

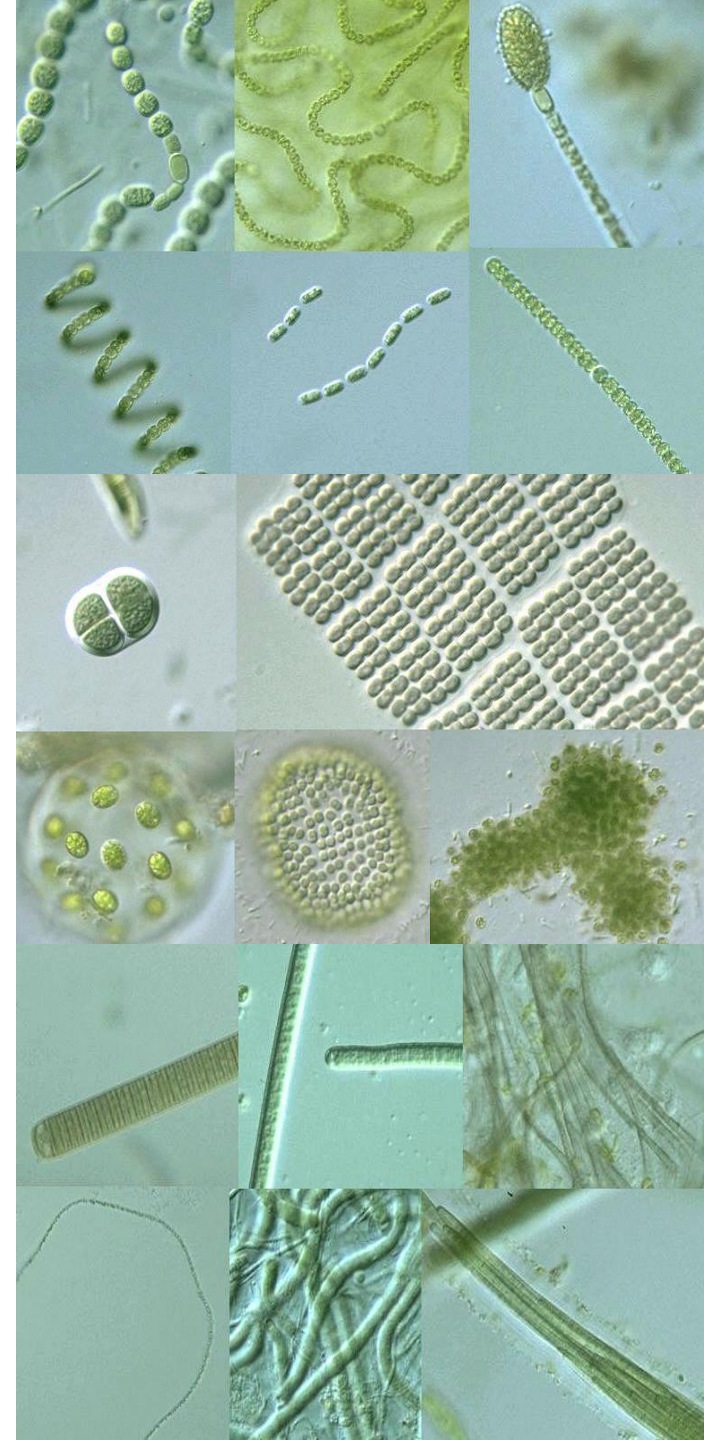
# Cyanobacteria and Lake Waihola



Dr Dean Olsen  
Water Resource Scientist

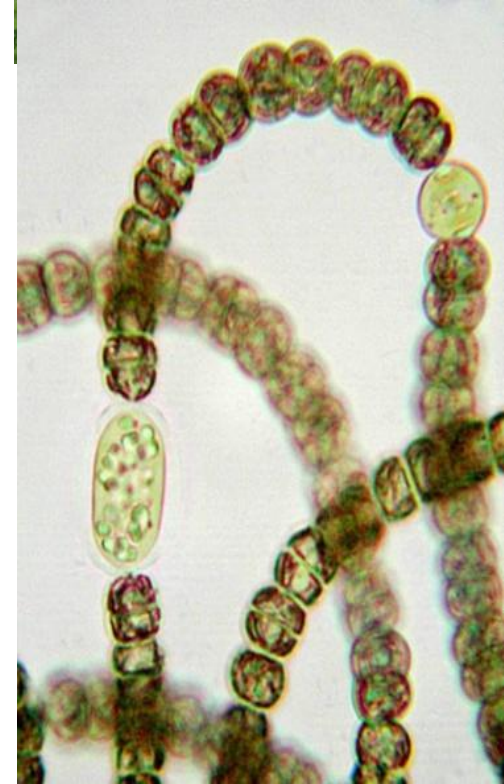
# What are cyanobacteria?

