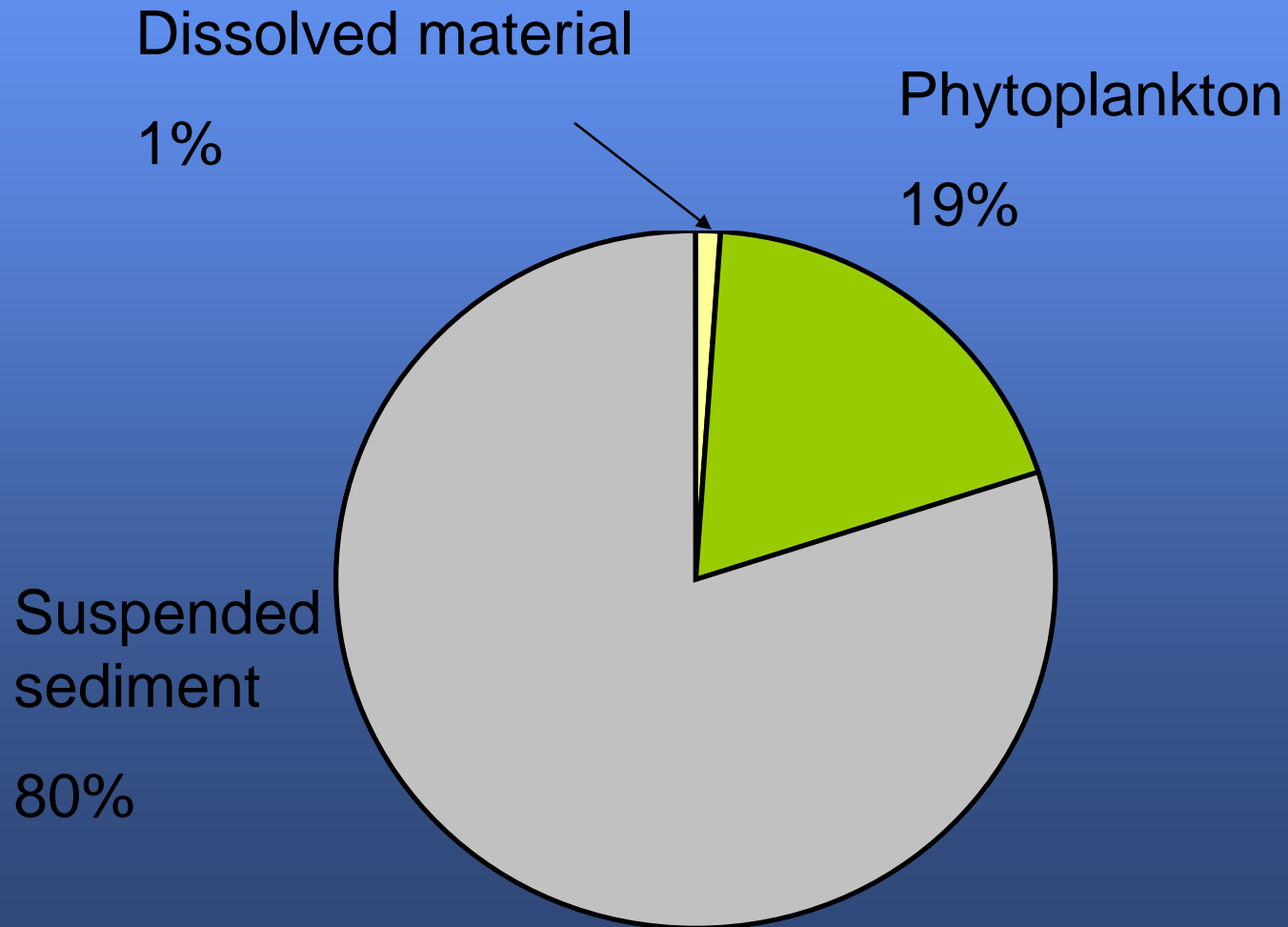
# Visual clarity

- Important for recreation and amenity values
- Important ecologically
  - Visual feeding insects, fish and birds
  - Plant and algal growth

