

Monitoring From a Bird's Eye: exploring drones for aquatic invasive species

Maureen (Ferry) Kalscheur
Statewide Aquatic Invasive Species
Monitoring Coordinator

Wisconsin Lakes Partnership Convention
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Overview



Paul Skawinski

WDNR AIS Monitoring



Water Action Volunteers



RIVER ALLIANCE
of Wisconsin



Illustration: Joel Plosz for Bloomberg Businessweek



WDNR Aeronautics Program

- 1915 planes first used to detect fire
- 1968 DNR was formed
- 1974 law enforcement & forestry first plane to detect fires
- 1987 planes used to monitor ozone & DNR takes ownership of all state aircraft
- 2020 Unmanned aircraft manual code



WDNR Aeronautics Program

Manual code governs DNR Division of Forestry Aeronautics Section & Bureau of Law Enforcement use of drones

State of Wisconsin Department of Natural Resources Manual Code # 9249 Unmanned Aircraft Systems (Drones)	
<u>Beth Bier</u> Beth Bier, Deputy Secretary	<u>2/28/20</u> Date
Rescinds and Replaces: New Division: Forestry Bureau: Business Services Section: Aeronautics	Approved by OMT: 12/13/2019 Next Review Date: 2022

- Emergency response
- Search & rescue
- Law enforcement investigations
- Education
- Research
- Environmental
- Resource management

WDNR Aeronautics Program



sasville.com/autel-robotics-drone-flight-planner-app

User Scenario: Wade

Wade has been contracted by a farmer to survey 100 acres of corn and soybean fields. The farmer wants a series of sequential crop surveys to check the health and progress of the crops over the course of three months. Wade needs to optimize the missions to optimize his time and fuel. He can use the exact same route for all three surveys. The farmer doesn't want to pay for a flight plan, so Wade can't rely on being able to download a mission plan. Wade owns an Autel X-Star Premium drone, and he has a flight planning application available from Autel, so he downloaded it.

Wade's office and is pleasantly surprised by how clean and simple the application is. He enters the geographic coordinates for the field he will be surveying. The map is automatically cached for offline use. Wade selects the appropriate spot on the map, and a flight path is automatically generated. He drags one of them to the north, and he can see the accompanying information: time as he moves the points, and he can see the accompanying information: number and types of waypoints created, area and distance of the flight, how many batteries will be needed, number of images, and resolution of images, storage needed, and altitude of flight.

Wade can also see that the distance covered will require a full day and six batteries. He is able to adjust the parameters of the survey area enough to reduce that by 50% and use two less batteries. Time is money, after all. He can specify points on the map to return home for battery changing (or, alternatively, set the battery level at which the drone will return when the battery reaches the critical level and the drone returns home). Then, with a recharge or extra battery installed, the drone would be ready to go.