- Blue-green algae
- Photosynthetic bacteria
- Found in almost all terrestrial and aquatic habitats



# Freshwater cyanobacteria

- Planktonic or benthic
- Can form dense blooms
  - water quality issues
  - Toxins (possible)
    - Drinking water
    - Swimming
    - Animals
    - Fish
- Shallow, eutrophic lakes (but not necessarily)





# Blooms & scums

- Not a new issue in NZ & widespread

## Pridmore & Etheredge 1987

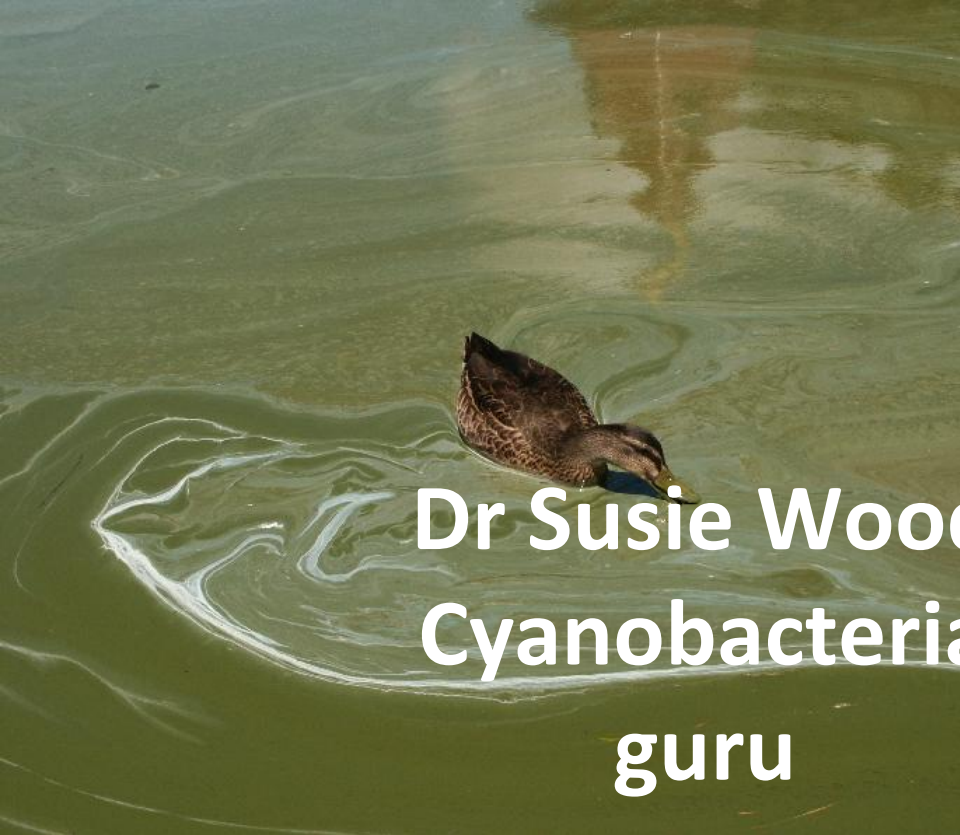
- Planktonic cyanobacteria detected in 127 NZ lakes
- Conspicuous blooms/scums reported from 33 NZ lakes (including Waihola)

## Wood *et al.* (2006)

- 37 lakes (incl. Waihola) screened for toxins
  - Microcystins most abundant class of cyanotoxin in NZ