# Clarity trends



# Lake clarity sources



# Lake salinity

Salt – input from the sea during lake openings and from waves overtopping gravel bar

Less frequent lake openings

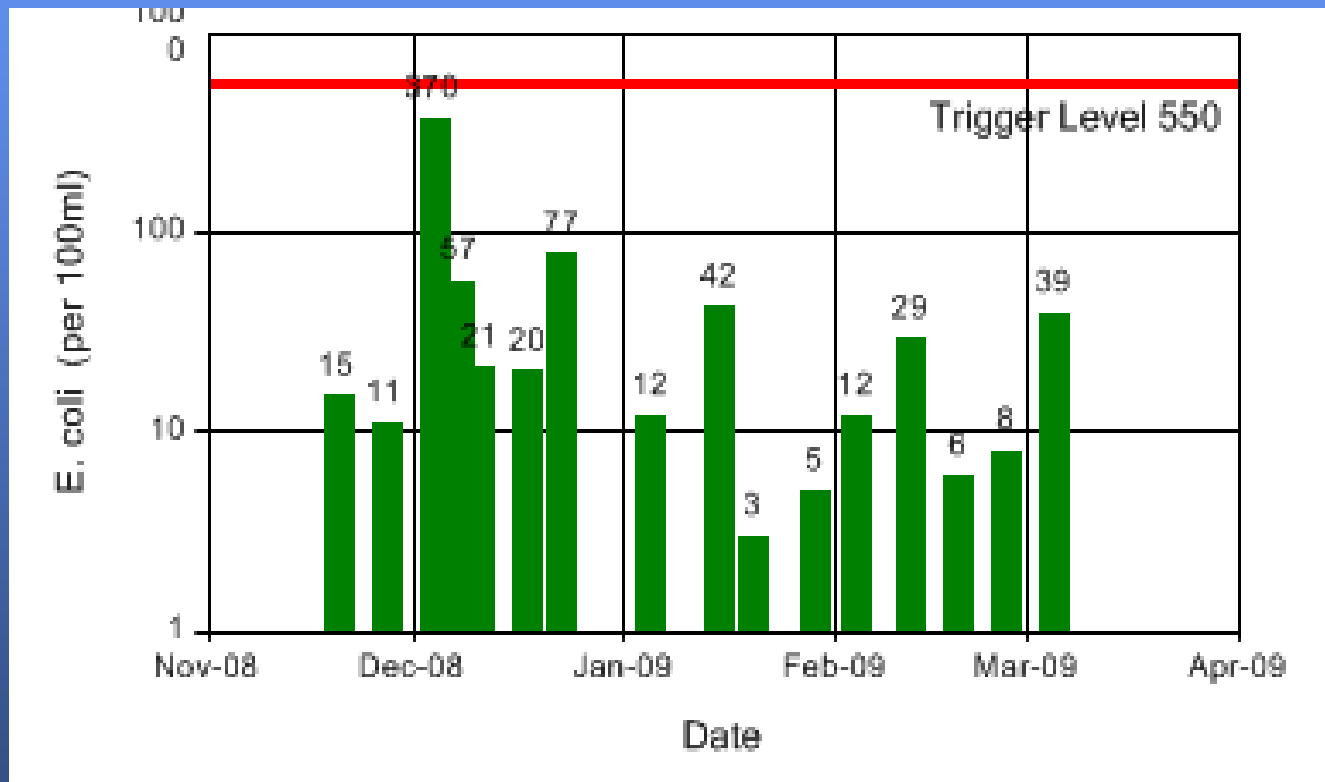


Decrease in lake salinity



# Microbial quality

## Lakeside Domain



Suitability for recreation grade – fair to good



# Summary of trends in lake water quality



Algal biomass is increasing



Total phosphorus – no change



Total nitrogen – decreasing



Clarity decreasing



Salinity decreasing



Microbial quality – improving

# Trends in tributaries



Flows – decreasing



Nutrient concentrations within streams – increasing



Nutrient inputs to Te Waihora (flow x conc.) - decreasing



# Thank you

Thanks to  
Julie Edwards  
Taryn Wilks