

**Drinking water supply and algal
blooms;
tools to identify noxious algal
chemicals and protect drinking
water sources in SC.**

Peter van den Hurk, Jim Strickland

SOUTH CAROLINA

Algae causing taste, odor problems in Upstate drinking water

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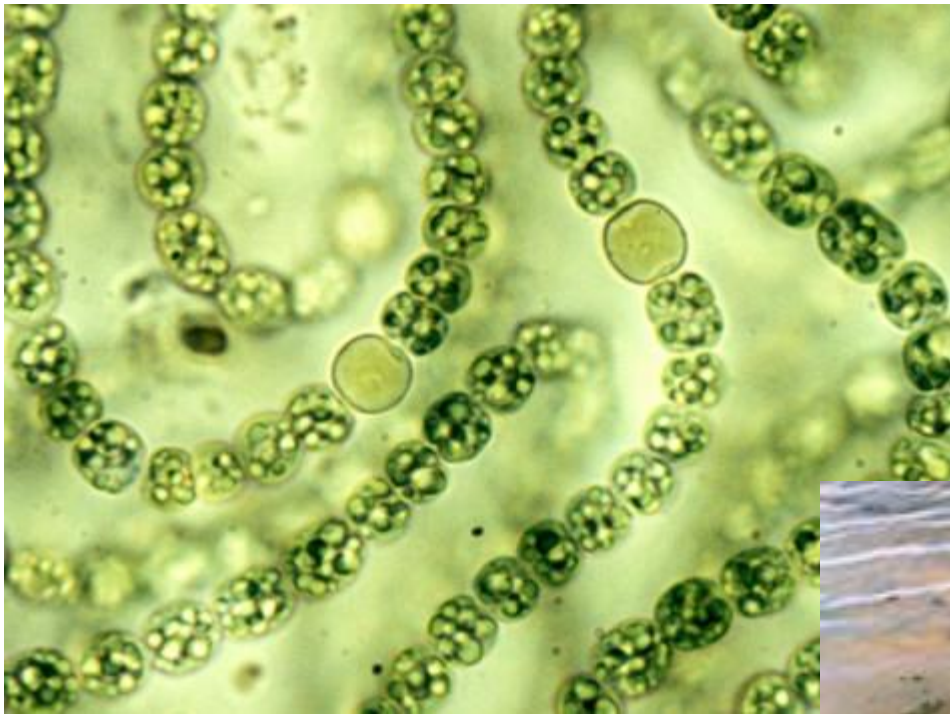
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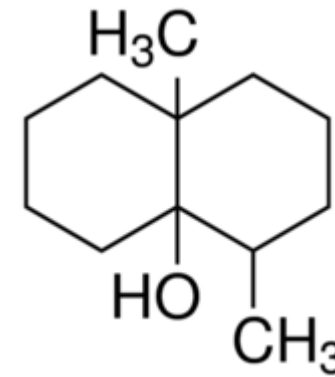
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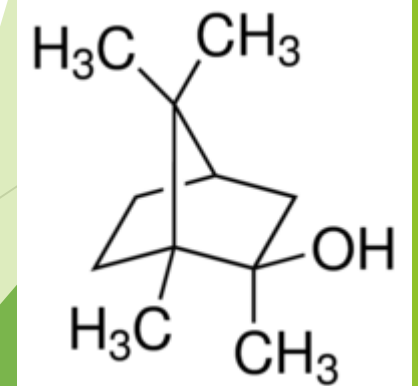


Toxic algal chemicals:

- Microcystin
- Saxitoxin
- Cylindrospermopsin



Geosmin



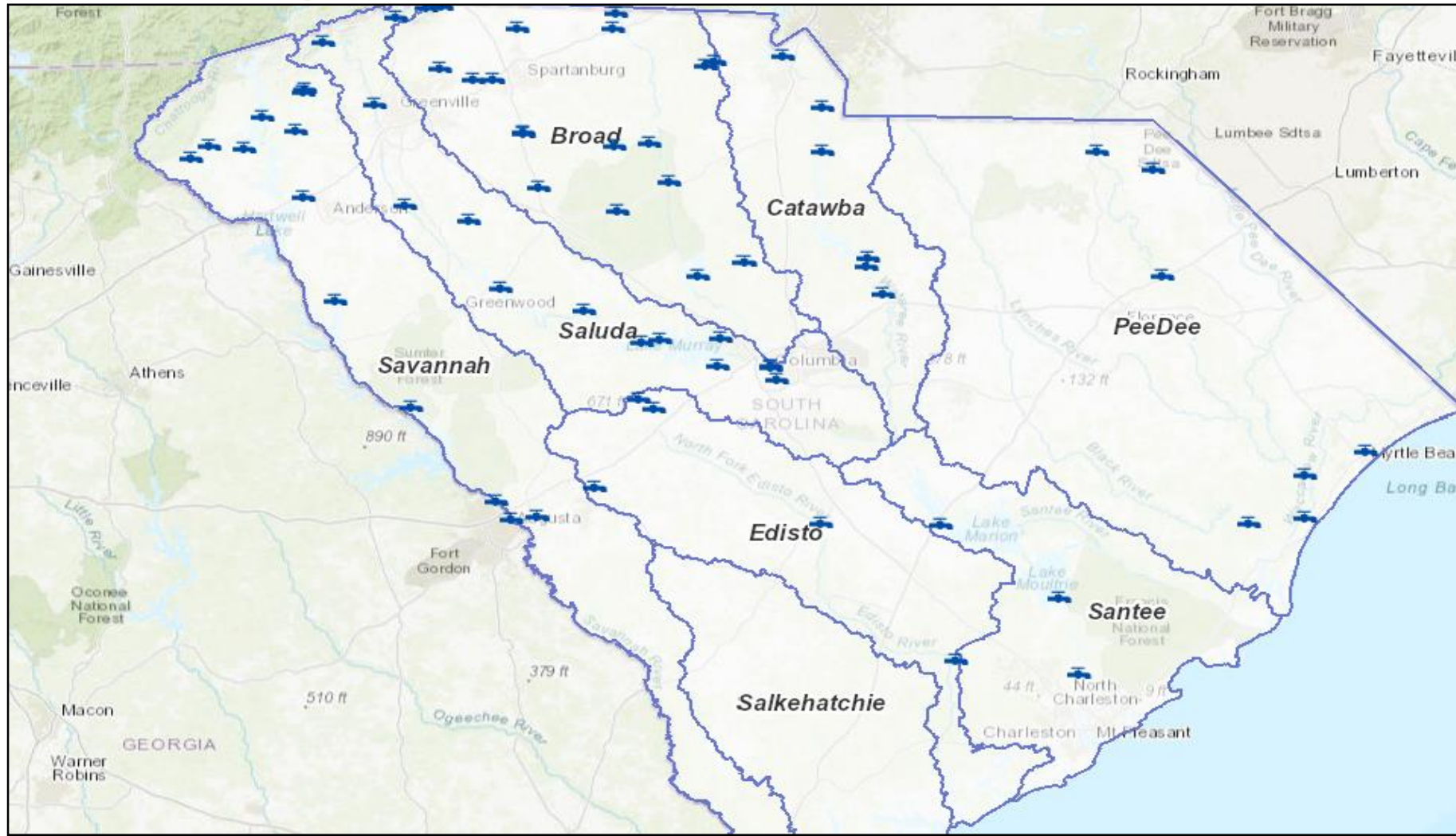
2-methylisoborneol

Questions and objectives

- ▶ How prevalent are T&O events in SC ?
- ▶ Lack of analytical capacity for T&O compounds in SC
- ▶ Address T&O causing conditions in watershed management plans

- ▶ **Goals:**
- ▶ Provide analytical capacity for T&O compounds
- ▶ Inventory of drinking water providers with T&O problems
- ▶ Develop tools to analyze and predict T&O events

Surface water intake sources for drinking water



Questionnaire

- ▶ 54 drinking water providers that use surface water
- ▶ Responses from 41 collected
- ▶ 20 reported having had issues with T&O compounds, from frequent in the last 5 years, to very rarely.

- ▶ Economic costs of T&O treatment:
 - ▶ Greenwood: \$65k/y for activated carbon
 - ▶ Anderson: \$13m investment in ozone treatment

