United States Environmental Protection Agency

Using Satellite Data to Monitor the Impacts of CyanoHAB Events on Drinking Water: A Texas Case Study

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Office of Research and Development
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Photo courtesy of NASA

Photo courtesy of U.S. EPA

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Toxic Algae Halts Water Service In Texas City

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Blue-green algae warning for San Luis Reservoir

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Cleburne water funky but safe to drink

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Cleburne water funky but safe to drink

Blue-green algae typical this time of year

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NASA

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NOAA
U.S. DEPARTMENT OF COMMERCE

USGS
science for a changing world

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Onboard Envisat
2008-2011
Data collected every 3 days

Onboard Envisat
2008-2011
Data collected every 3 days

Onboard Sentinel-3A and 3B
2017 and beyond
Data collected every 1-2 days

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Photo courtesy of National Geographic

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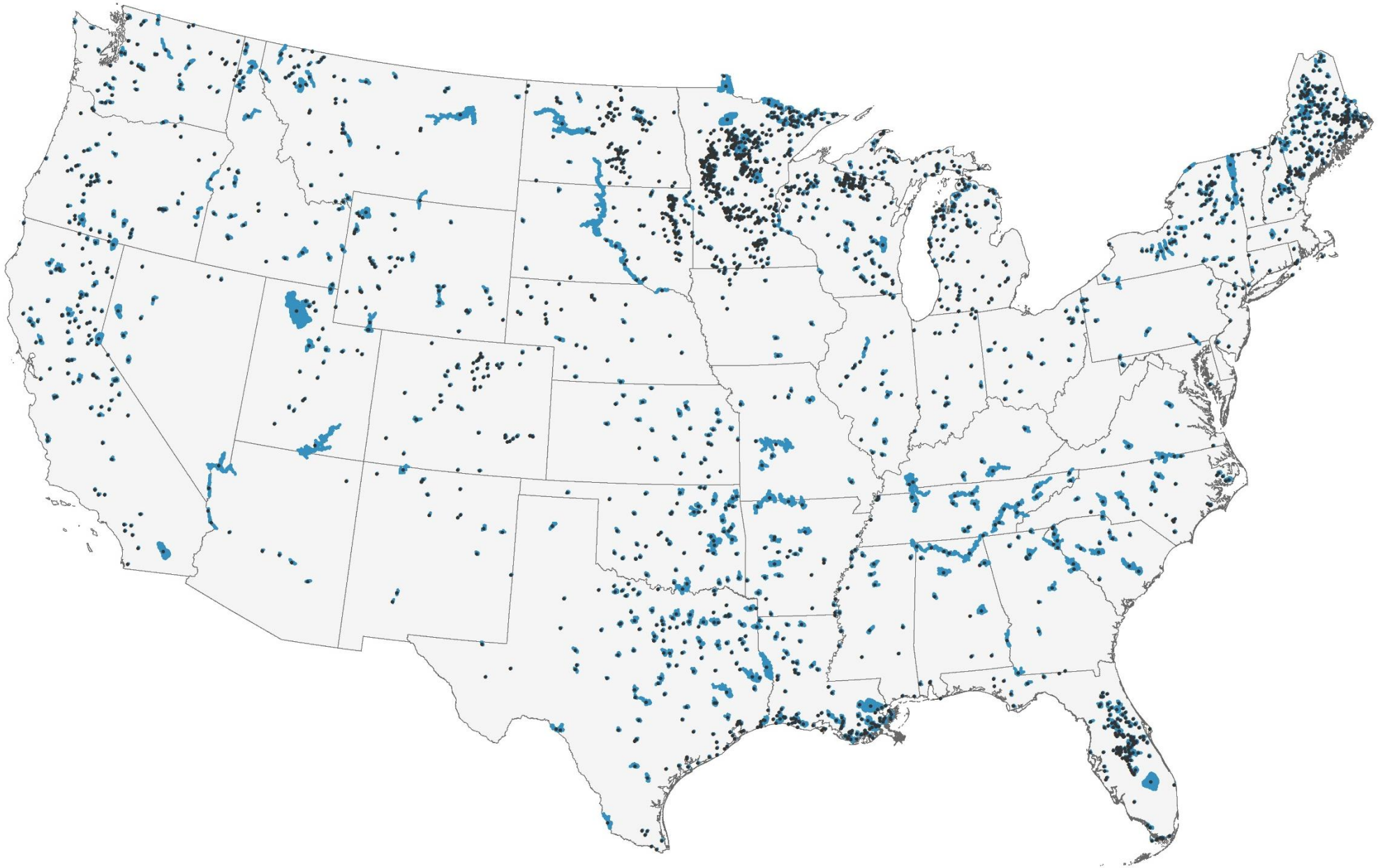

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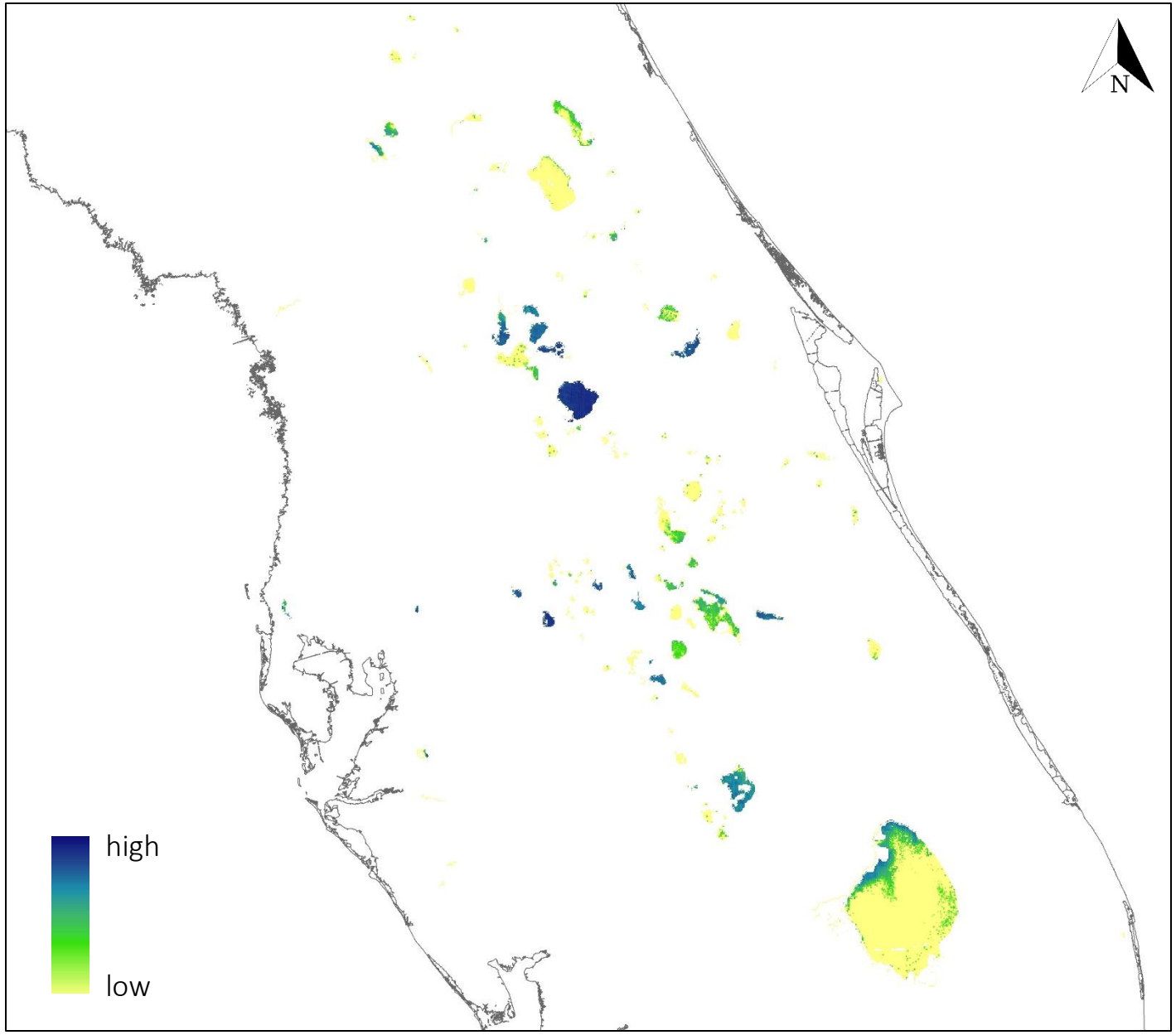
Central Florida



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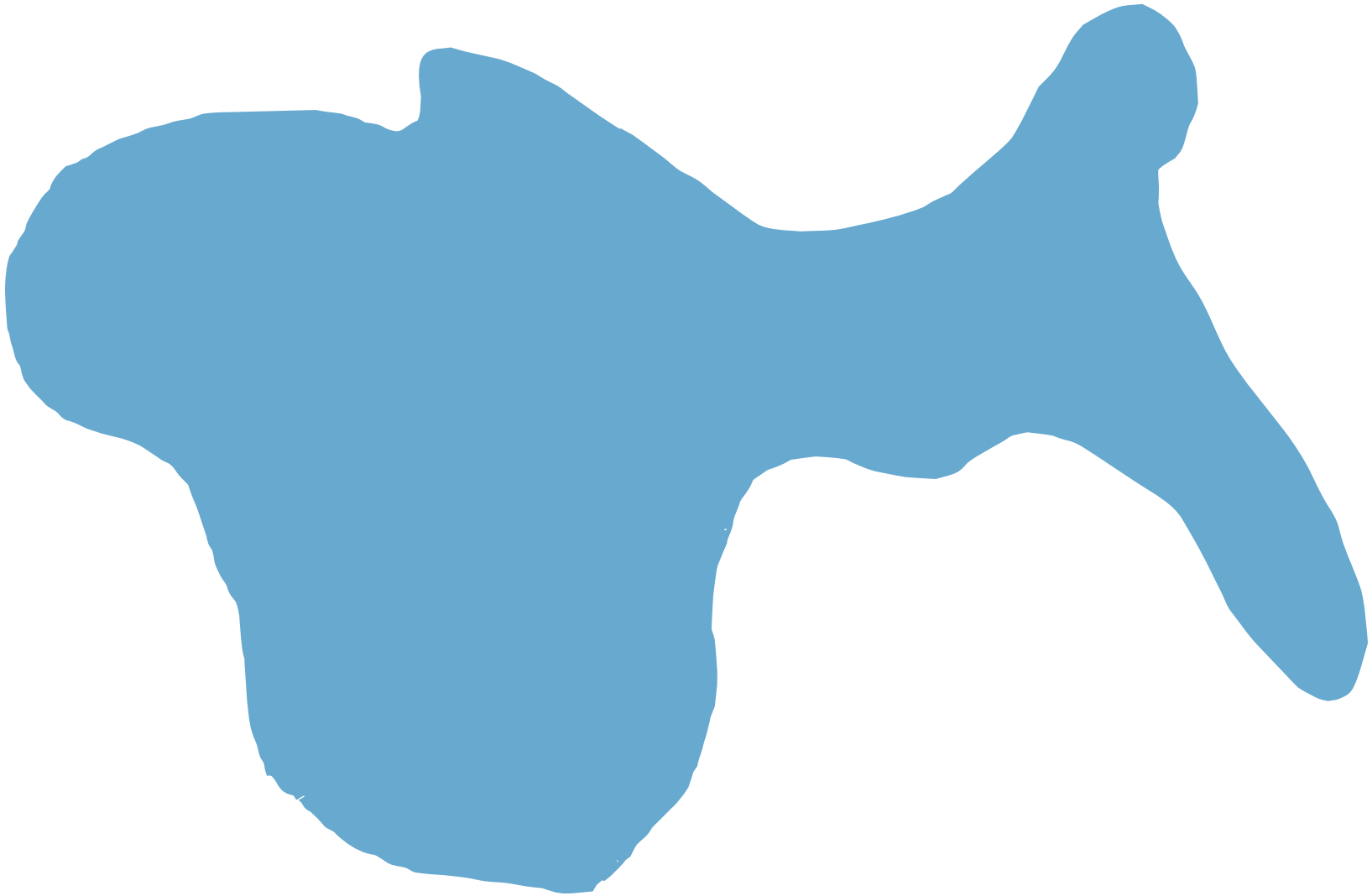

