Using satellite imaging for early detection of harmful algal blooms

Presented to the Public Health Advisory Council

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What does the Swim Beach Monitoring Program do?

- **We provide timely and accessible information on water quality at designated swim beaches and other publicly accessible waterbodies used for recreation**

- **We work with lake managers and parks departments to post notifications during unsafe conditions**

- **We issue weekly newsletters during the summer with advisory updates and how to protect yourself and your family from potentially hazardous conditions**

What are harmful algal blooms?

- **Rapid growth of algae or cyanobacteria**

- **Algae: broad, informal term for photosynthetic eukaryotes**

  - Cyanobacteria= blue-green algae

    - Microcystin: liver toxin

    - Anatoxin: neurotoxin

- **Algae are always present, but they can grow out of control in certain conditions**

  - Slow-moving water=warm water

  - Sunlight

  - Nutrient pollution

The issue: it's hard to predict HABs

- **Increasing temperatures (climate change) and high levels of nutrient pollution make harmful algal blooms more likely to happen, but it is still difficult to predict when and where a bloom will occur**


8 AM → 1 PM

Vancouver Lake, 8/3/2020

Satellite imagery as a tool to predict blooms

- **Cyanobacteria Assessment Network (CyAN): a multi-agency project among EPA, NASA, NOAA, and USGS**

    - Purpose: develop and early warning indicator system to detect algal blooms in freshwater systems

    - Gives us the capability of detecting and quantifying algal blooms

    - Pigments associated with algal blooms can be detected and measured with special satellite instruments
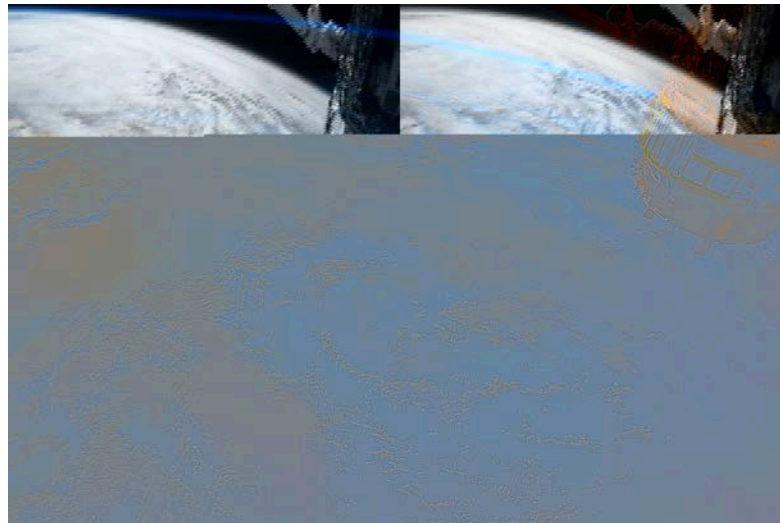
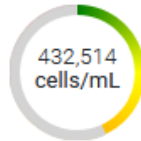# An overview of CyAN App

Location Name ▼   X

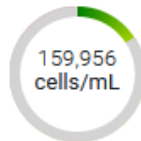☐ Show checked locations   3 locations

Flushing Channel-Vancouver Lake
45°40'10"N, 122°44'30"W
(Max adjacent
cells: 432,514)
432,514 cells/mL
⬇ 12,117
cells/mL
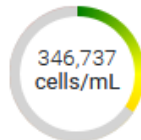since 07-28-2021
Date: 07-29-2021