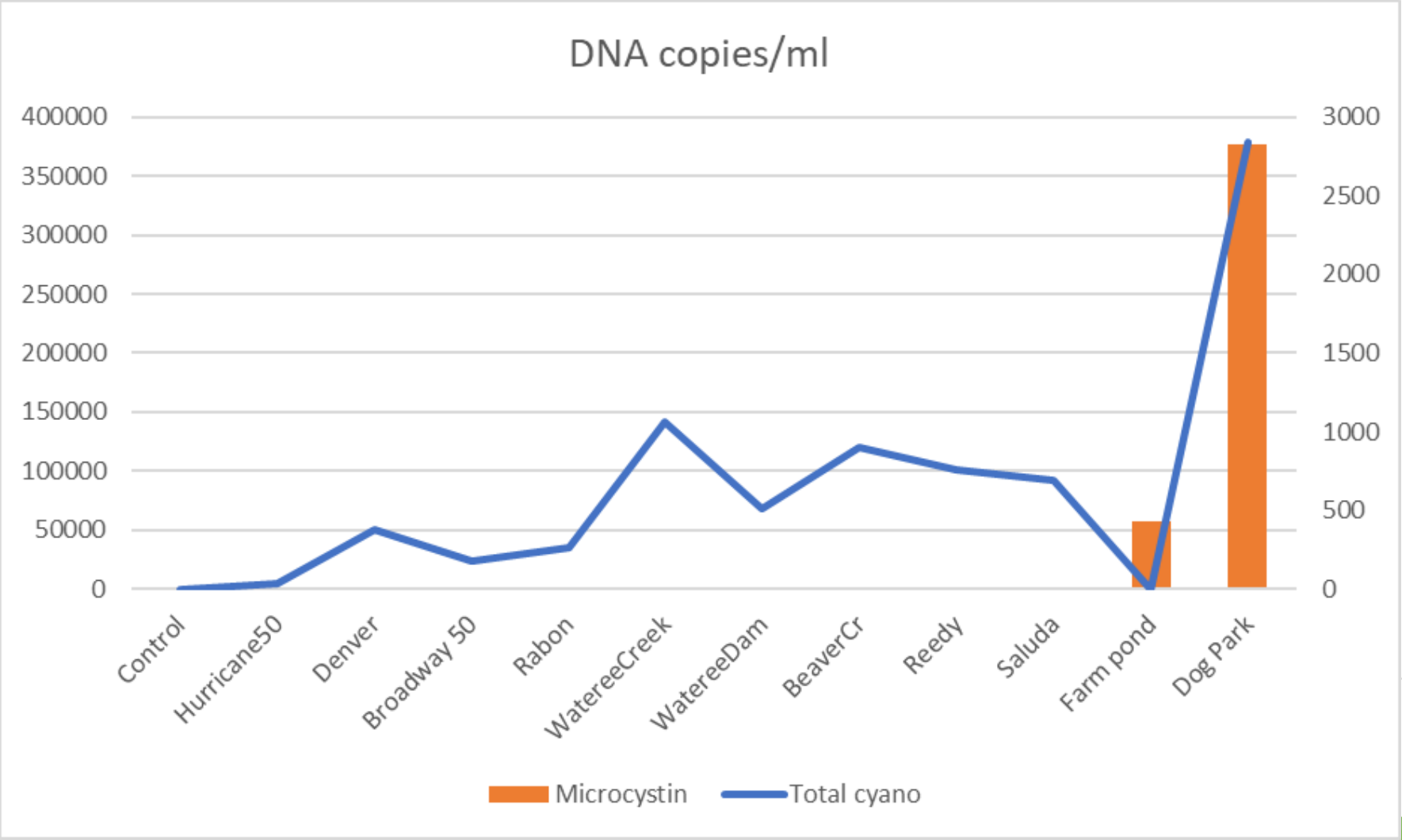
Chemical analysis of T&O

- ▶ Geosmin and MIB are very water soluble, very stable, and volatile
- ▶ Humans can smell < 10 ng/l (ppb)
- ▶ Analysis traditionally done with GC/MS
- ▶ We are developing LC/MS method

e-DNA

- ▶ Analyze environmental samples for species-specific DNA using qPCR
- ▶ For cyanobacteria:
 - ▶ Filter water sample
 - ▶ Homogenize filtered algae
 - ▶ Use species-specific DNA primers to measure # of DNA copies in sample
- ▶ For T&O:
 - ▶ Use primers that detect the enzymes that produce geosmin and MIB

Phytoxygene kit results



Future research

- ▶ Use T&O measurements, together with e-DNA, and abiotic parameters to build model that can predict T&O events
- ▶ Measure these parameters in annual cycle
- ▶ Identify specific algae blooms during T&O events
- ▶ Develop early warning system
- ▶ Develop effective mitigation strategies:
 - ▶ Nutrient reduction
 - ▶ Lake levels
 - ▶ Benthic substrate modifications