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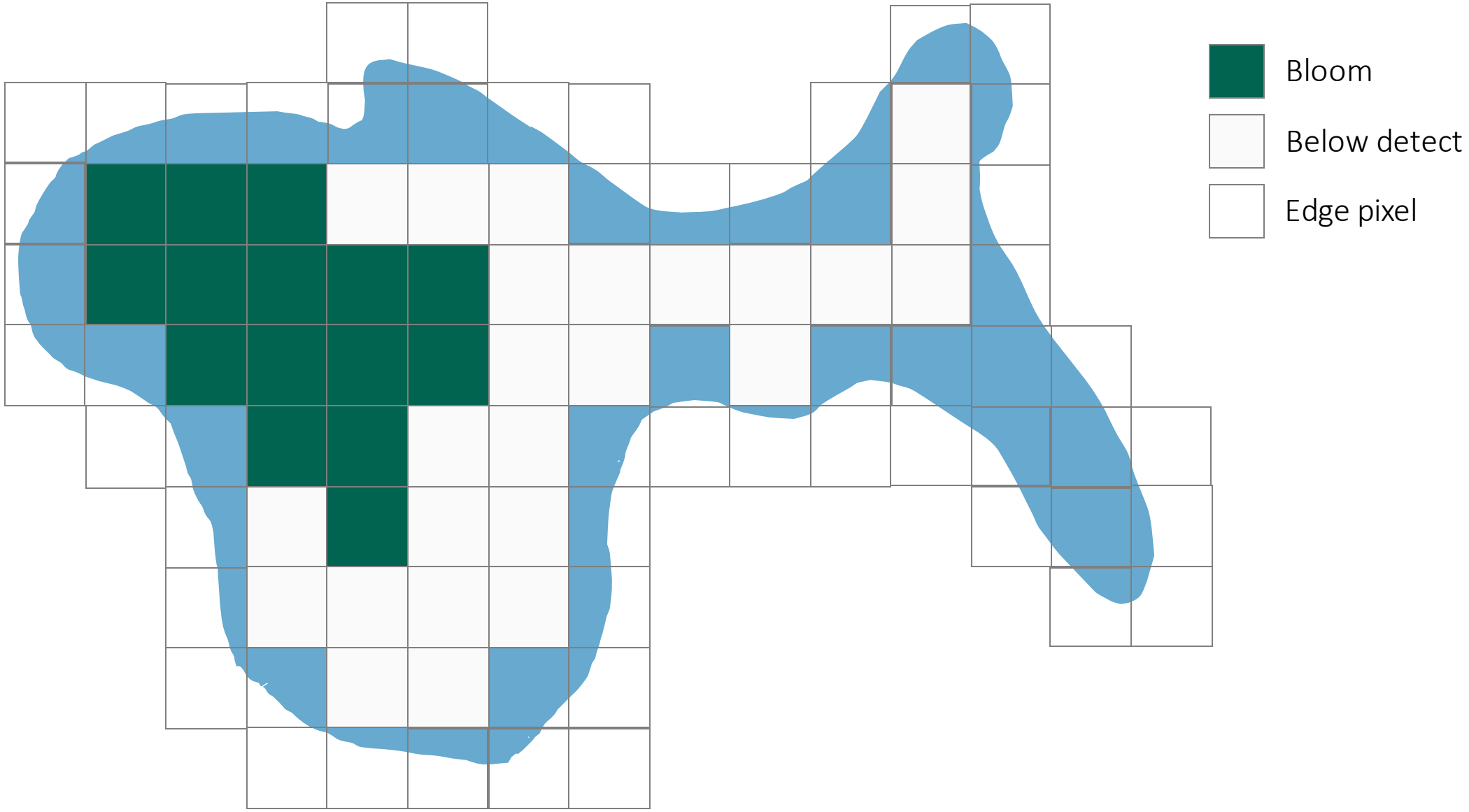

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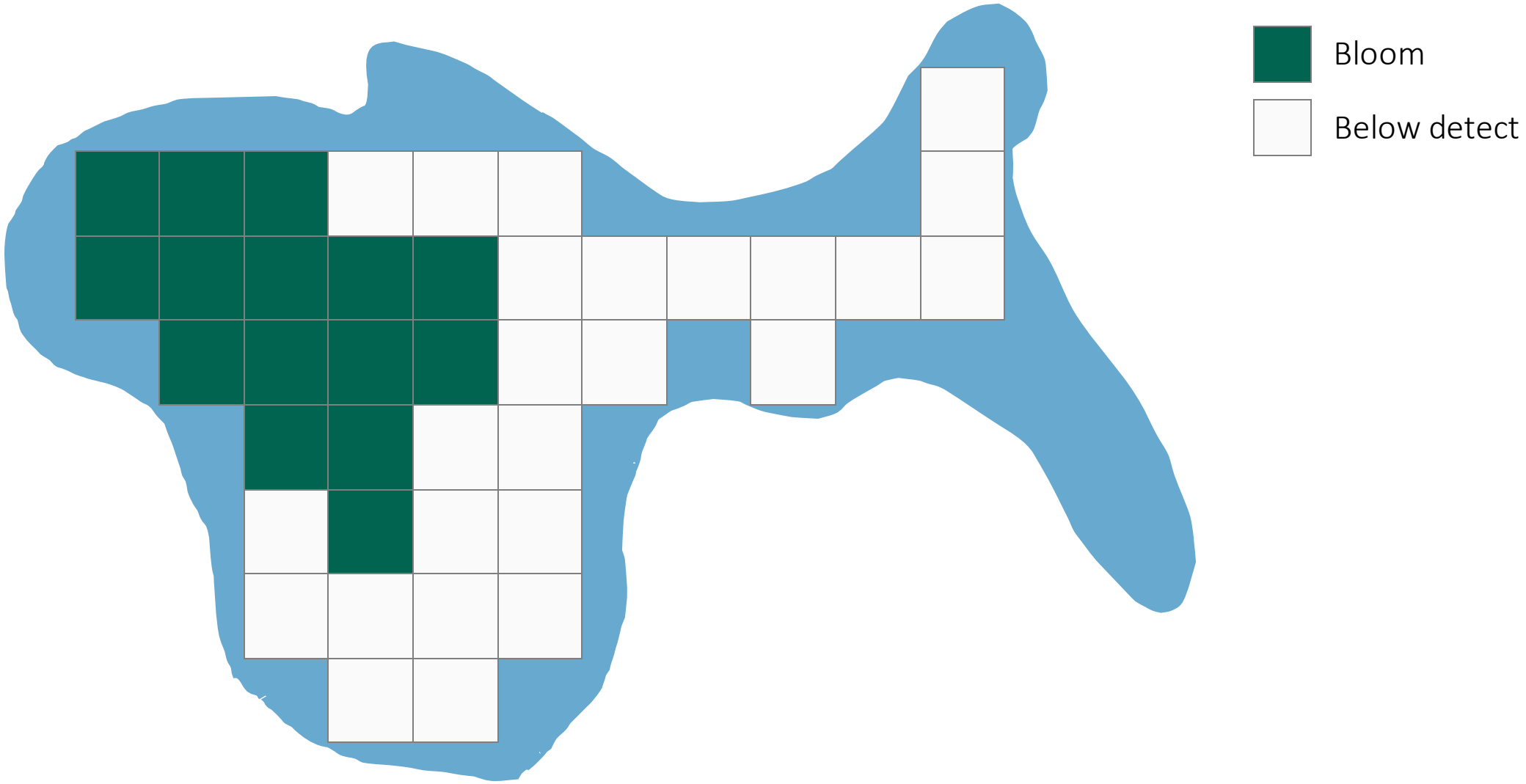

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Bloom area

Calculated over some spatial area for each weekly composite then averaged over an entire year.