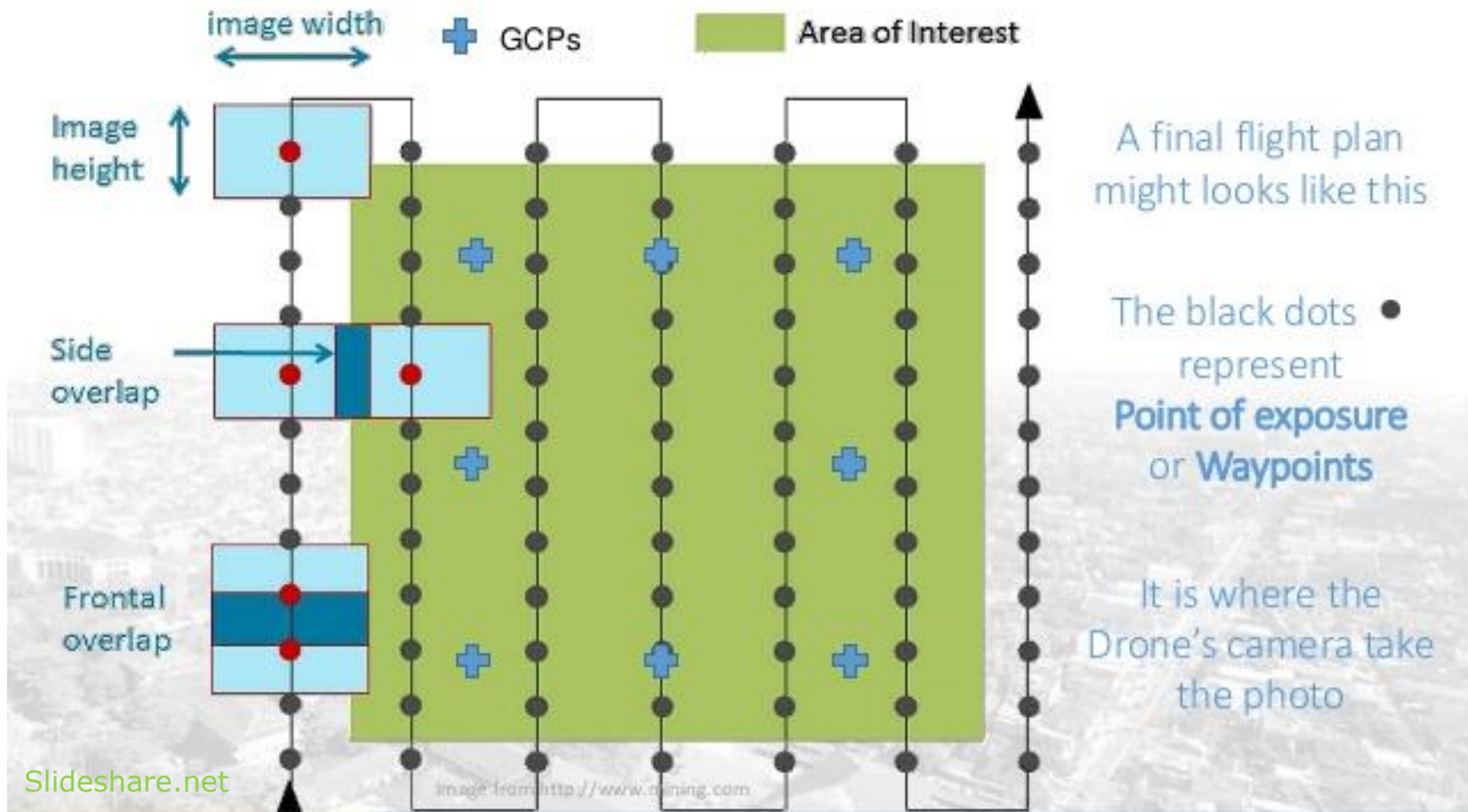
Wade realizes that he can change the speed, altitude, camera settings, and many other parameters. He also realizes that the app has an Advanced Mode that allows additional fine-tuning, and he decides to explore those once he's mastered the basic functionality. Wade completes his flight plan and hits the 'Save' button, ensuring that the plan and map information will be available for offline when he is ready. Now his plan is ready to use, he (or an employee, etc.) manually connects the drone to the drone's controller, powers up the drone on-site, selects the mission plan, and hits the 'Launch' button, and the drone will automatically follow the planned flight path.

WDNR Aeronautics Program

- Identify area
- Pilot handles air space issues
- Municipality notified
- Need access permission
- Ground contact



WDNR Aeronautics Program



WDNR Aeronautics Program



WDNR Aeronautics Program

- Access
- Rapid assessment
- Efficient?
- Lower cost?