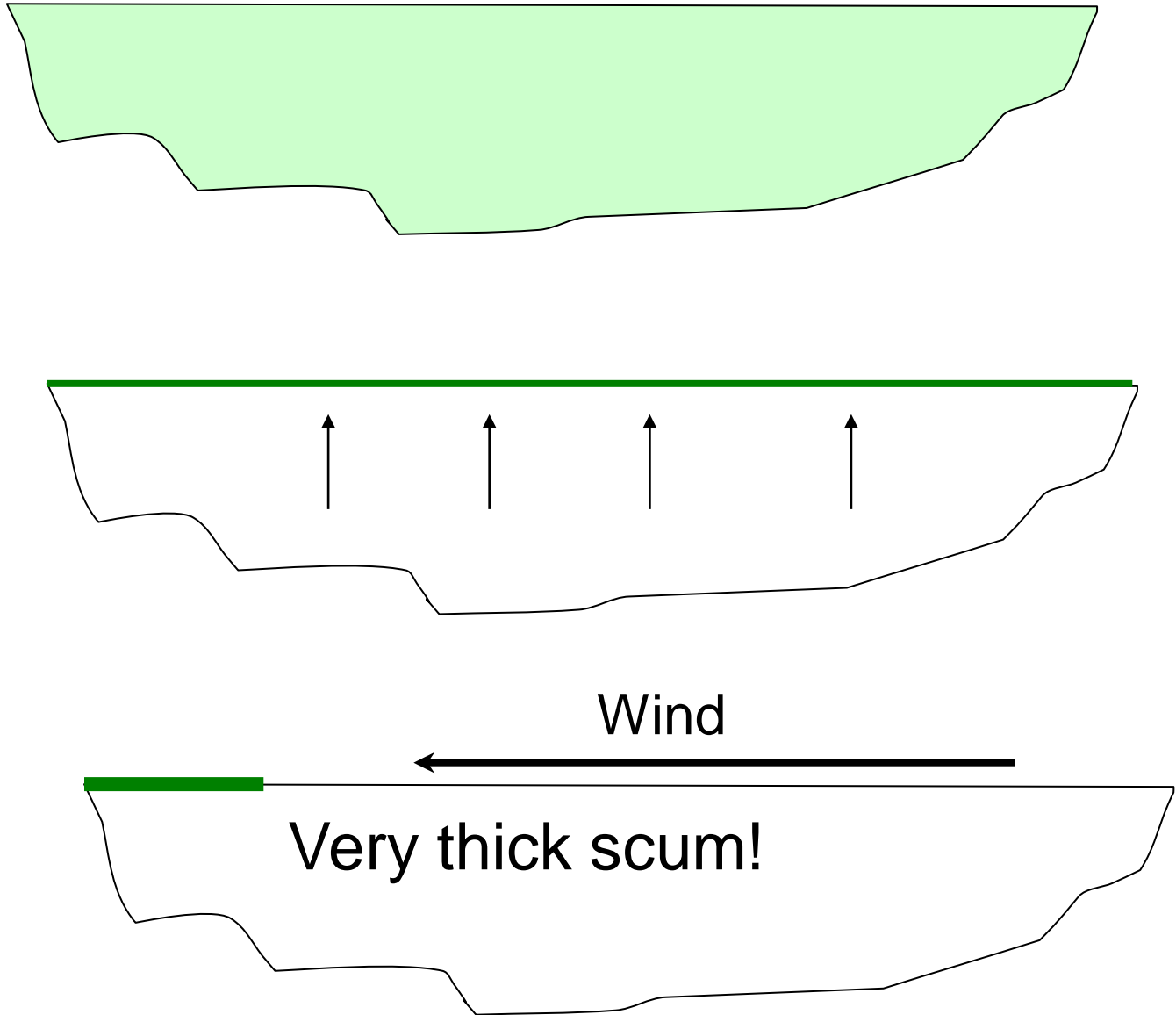




Dr Susie Wood  
Cyanobacteria  
guru



# How scums form



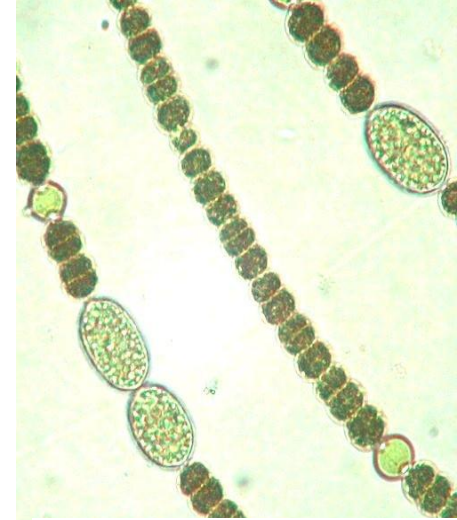


Lake Rotorua, Kaikou



# Lake Waihola

- Cyanobacteria blooms have occurred previously
- E.g. summer 2001/2002
  - *Anabaena lemmermannii*
  - Microcystin 1.7 µg/L
    - Drinking water MAV (provisional) : 1 µg/L
- Nutrient levels not likely to be limiting algal growth