Bloom area

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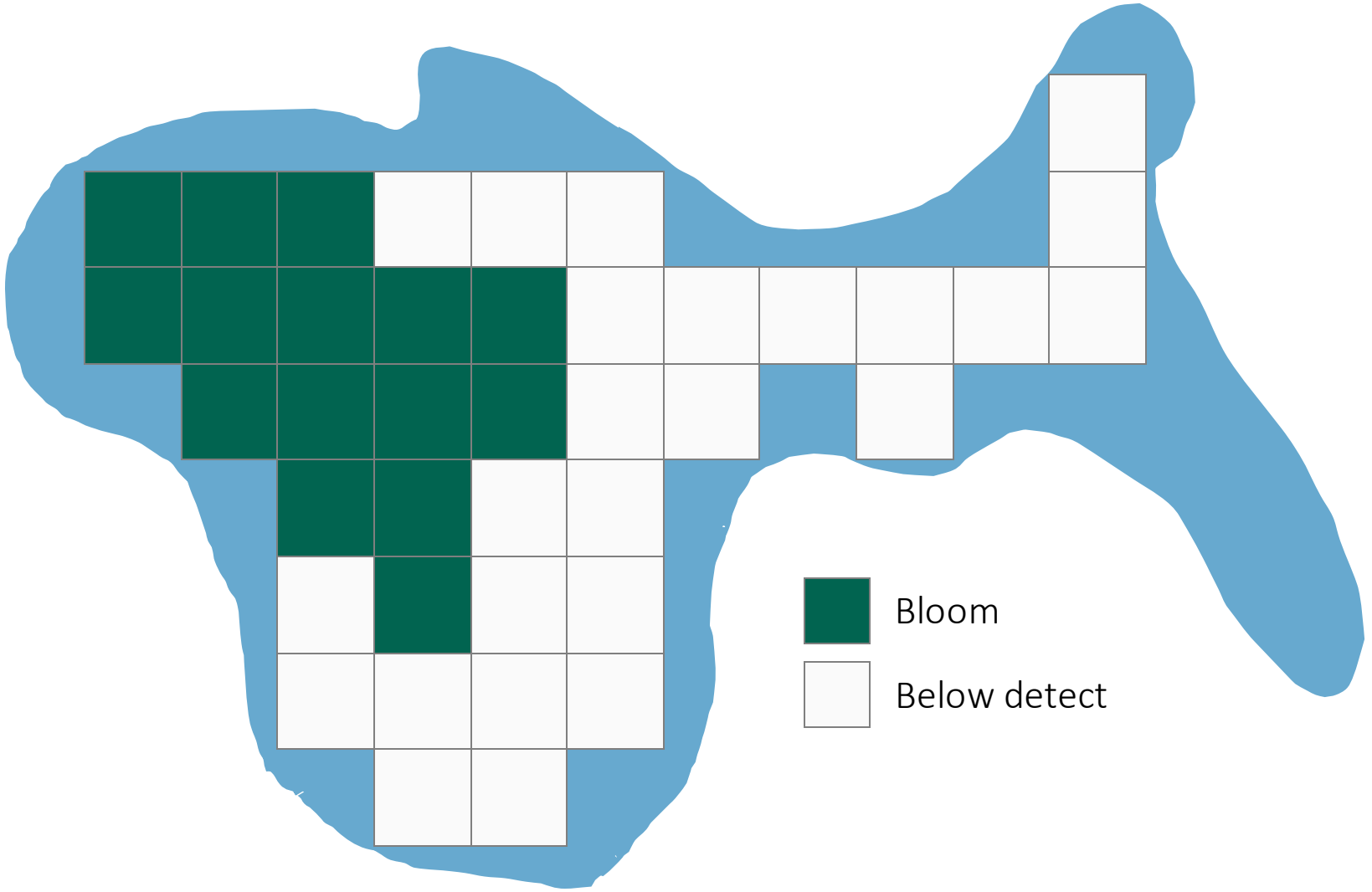
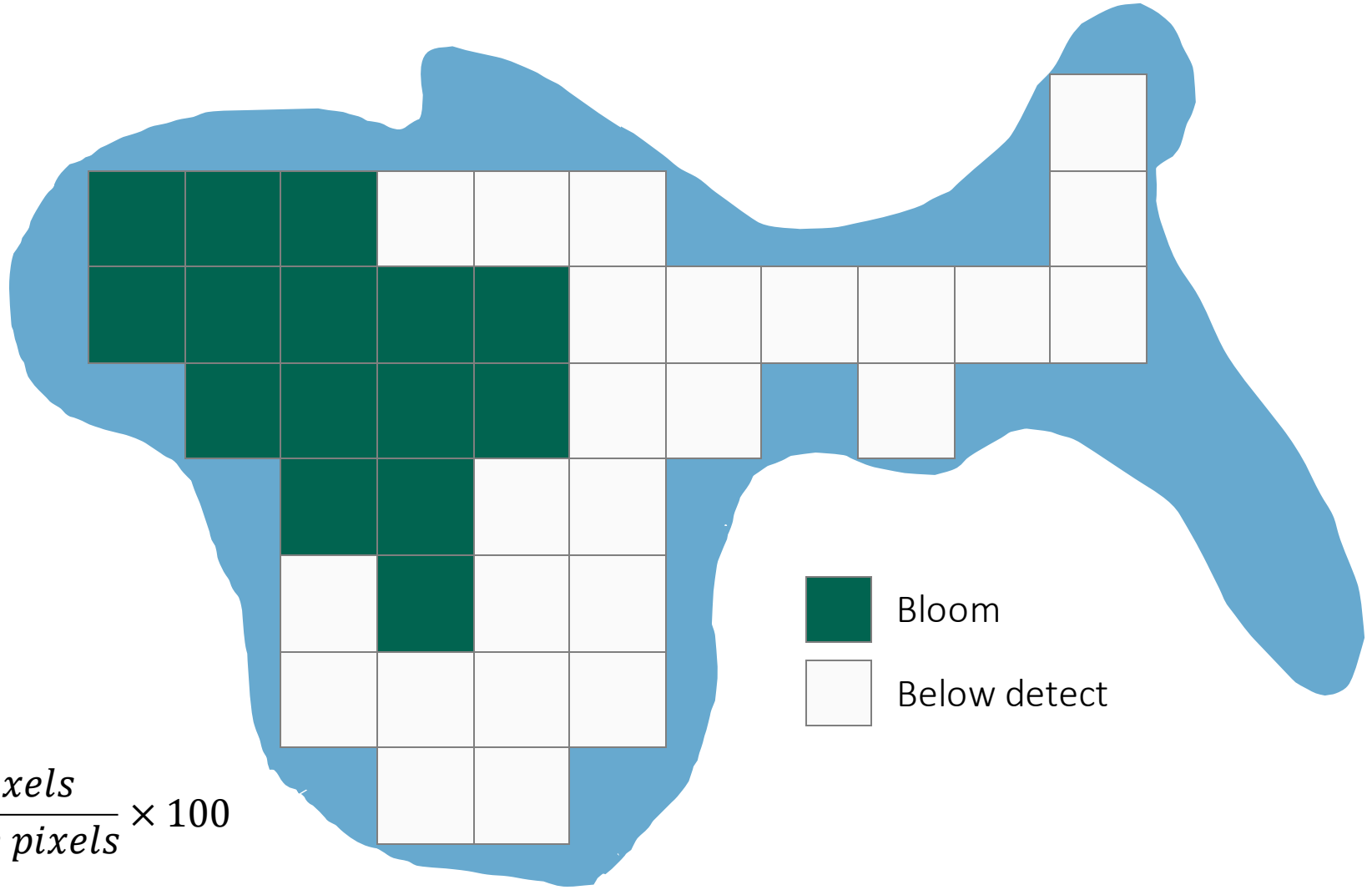


Bloom area

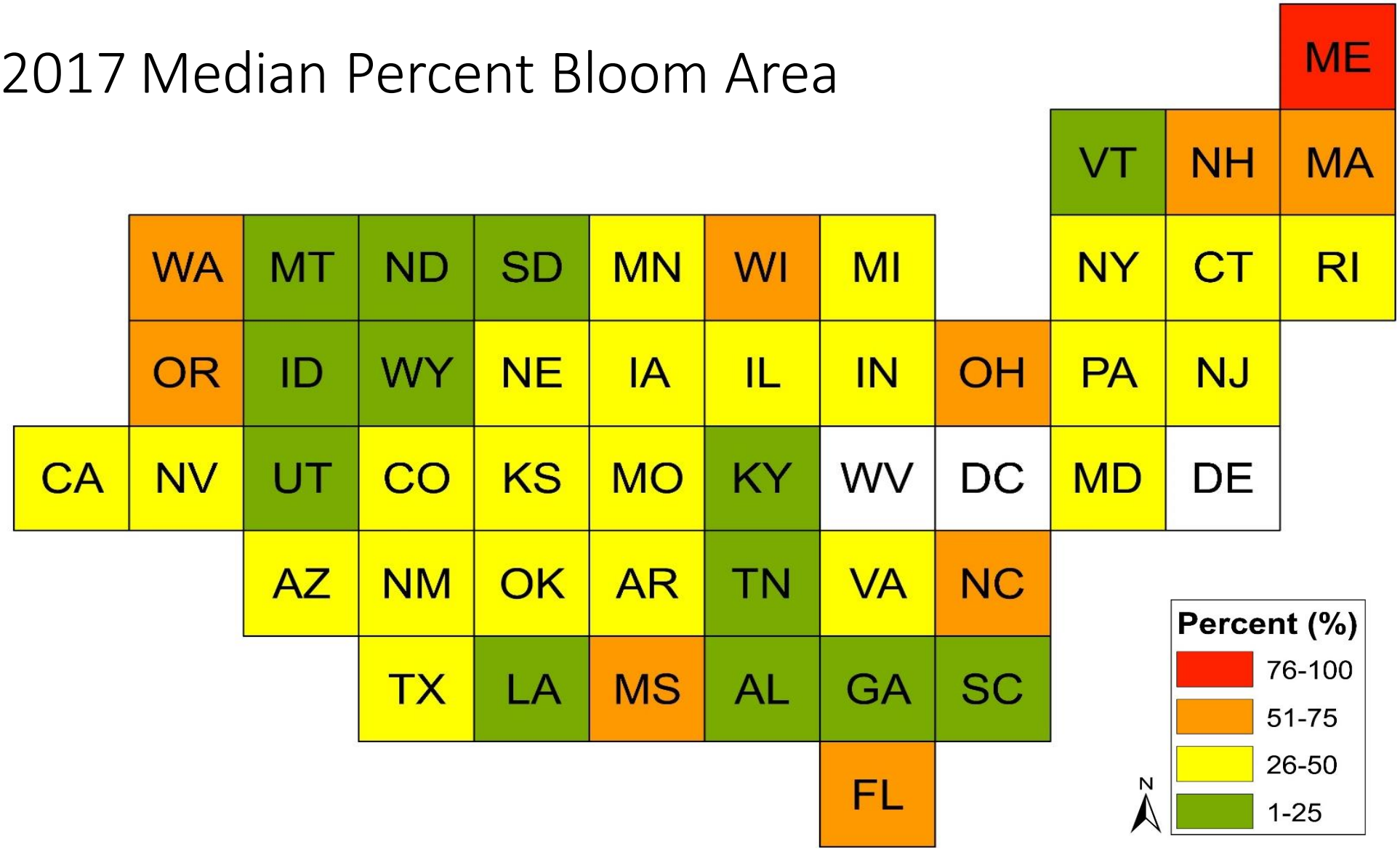
Calculated over some spatial area for each weekly composite then averaged over an entire year.



$$Bloom\ area\ = \frac{Number\ of\ bloom\ pixels}{Number\ of\ observable\ pixels} \times 100$$

$$= \frac{14}{40} \times 100 = 35\%$$

2017 Median Percent Bloom Area



Urquhart, Schaeffer, Loftin, Stump. Examining Temporal Changes in Cyanobacteria HAB Spatial Extent in the Continental United States Using Satellite Remote Sensing. *In preparation for PNAS.*

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Bloom frequency

Calculated for each pixel across an entire year and then average across a spatial area.