WDNR Aeronautics Program



Mission: water hyacinth



Mission: water hyacinth

- *Eichhornia crassipes*
- Native to South America
- Purple/blue flowers
- Air sacs
- Popular for water gardens
- NR 40 prohibited





Mission: water hyacinth

- Water gardens
- Quick to establish
- Easy to grow
- Tolerant

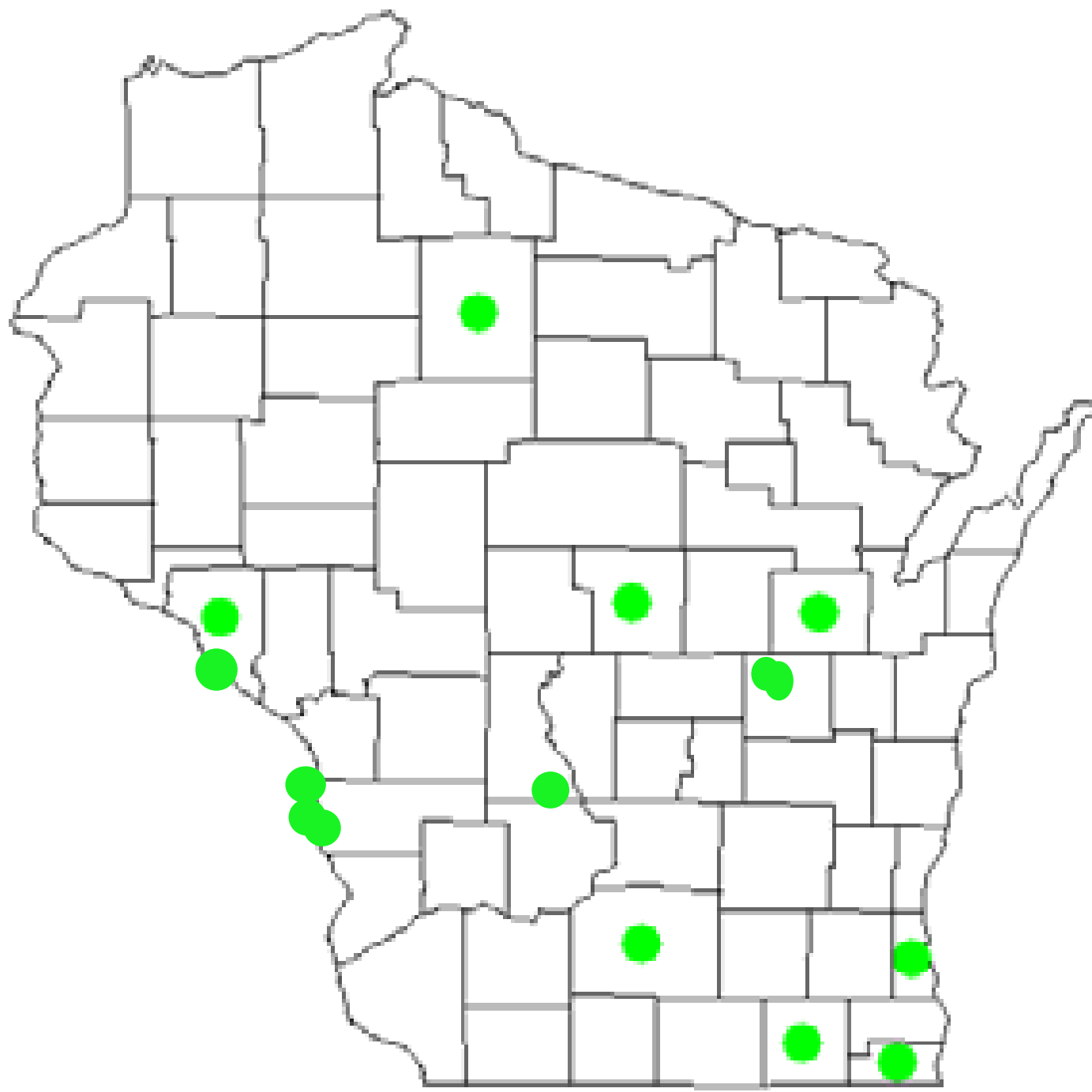


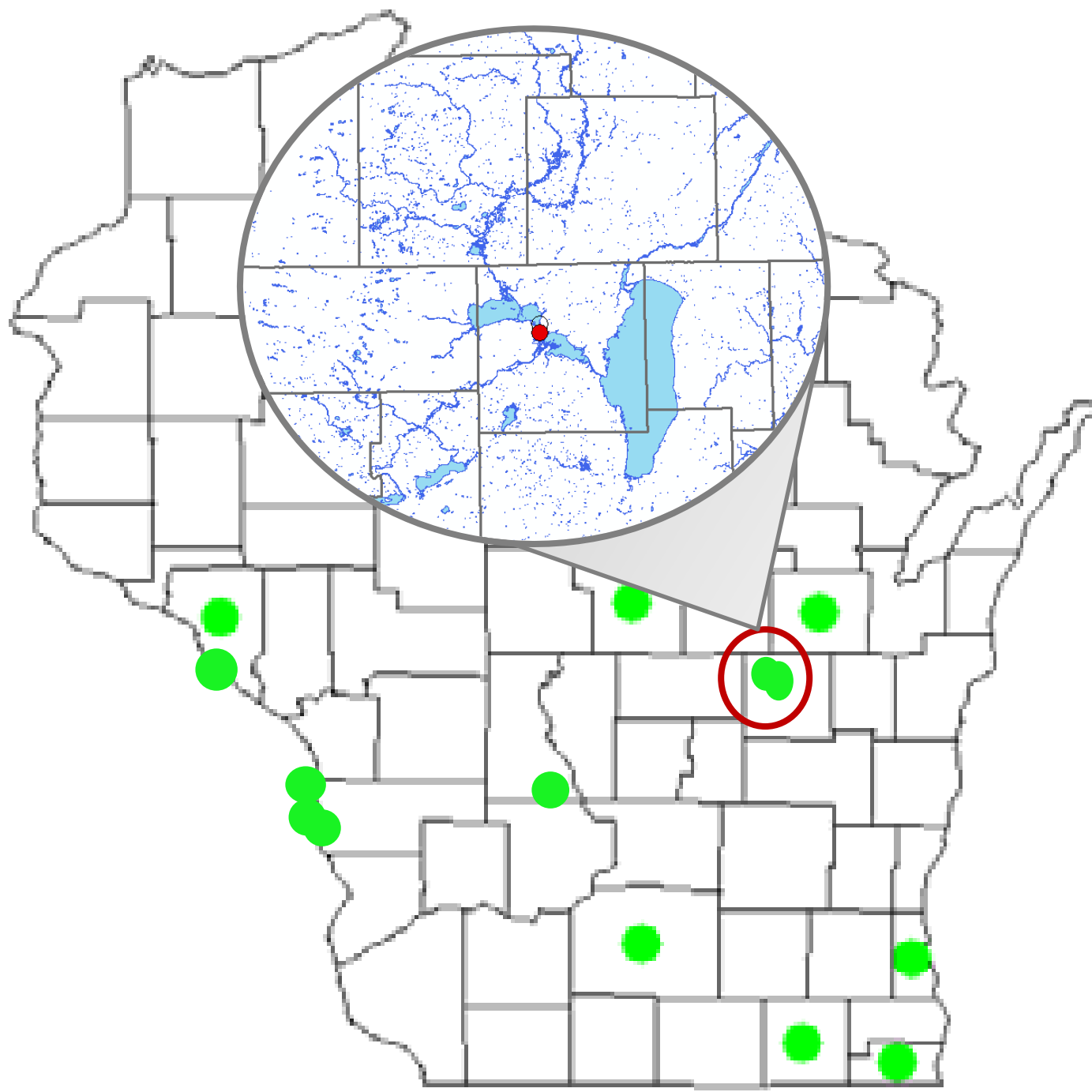
HOPE NO ONE'S LOOKING...

Ooo...