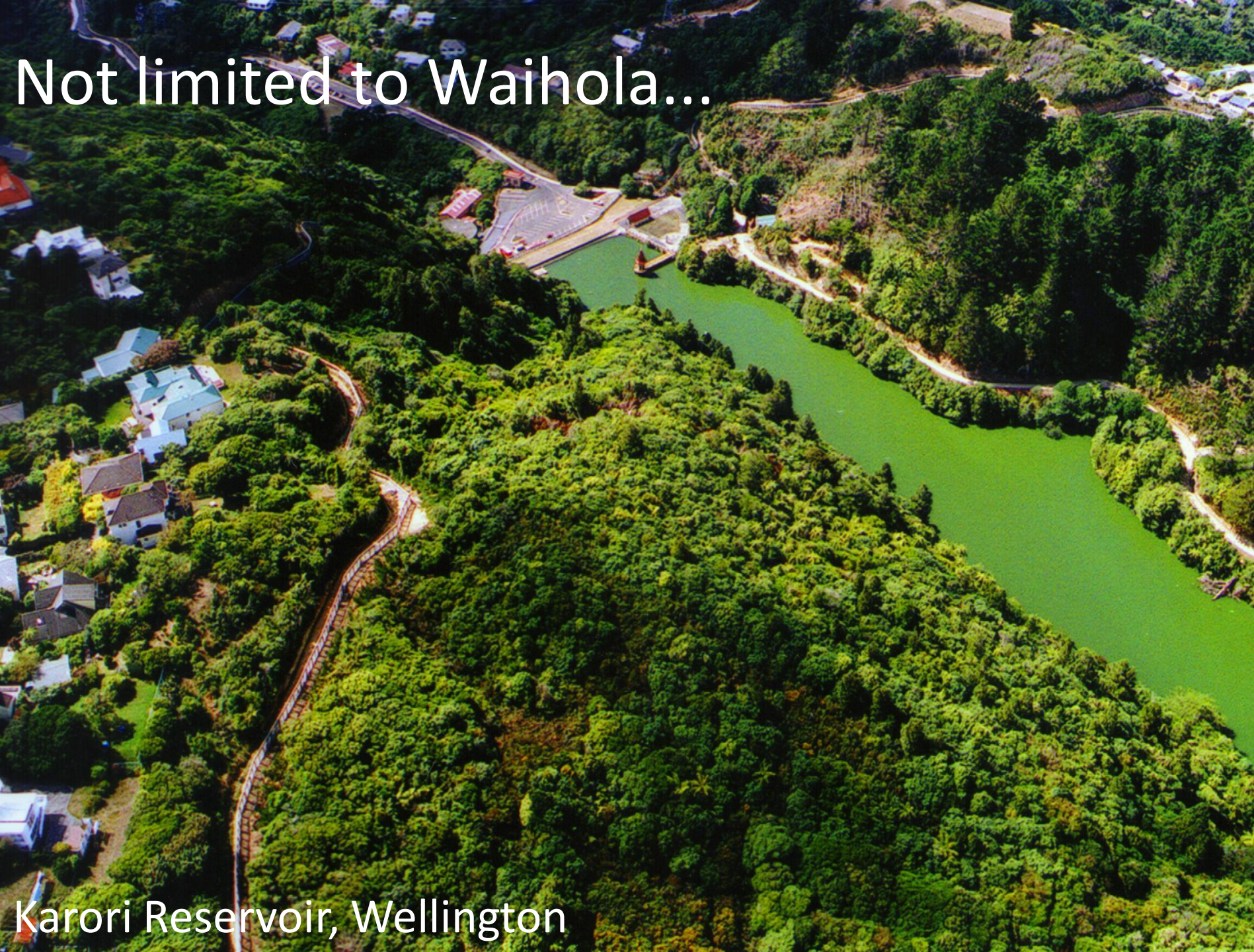


*Anabaena planktonica*





Not limited to Waihola...



Karori Reservoir, Wellington





L. Waahi

*Cylindrospermopsis sp.*



L. Rotoehu

*Microcystis sp.*



Karori Res.