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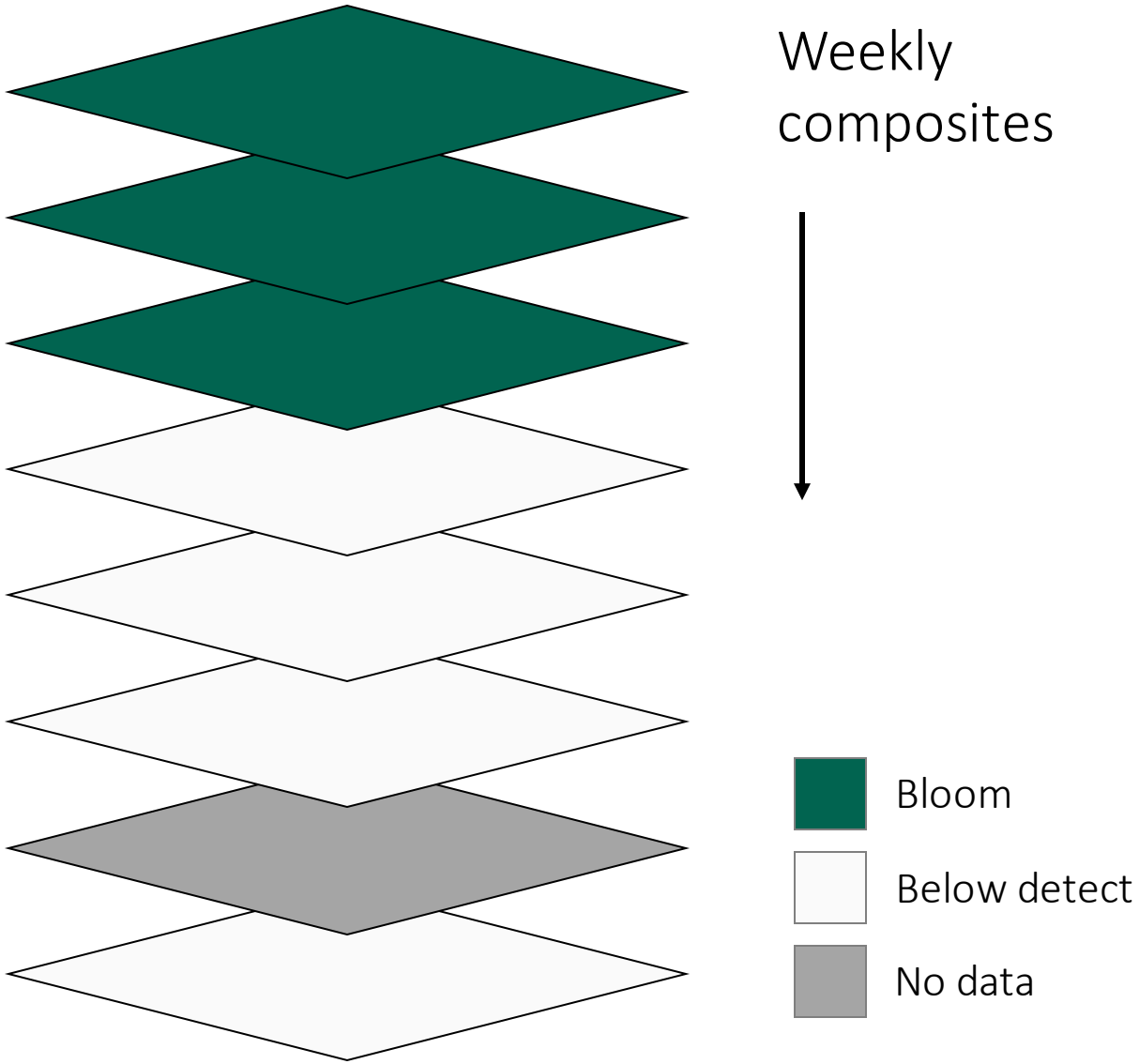
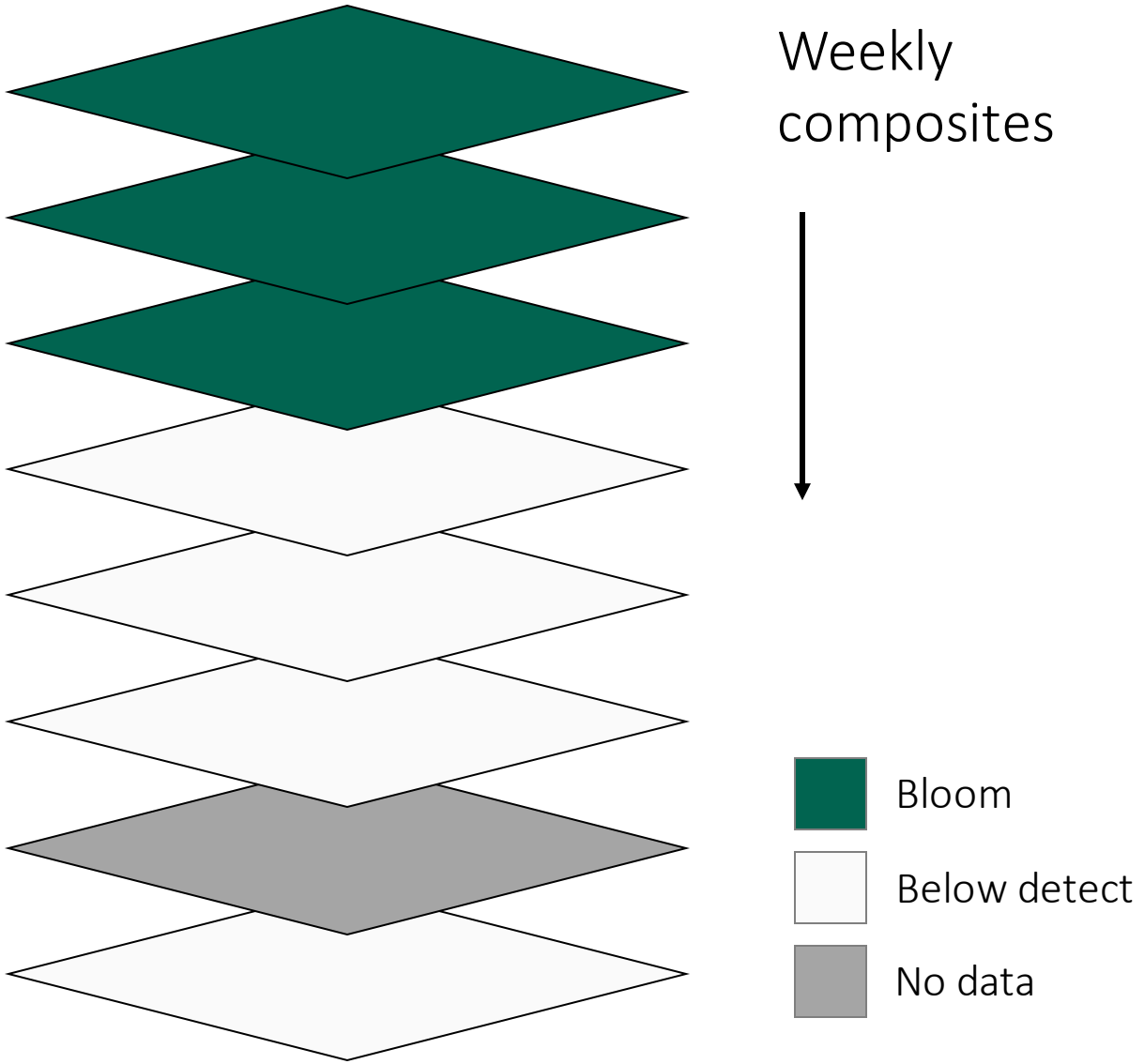


Bloom frequency

Calculated for each pixel across an entire year and then average across a spatial area.

$$Bloom\ area = \frac{Number\ of\ bloom\ pixels}{Number\ of\ observable\ pixels}$$