Shillapoo-Vancouver Lake
45°39'51"N, 122°43'1"W
(Max adjacent
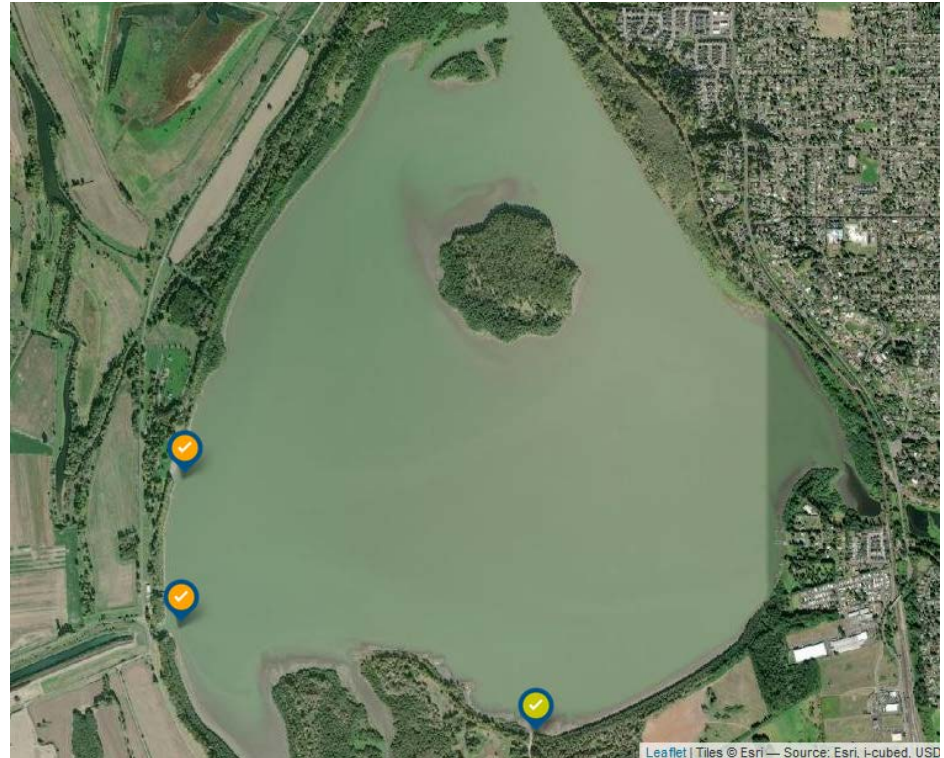cells: 159,956)
159,956 cells/mL
⬇ 196,495
cells/mL
since 07-28-2021
Date: 07-29-2021

Swim Beach-Vancouver Lake
45°40'36"N, 122°44'29"W
(Max adjacent
cells: 409,261)
346,737 cells/mL
⬆ 241,055
cells/mL
since 07-28-2021
Date: 07-29-2021

Collecting the data

- **400+ days, 1600+ total data points**

  - May 2016 to present day

  - Only Vancouver Lake

    - Swim beach, flushing channel, Shillapoo Wildlife Area, and maximum lake value

- **For many days, no picture could be taken because of cloud cover, wildfire smoke, etc.**