*Anabaena sp.*

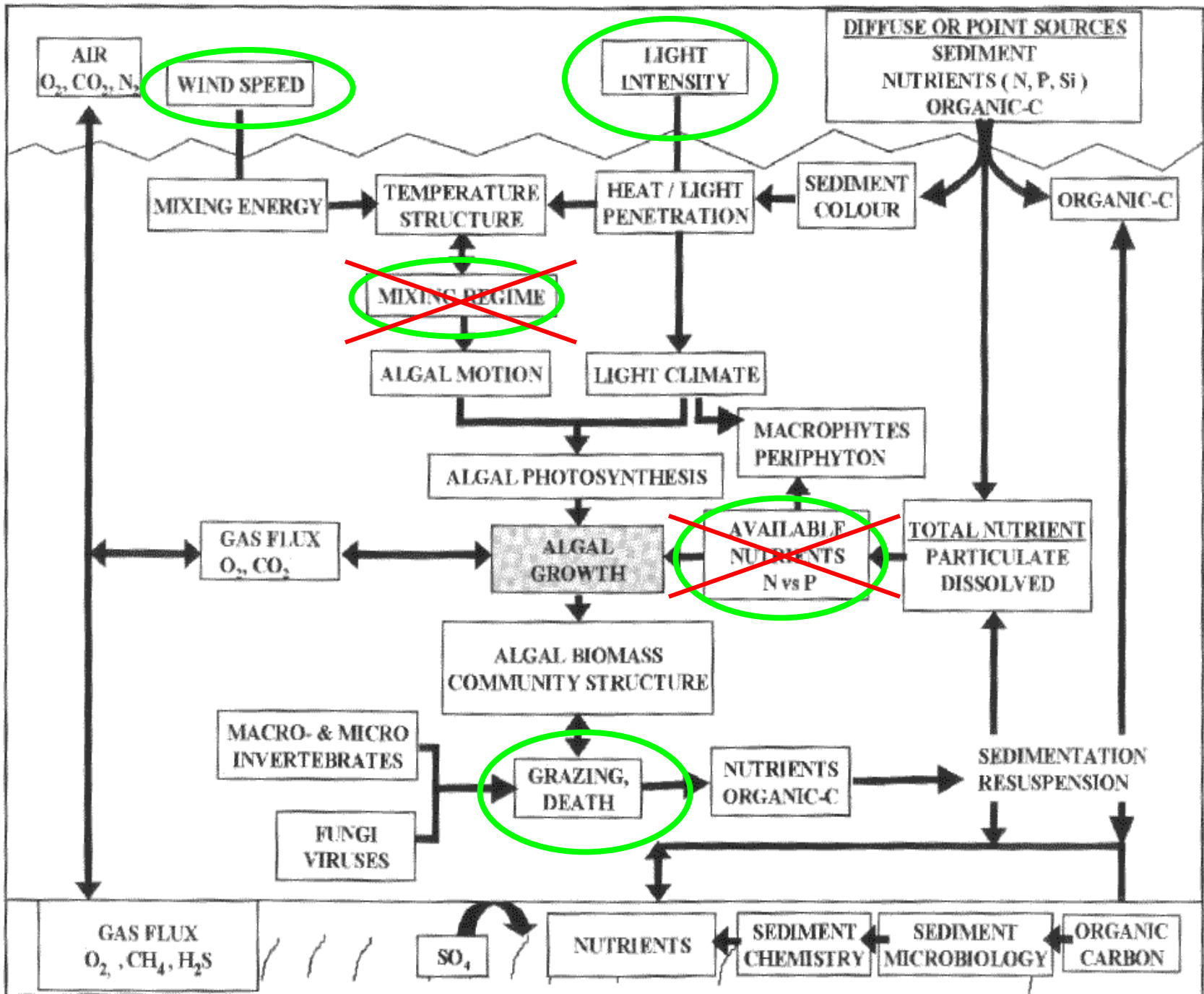


# Lake Horowhenua - Levin



*Microcystis* sp.







# Cyanotoxins

**ALGAE  
WARNING SIGN**

**Low Risk**      **Medium Risk**      **Unsafe**

ROTORUA DISTRICT COUNCIL

**HEALTH WARNING**  
LAKE ROTOTI  
BLUE-GREEN ALGAE  
DO NOT SWIM  
DO NOT DRINK  
DO NOT MAKE CONTACT WITH WATER OR LAKE VEGETATION  
DATED: 18 MARCH 2004

**WARNING**

TOXIC ALGAE PRESENT IN LAKE WATER. SERIOUS HEALTH RISK TO HUMANS AND PETS.

DO NOT MAKE CONTACT WITH WATER OR LAKE VEGETATION

*Lake Domain Board*

**CAUTION**  
ALGAL BLOOM PRESENT

**NO SWIMMING**  
**NO DRINKING**  
**OF LAKE WATERS**  
**AVOID LAKE EDGE SCUM**  
**BOATING USE PERMITTED**

MINIMUM WATER CONTACT ADVISED

HOROWHENUA LAKE DOMAIN BOARD

ROTORUA DISTRICT COUNCIL

**HEALTH WARNING**

LAKE ROTOTI

THERE IS A CONFIRMED PRESENCE OF **BLUE-GREEN ALGAE**

UNTIL FURTHER NOTICE THE WATER SHOULD **NOT** BE USED FOR:

**DRINKING**  
**SWIMMING**  
**WATER CONTACT SPORTS**

FOR FURTHER INFORMATION CONTACT:

ENVIRONMENTAL HEALTH SERVICES      Telephone: 07 348 4199 Working Hours  
COUNCIL ADMINISTRATION BUILDING      1061 HAUPAPA STREET      07 348 4195 After Hours  
ROTORUA

DATED: 18 MARCH 2004

18365-01

# Cyanotoxins

**Three broad classes:**

**Hepatotoxins = damage liver**

Microcystin eg: *Microcystis*, *Anabaena* 

Nodularin eg: *Nodularia*

Cylindrospermopsin eg: *Cylindrospermopsis*

**Neurotoxins = affect nervous system**

Anatoxin-a eg: *Aphanizomenon*, *Anabaena* 

Saxitoxin eg: *Lyngba*, *Anabaena*

**Dermatotoxins = skin irritants**

Lyngbyatoxin-a eg: *Lyngba*, *Anabaena* 

Aplysiatoxins

Lipopolysaccharides eg: most spp. 