$$= \frac{3}{7} = 0.43$$



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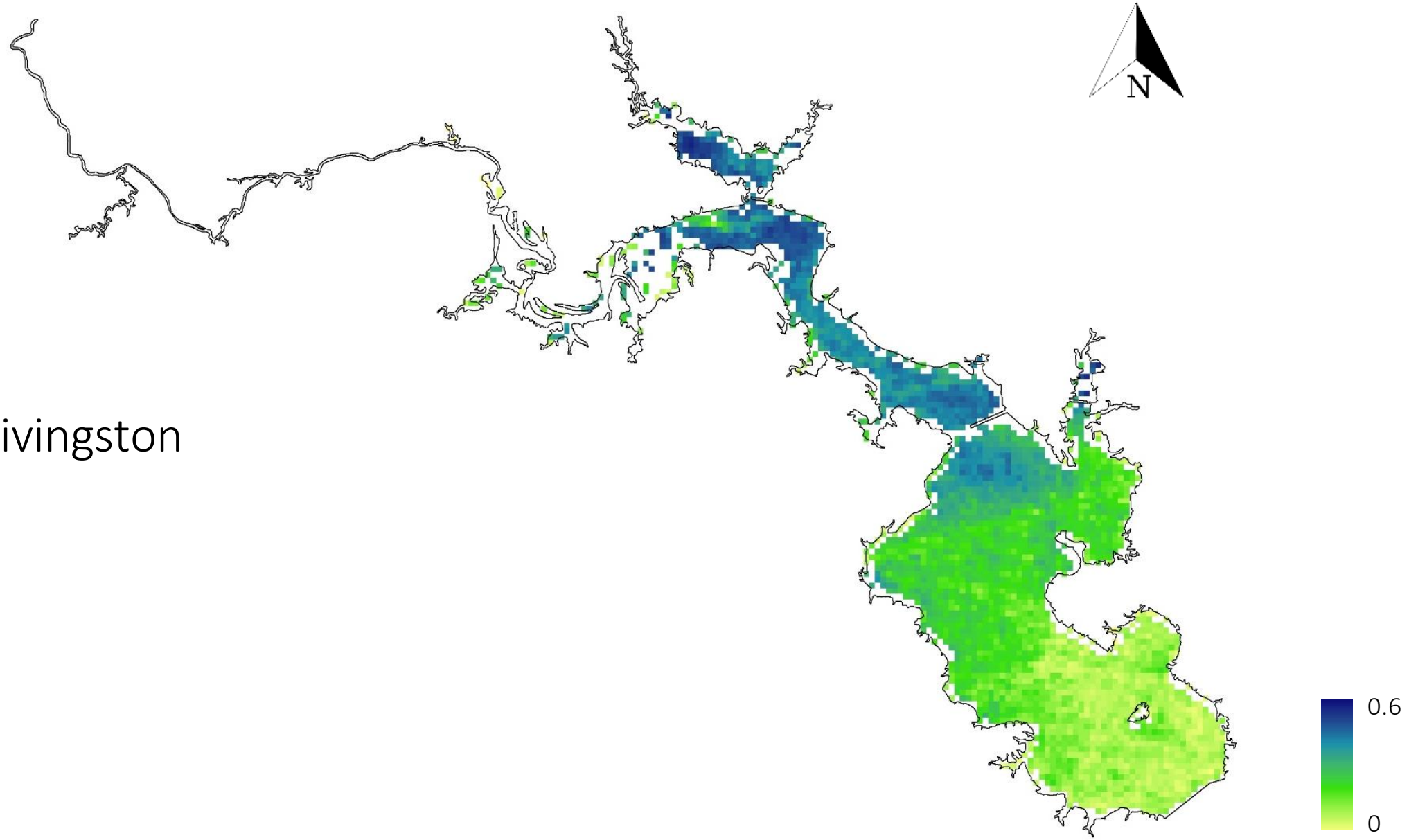
Lake Livingston