- **Used our historical records to determine when a bloom was present in Vancouver Lake and assigned each day into the "bloom present" or "no bloom present" category"**
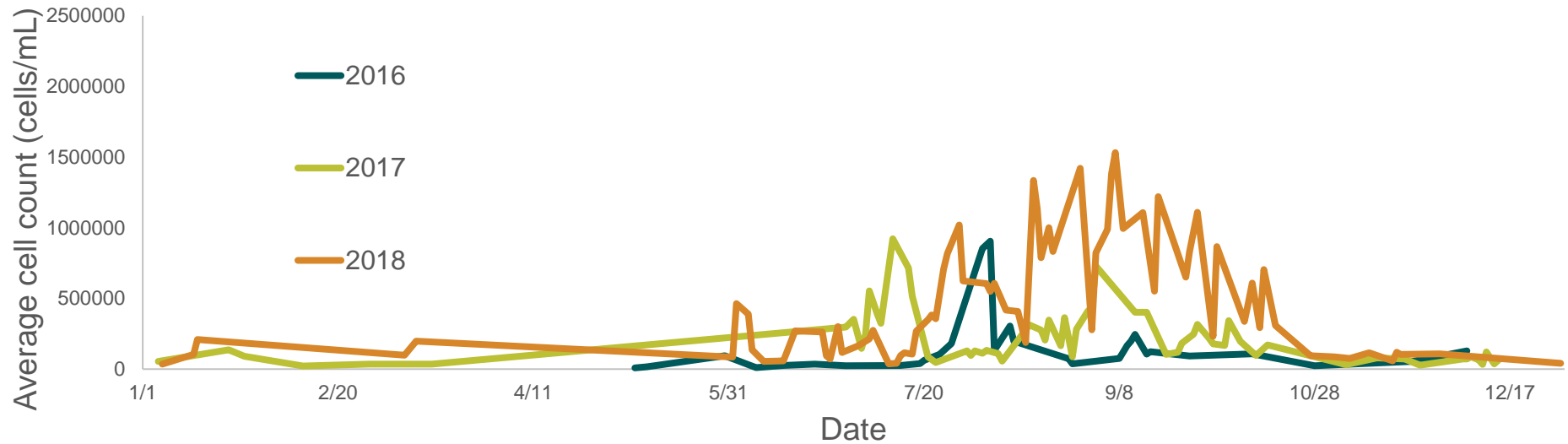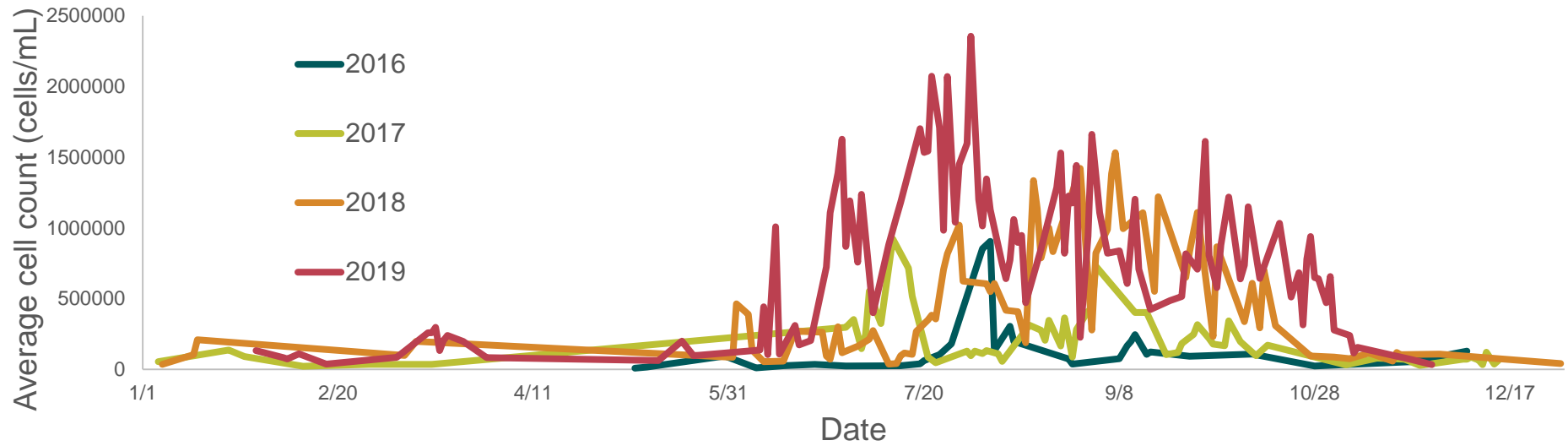
Cyanobacteria count timeline (Vancouver Lake 2016-2021)
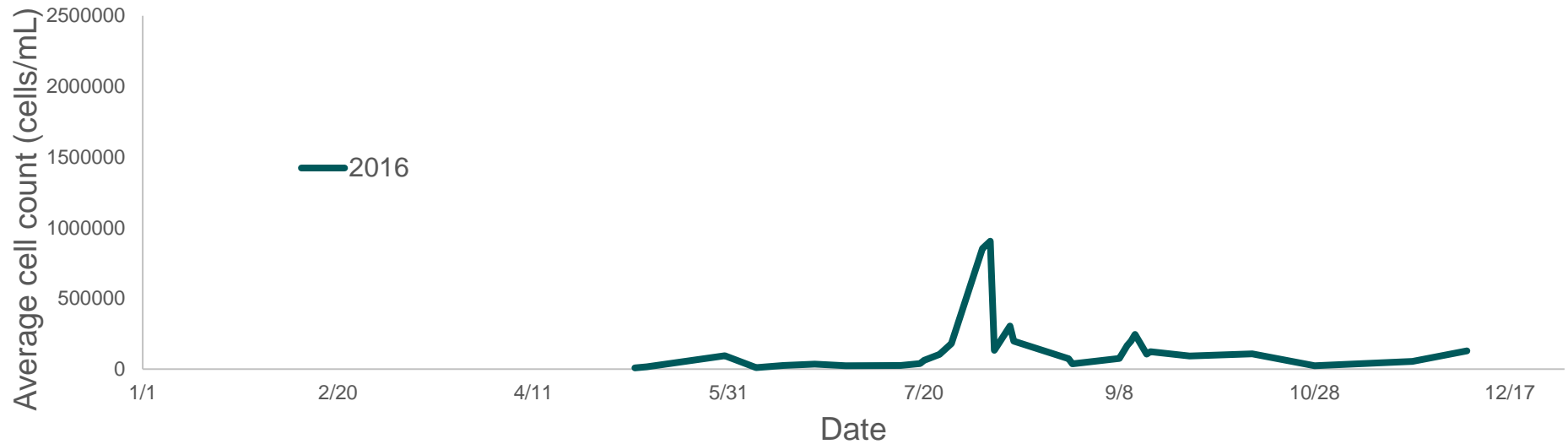
Cyanobacteria count timeline (Vancouver Lake 2016-2021)
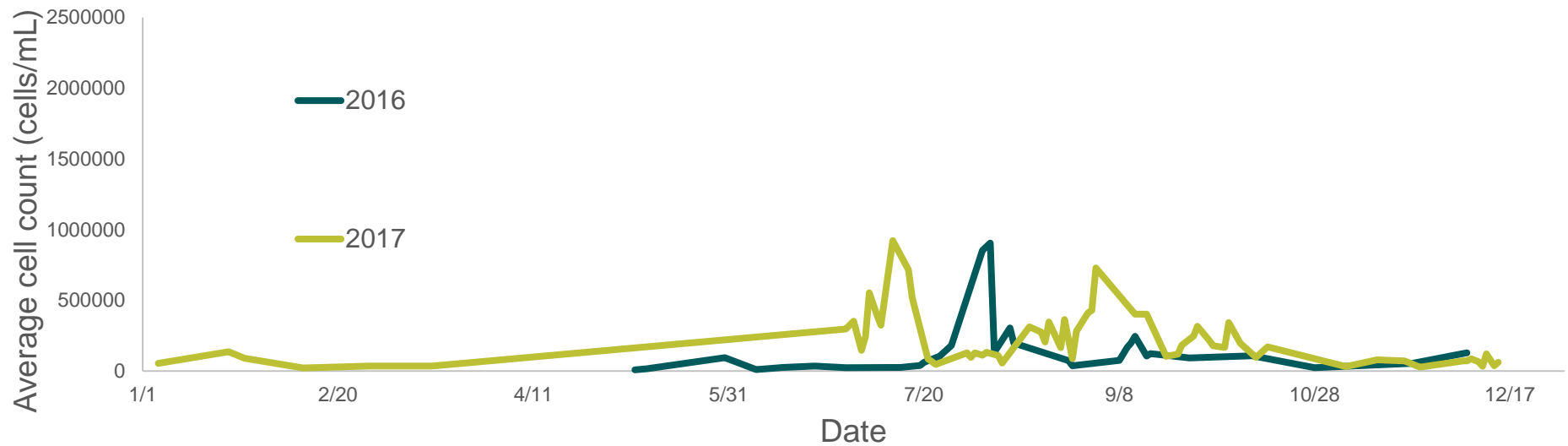