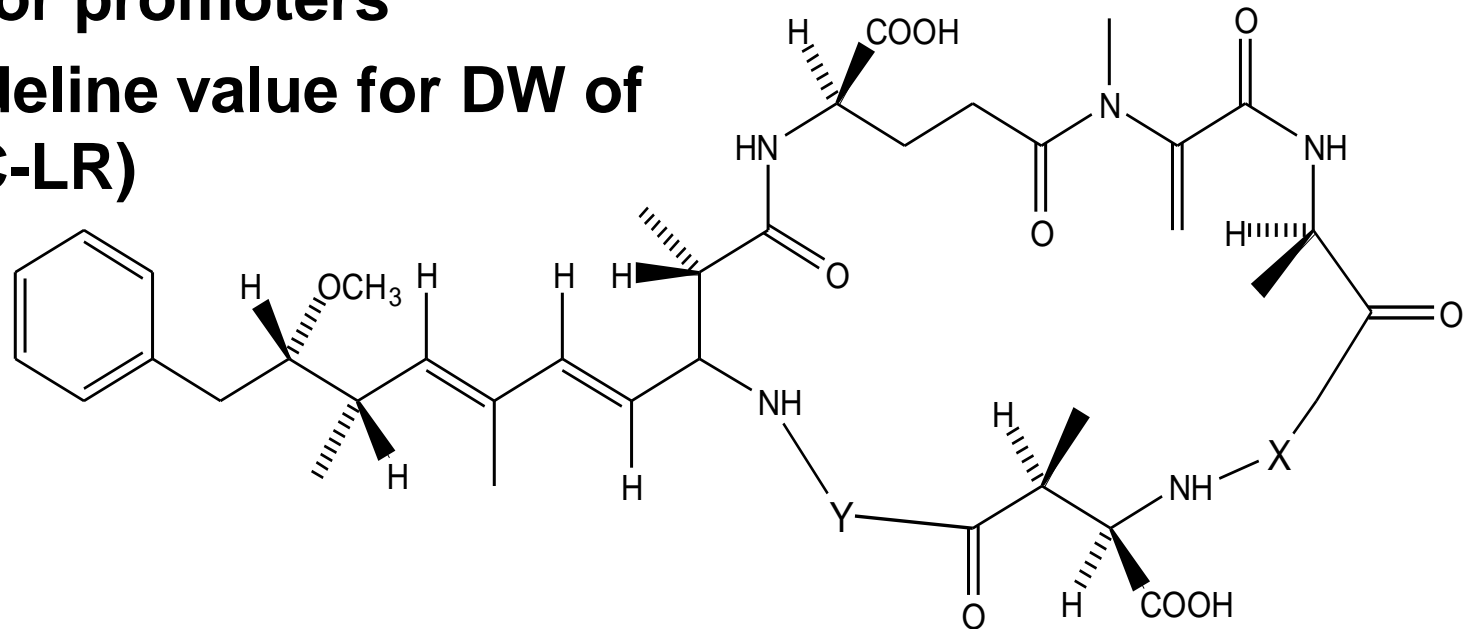


# Microcystins

- Globally the most frequently found cyanotoxin
- Some cases of human deaths from drinking contaminated water
- Inhibitors of protein phosphatases enzymes
- Liver tumor promoters
- WHO guideline value for DW of  $1\mu\text{g/L}$  (MC-LR)

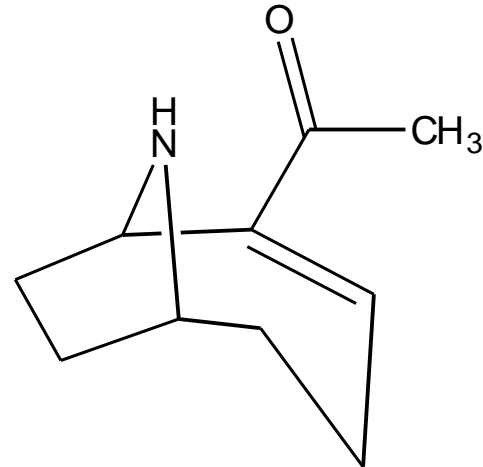


*Microcystis aeruginosa*



# Anatoxin-a & Homoanatoxin-a

- Not identified from Waihola
- Neurotoxin
- Rapid death from respiratory arrest
- Numerous dog deaths in NZ
- Esp. Benthic cyanobacteria in rivers



**NEWS 5**

**Algae can be deadly**

...c algae have and three dogs

...died last night. The warning said...

...the dog was killed after swimming in the Hutt River last Sunday. Owner Richard Nicholls saw no warnings.

...while his wife drove to a vet. The vet put Maggie into an incubator and gave her adrenaline.

...However, efforts failed.

...Both Mr Nicholls and the dog were upset at the loss of the dog.

## Dog killed by toxic algae in Hutt River

**COLIN PATTERSON**

A DISTRAUGHT Wellington dog owner performed cardiac massage on his dog in a desperate attempt to revive the animal when it collapsed after a swim in the Hutt River.

Despite his efforts, Richard Nicholls' six-year-old Labrador cross, Maggie, died after a dip in the river on Sunday.

Dog owners had been warned to keep their animals out of the water after tests revealed high levels of a bacterial algae.



"It's like losing one of your kids. My wife said she will refuse to go to the Hutt River ever again."

The Nicholls' other three dogs had their stomachs pumped.

Mr Nicholls believed Maggie's death would have been prevented had there been better signage. He saw no signs when he arrived at the river, though later saw one "relatively inconspicuous" sign.

There were other dogs in the water with their owners.

Hutt City Council spokesman John Pepper said the council had erected more than 70 signs along the river.

The council had also used the media to inform owners. Animal control staff and vets in the area had been alerted.

Upper Hutt City Council had also put signs by the river and had told dog owners about the problem.

Health officials said yesterday that the algae had been found in other areas.