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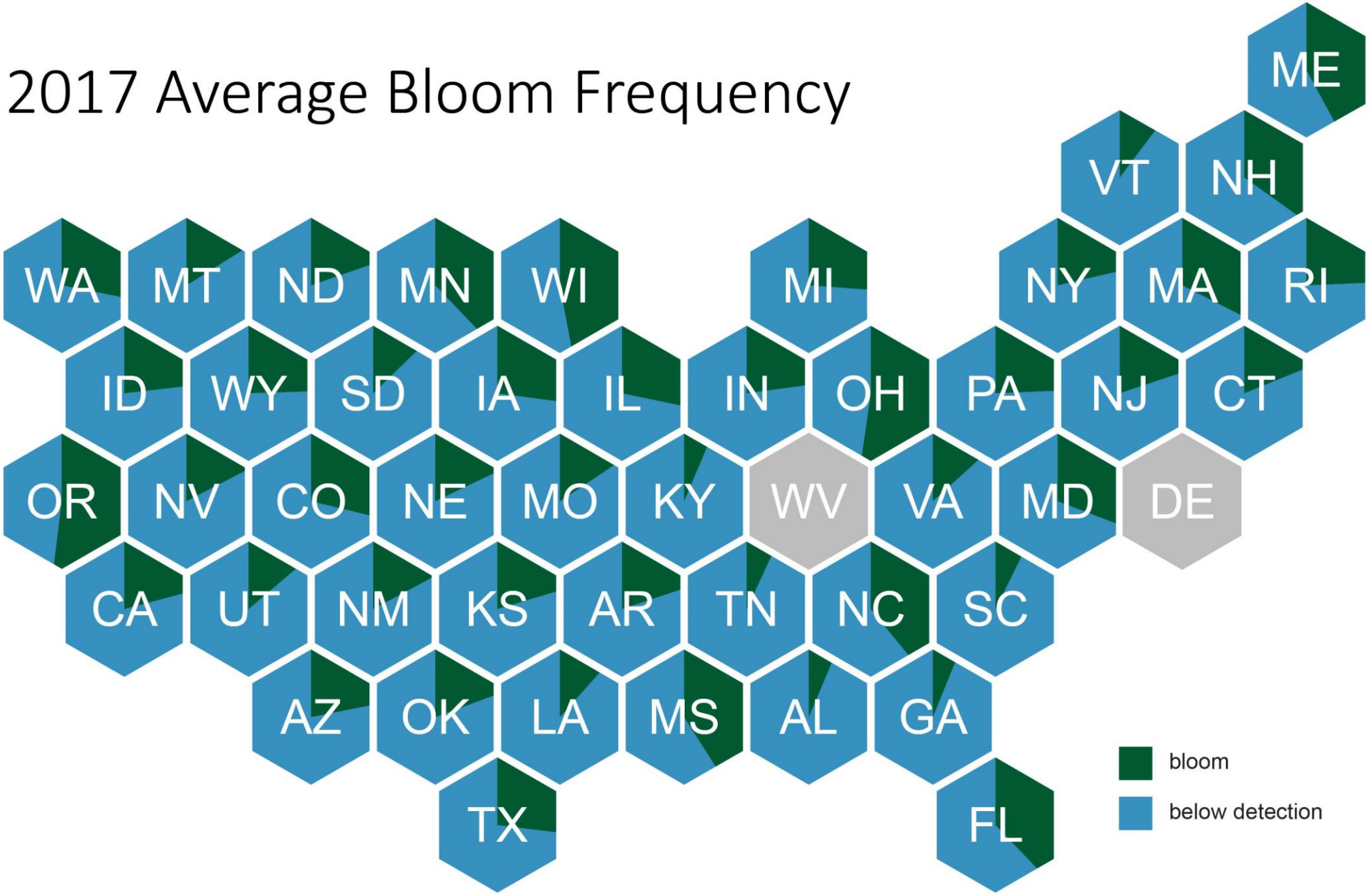
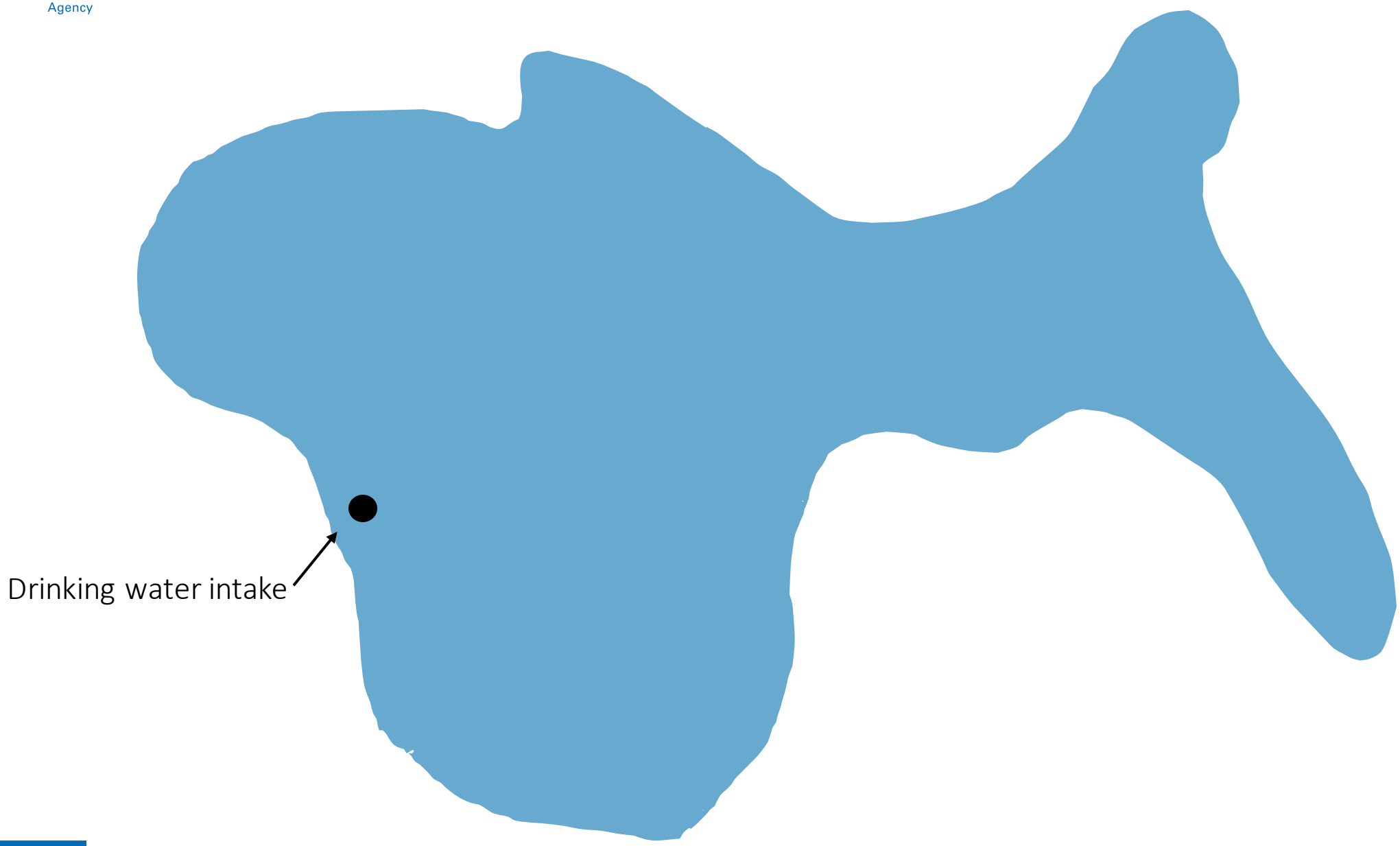
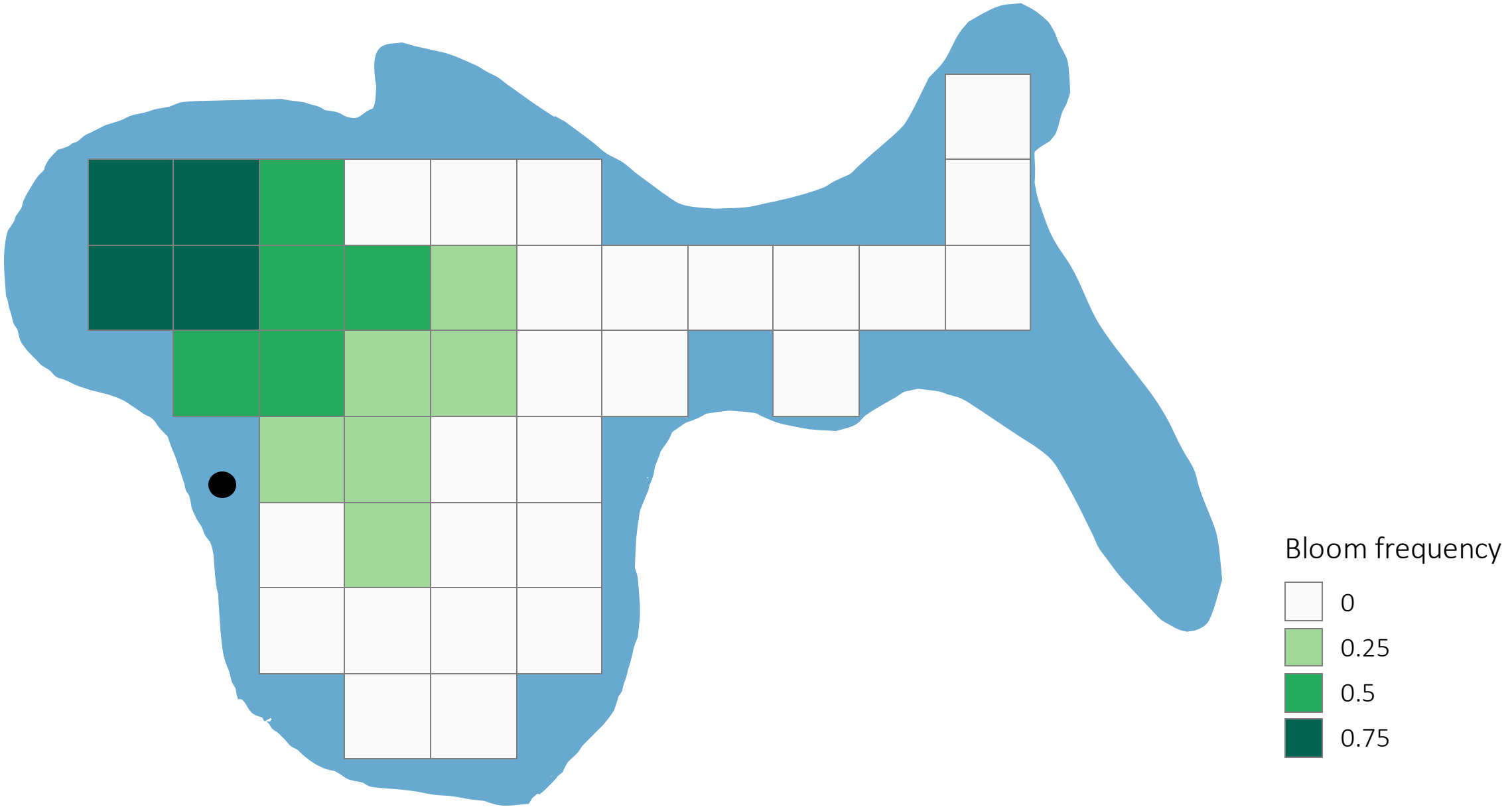
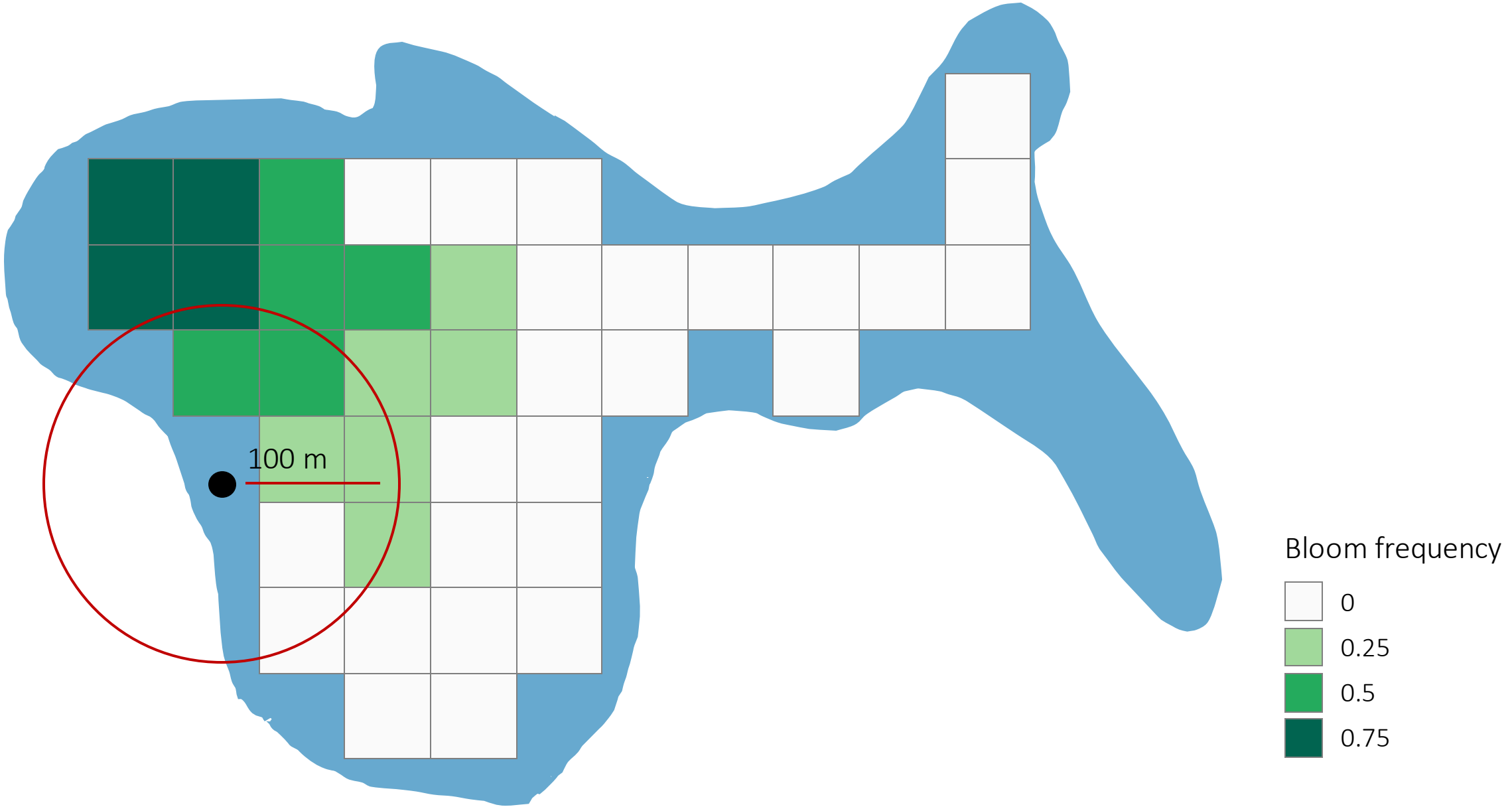
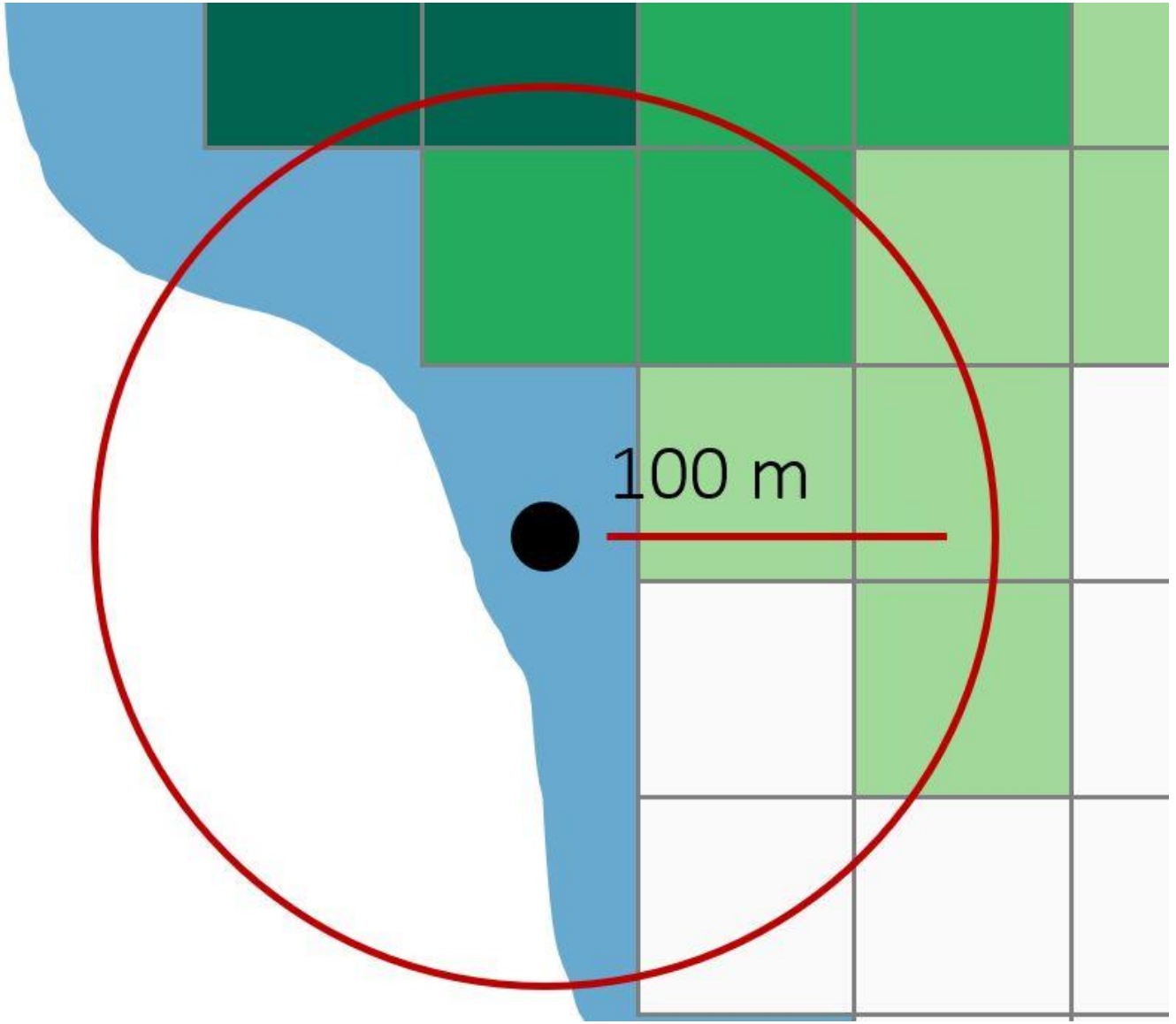
2017 Average Bloom Frequency