Cyanobacteria count timeline (Vancouver Lake 2016-2021)
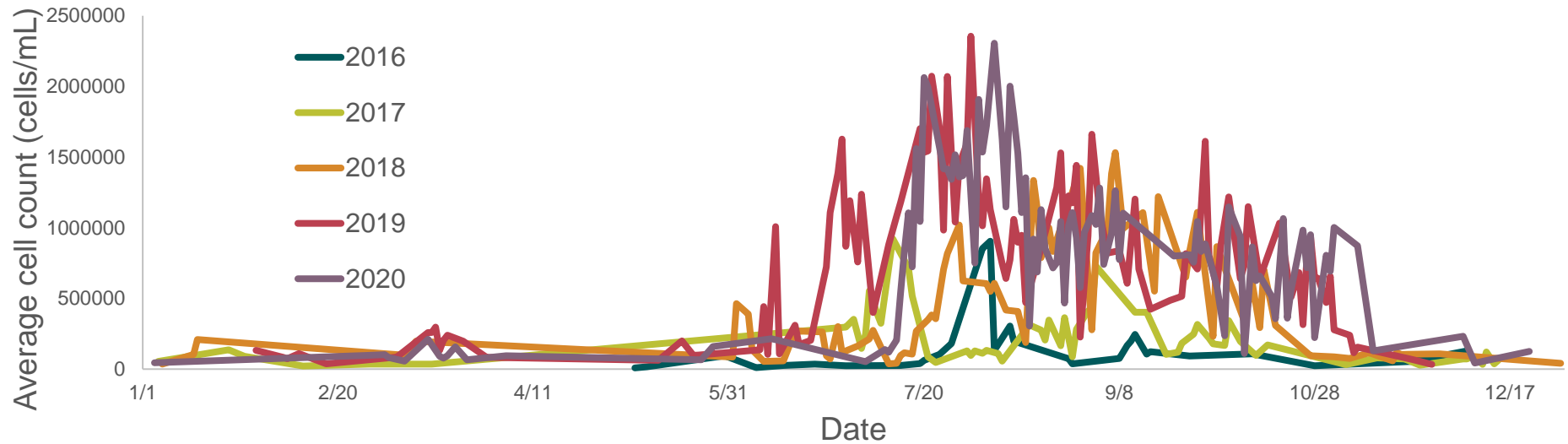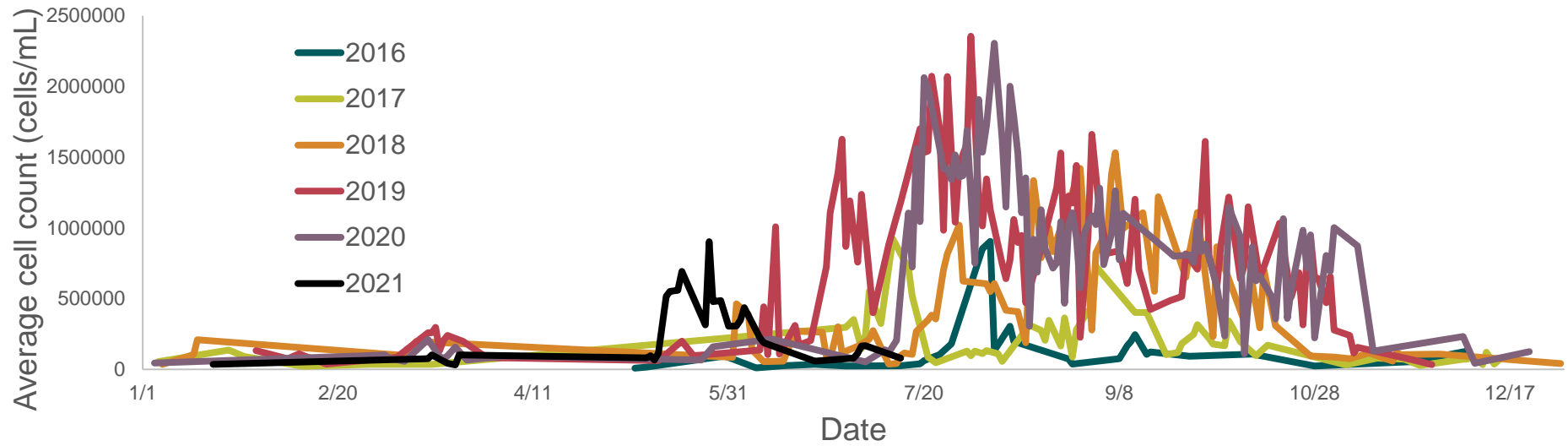
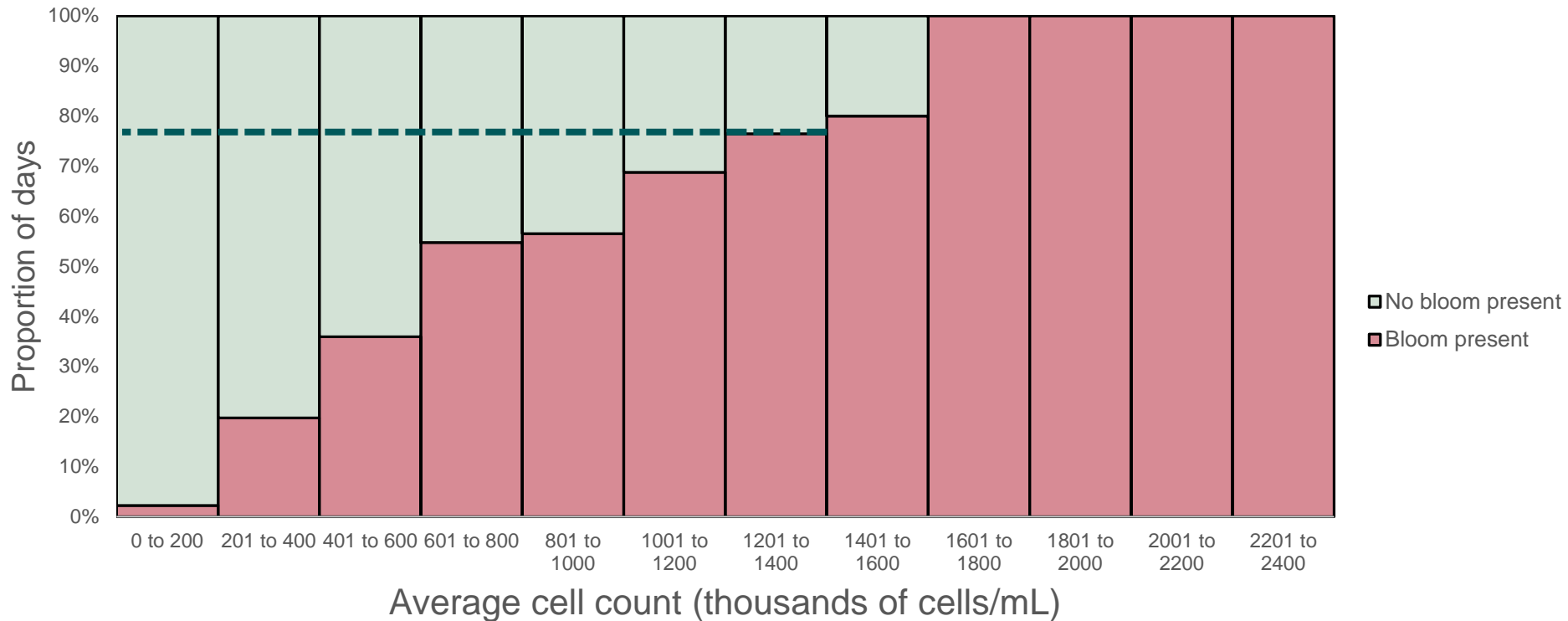Cyanobacteria count timeline (Vancouver Lake 2016-2021)

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Results

Comparing cyanobacteria count to bloom presence (Vancouver Lake, 2016-2021)

How can we use this data?

- **We can set a threshold cell concentration**

  - When it's above this value, do a site visit to check for bloom and test for toxicity

  - Would allow for earlier detection of algal blooms and less reliance on notifications from the public

- **More successful detection of algal blooms**

  - Issue advisories sooner to better protect human and animal health

- **We can see if a past bloom was likely present but not reported**

Areas for improvement

- **Limited by spatial resolution**

- **Cloud cover/wildfire smoke**

- **This technology isn't a foolproof solution**

  - We still rely on the public to notify us of potential blooms

    - If you see something, say something

    - https://clark.wa.gov/public-health/report-health-concern

You can get involved, too!

- **The CyAN App is available on Android and most web browsers**

- **https://qed.epa.gov/cyanweb/account**

Thank you!

Comments and questions

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