## Council looks into dog 'poisonings' from river visits

Hutt City Council is looking into a report that three dogs have been poisoned whilst swimming in the Hutt River.

Louise Pierce from Taita says she took her dog Max for a swim near the dog exercise area north of Fraser Park on Sunday.

Her dog got sick shortly afterwards and had to be taken to the After Hours vet.

The vet told her that she was the third person to bring in a dog that appeared to have been poisoned during a visit to the river.

Max was induced to vomit and the vet treated her as if she had been poisoned with 1080.

"If I had not got her to the vet, she would have died," Louise says.

Whilst Max made a quick recovery, Louise was told that one of the other dogs had died.

Council animal control manager Les Dalton told the *Hutt News* shortly before we went to press yesterday that he would look into the matter.

If there is any problem with the water, he says the council will put up a sign warning dog owners.

**Warning too late:** Labrador cross Maggie died after swimming in the Hutt River last Sunday. Owner Richard Nicholls saw no warnings.

...while his wife drove to a vet. The vet put Maggie into an incubator and gave her adrenaline.

...However, efforts failed.

...Both Mr Nicholls and the dog were upset at the loss of the dog.

**algae have killed dog**

**Fears killer algae may flare up in other areas**

**LANE NICHOLLS**

**Authorities fear a toxic algal bloom in the Hutt River that has killed at least two dogs will flare up in other Hutt Valley waterways.**

It has brought a warning to keep children and pets away from shallow water. Hutt City Council is urging residents to be vigilant around streams, ponds and drains after a warm weather and low rainfall increase the risk of the algae polluting river water supplies.

Greater Wellington regional council issued a warning last week about high toxin levels in the Hutt River.

Lower Hutt environmental health officer Dean Bentley said the health warning was the same as for kaitiaki (dog) or Waiatapu five years ago.

Warnings signs around the river have been erected along its length.

At a public meeting last night, council manager Don Carson said the warning was the same as for kaitiaki (dog) or Waiatapu five years ago.

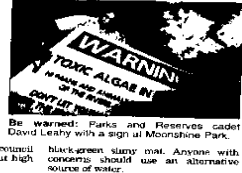
The council advised rural land owners with private water supplies to check the water for toxins.

The algae bloom will remain a threat if it is washed away by a heavy downpour.

blackscreen slumy mat. Anyone with concerns should use an alternative source of water.

Hutt and Upper Hutt city councils have erected signs along rivers and stream banks advising of potential hazards to swimming or walking dogs.

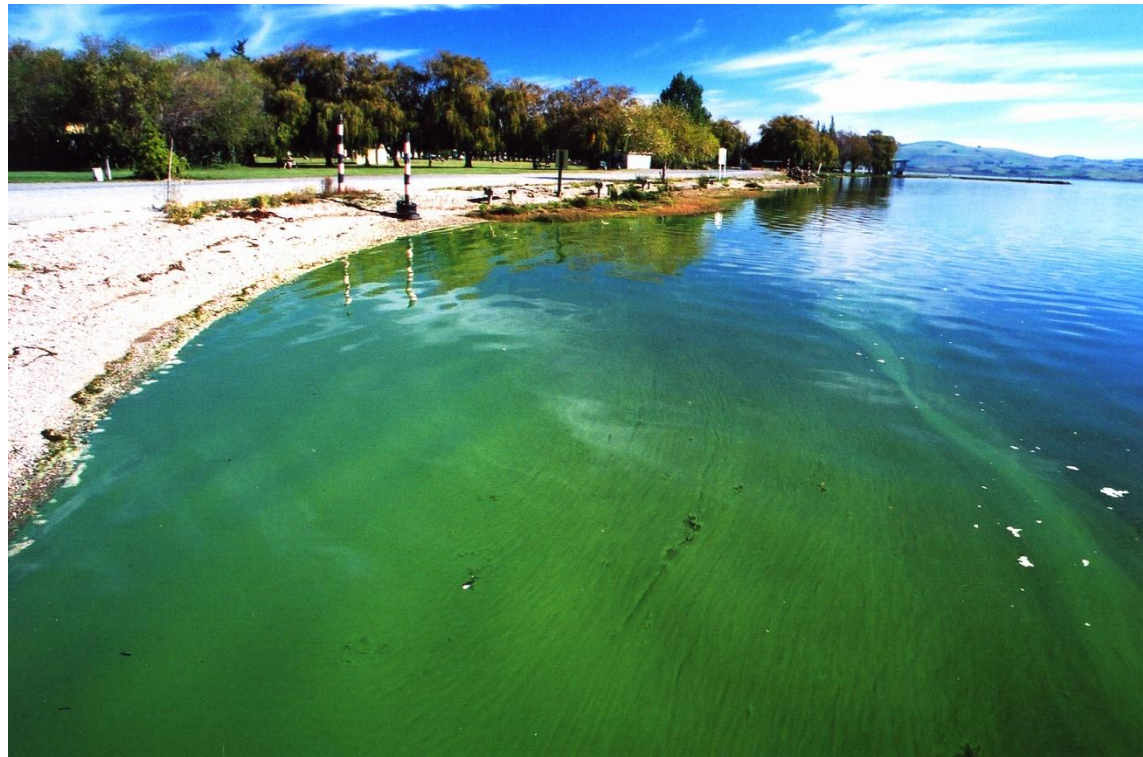
The algal bloom will remain a threat if it is washed away by a heavy downpour.