Drinking water intake


Bloom frequency
0
0.25
0.5
0.75


100 m
Bloom frequency
0
0.25
0.5
0.75


100 m
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0.25
0.5
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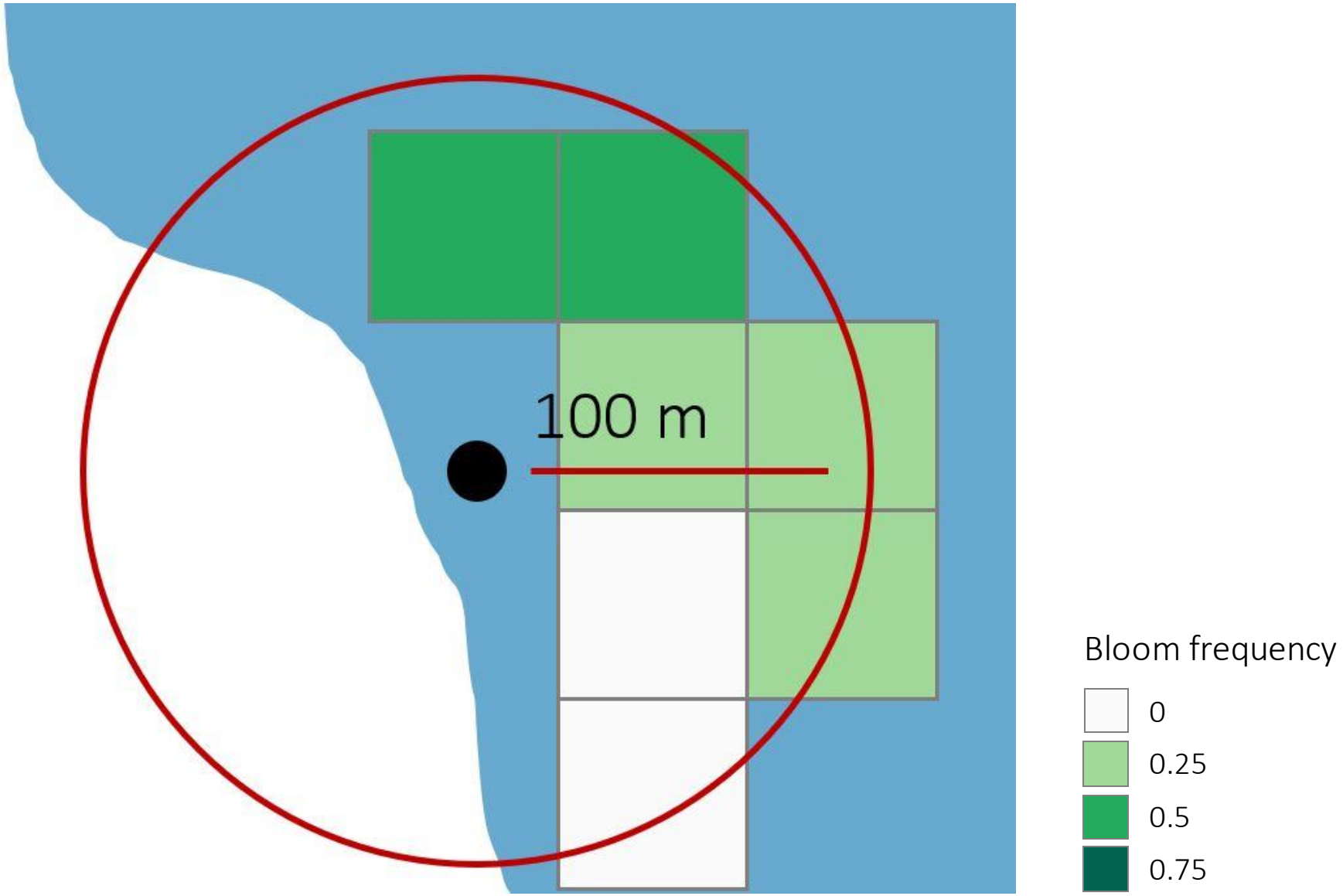
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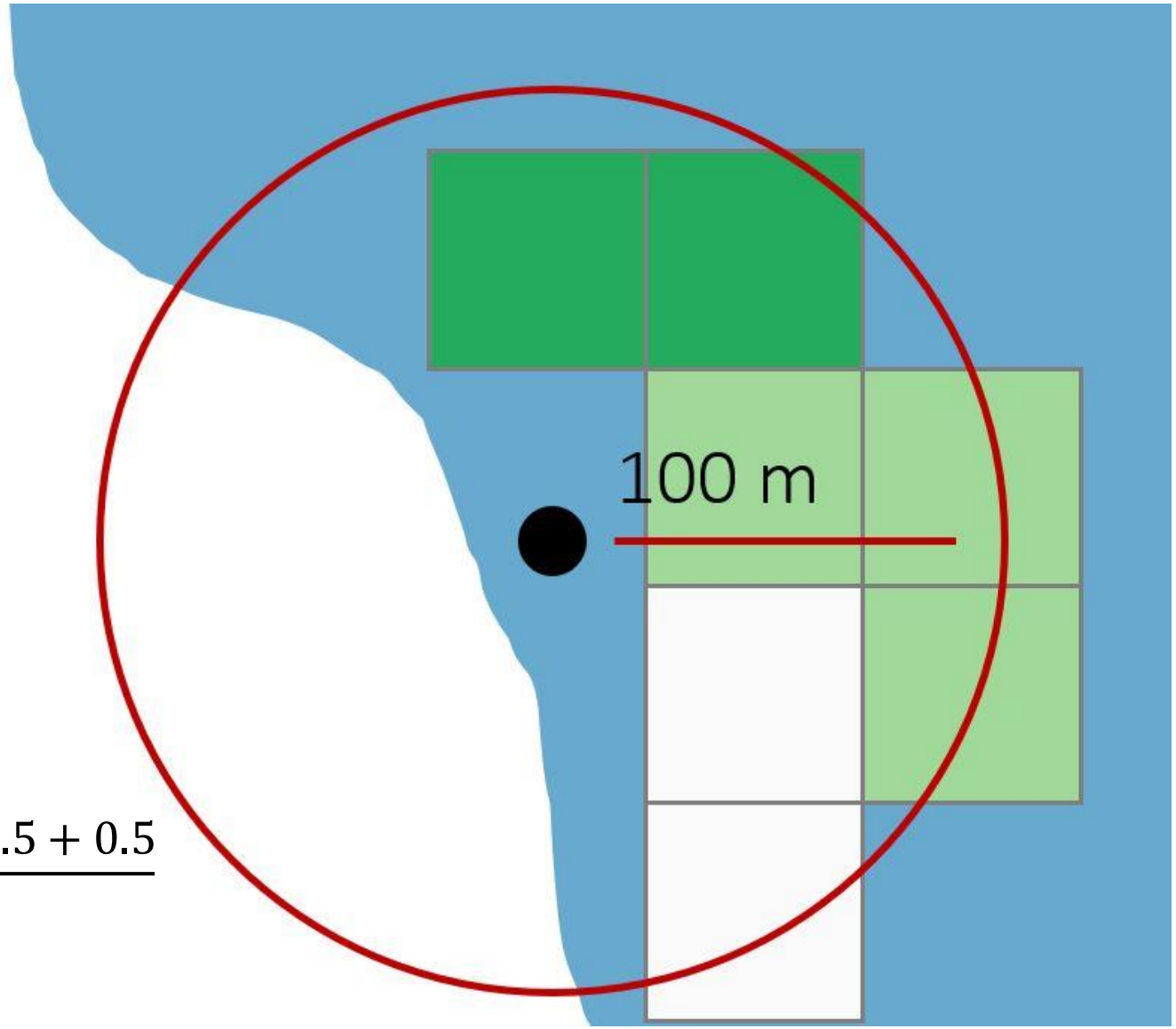
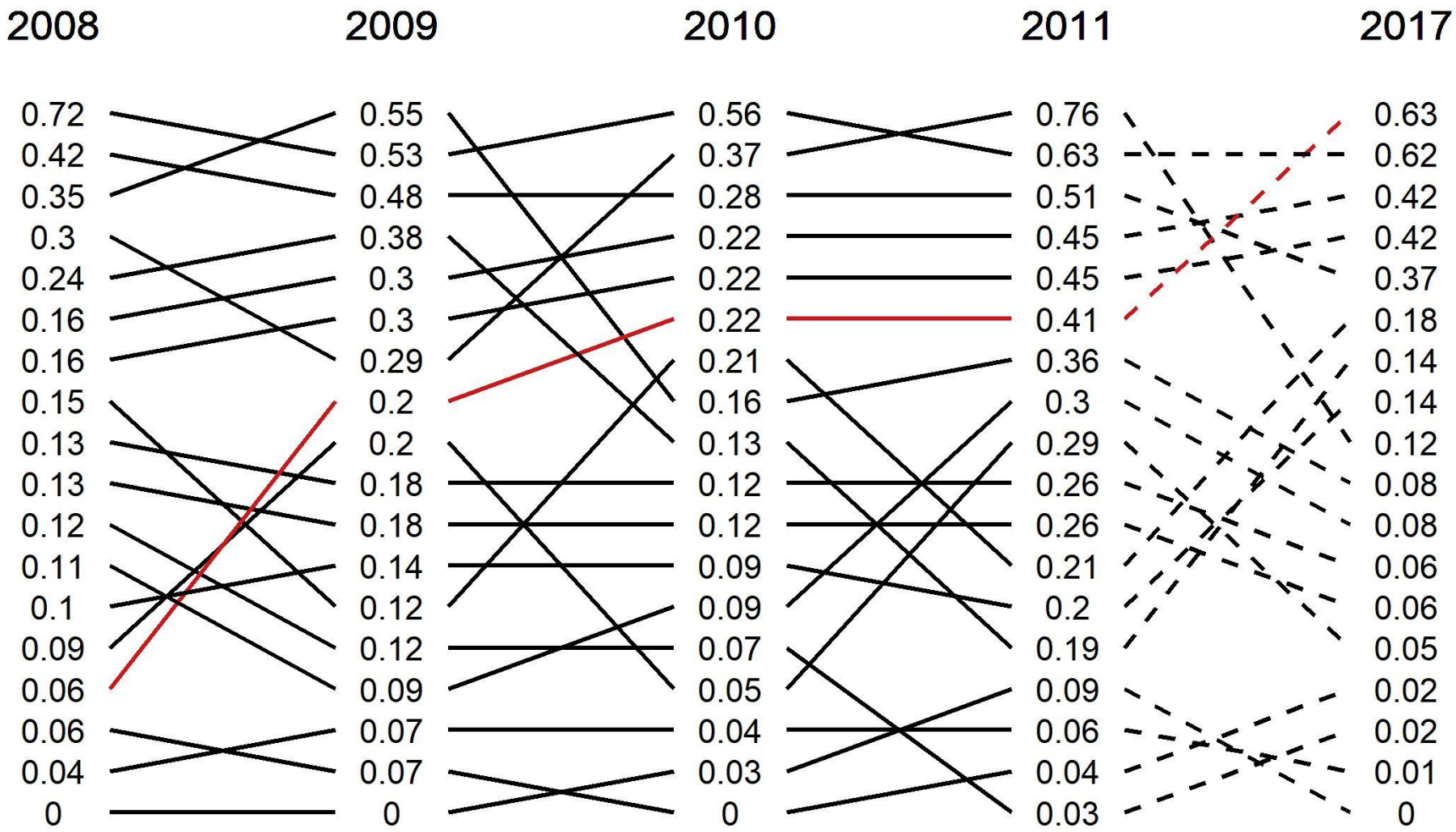


$$Intake\ bloom\ frequency$$

$$= \frac{0 + 0 + 0.25 + 0.25 + 0.25 + 0.5 + 0.5}{7}$$

$$= 0.25$$

2008
2009
2010
2011
2017
0.72
0.42
0.35
0.3
0.24
0.16
0.16
0.15
0.13
0.13
0.12
0.11
0.1
0.09
0.06
0.06
0.04
0
0.55
0.53
0.48
0.38
0.3
0.3
0.29
0.2
0.2
0.18
0.18
0.14
0.12
0.12
0.09
0.07
0.07
0
0.56
0.37
0.28
0.22
0.22
0.22
0.21
0.16
0.13
0.12
0.12
0.09
0.09
0.07
0.05
0.04
0.03
0
0.76
0.63
0.51
0.45
0.45
0.41
0.36
0.3
0.29
0.26
0.26
0.21
0.2
0.19
0.09
0.06
0.04
0.03
0.63
0.62
0.42
0.42
0.37
0.18
0.14
0.14
0.12
0.08
0.08
0.06
0.06
0.05
0.02
0.02
0.01
0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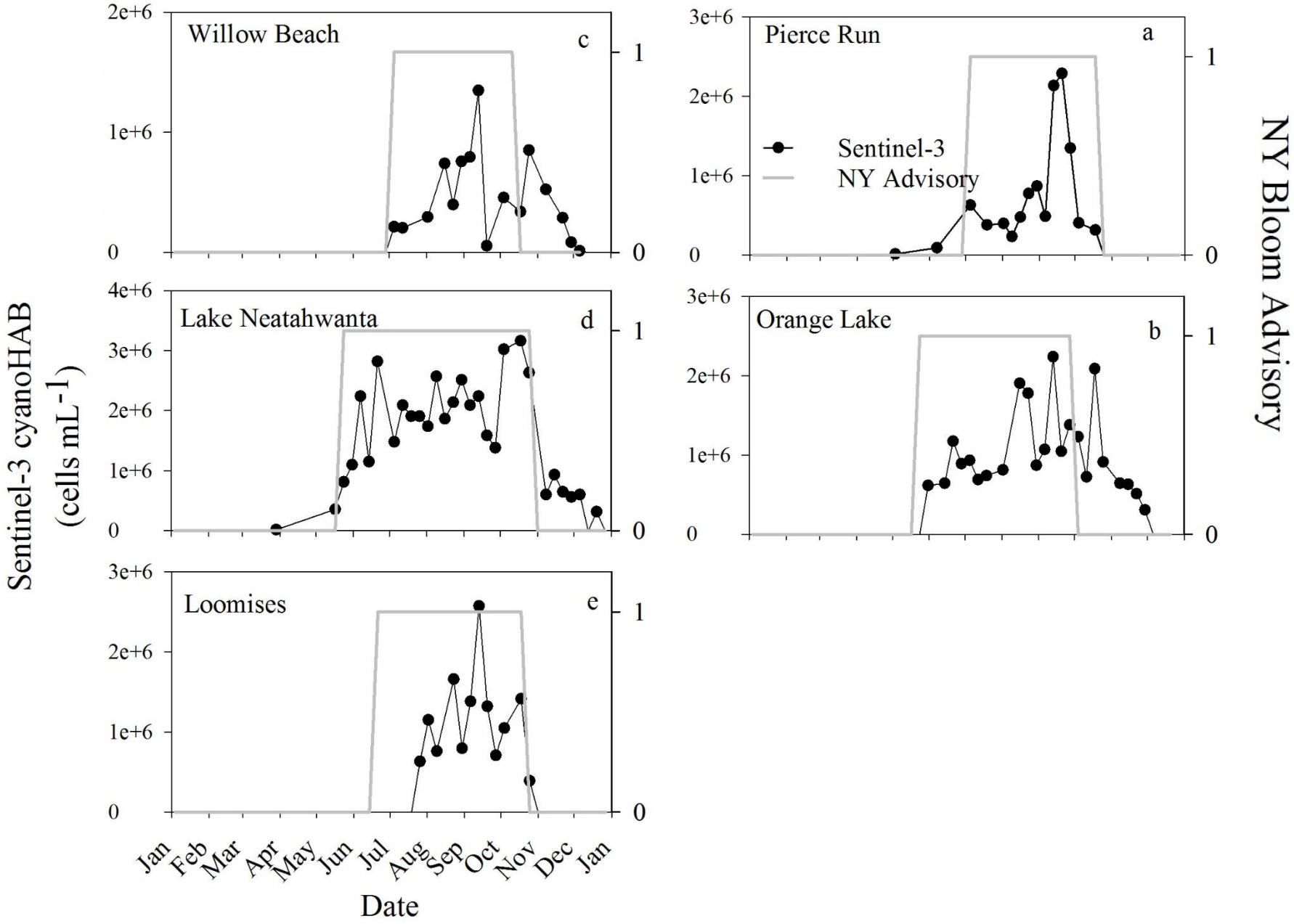
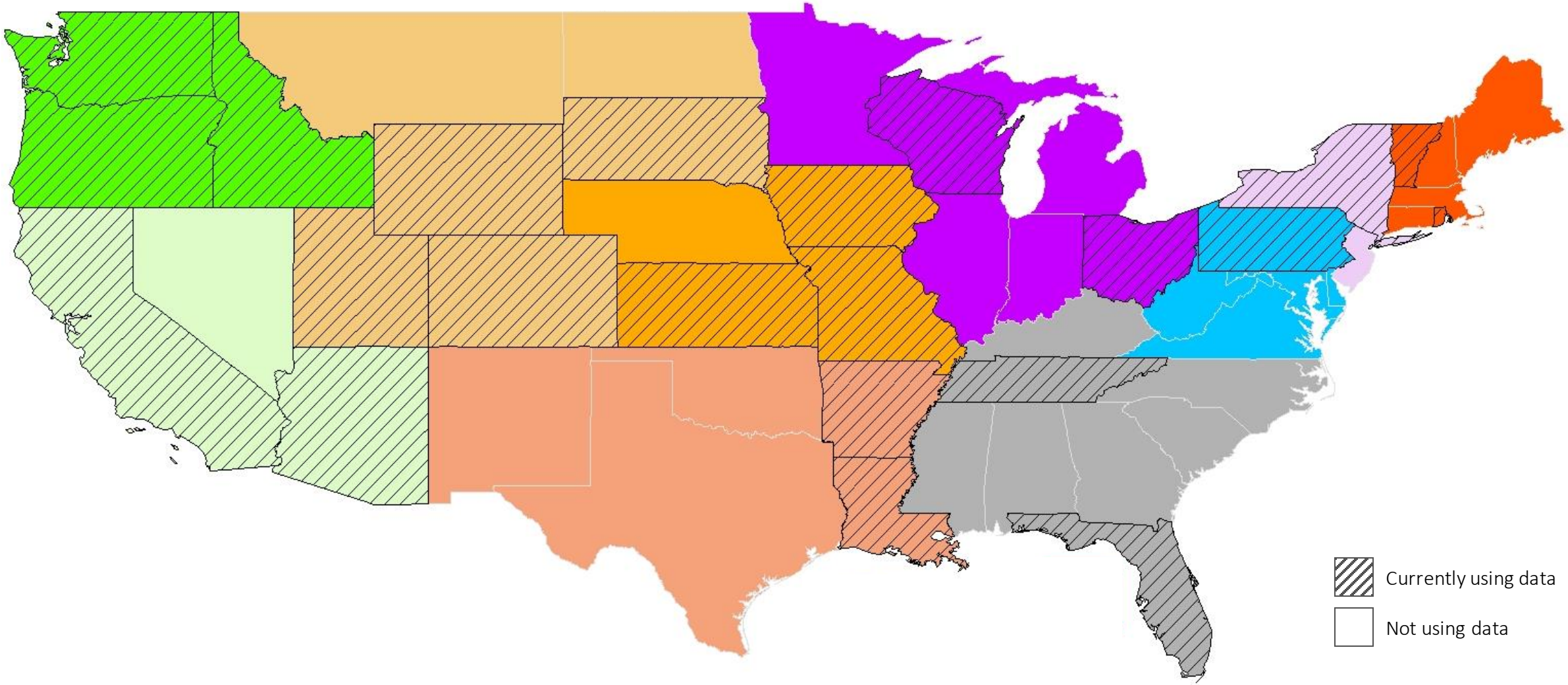


Schaeffer et al (In Review). Mobile device application for monitoring cyanobacteria harmful algal blooms using Sentinel-3 satellite Ocean and Land Colour Instruments. Environmental Modeling and Software.


Currently using data
Not using data