# Dermatotoxins

- Severe dermatitis
- Burning or itching skin
- Red eyes & lips
- Asthma symptoms
- Sore throat
- Dizziness



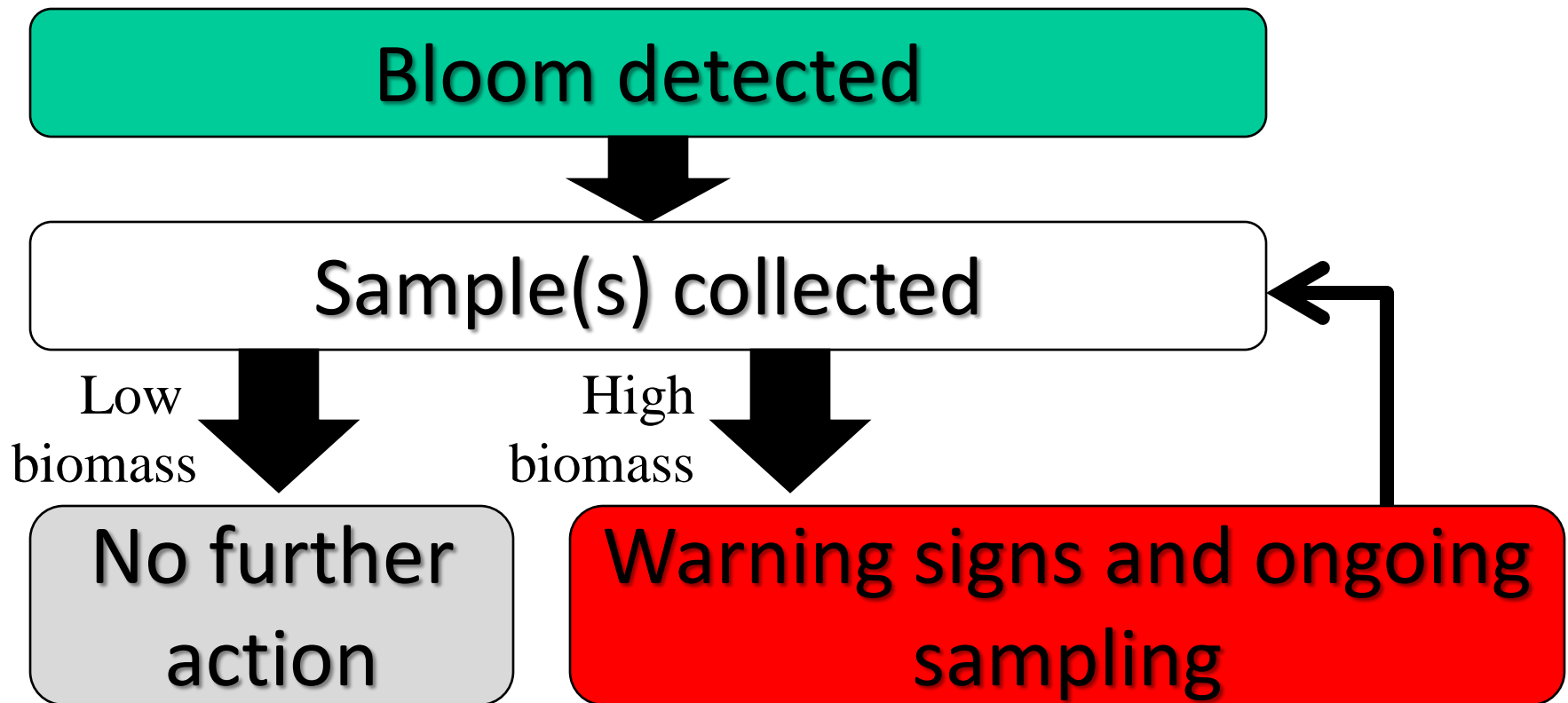
# Safety considerations

- Significant health consequences from drinking contaminated water
  - Humans
  - Animals (esp. dogs & horses)
- Swimming or showering/bathing
  - Dogs
- Contaminated irrigation water can deposit toxins & cells on crops



# Take-home messages

- Blooms are likely to develop from time to time
  - Settled, warm weather
- Precautions during blooms:
  - Don't drink lake water (boiling won't remove toxins)
    - Including stock water
  - Minimise contact with water
  - Keep dogs out of water
  - Don't irrigate using lake water during



- No routine monitoring for cyanobacteria in Otago
- Rely on public and/or ORC staff to report



# Thanks!

- A massive thanks to Susie Wood (Cawthron Institute) who provided much of the material for this presentation