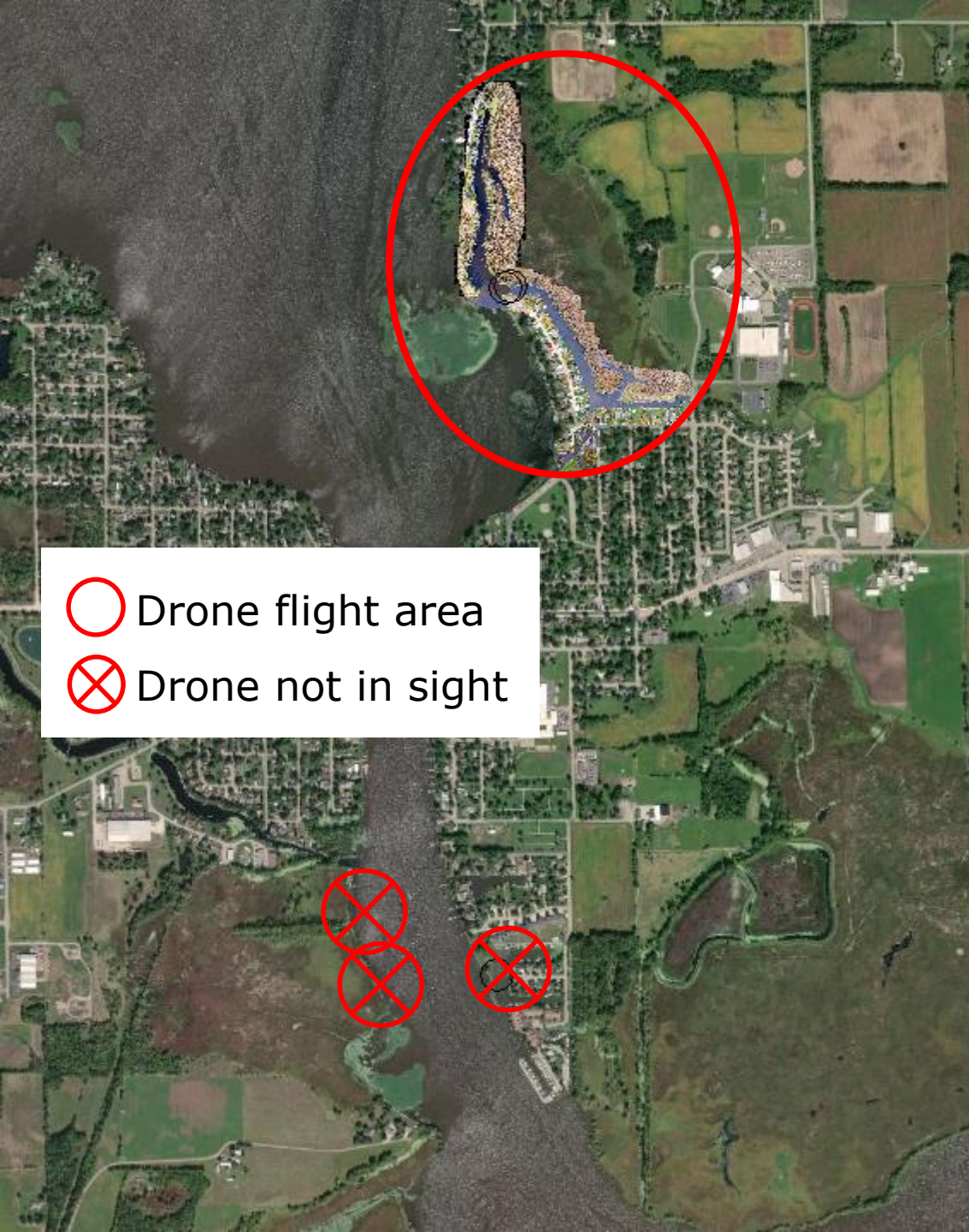




Water hyacinth observed 2015-2018



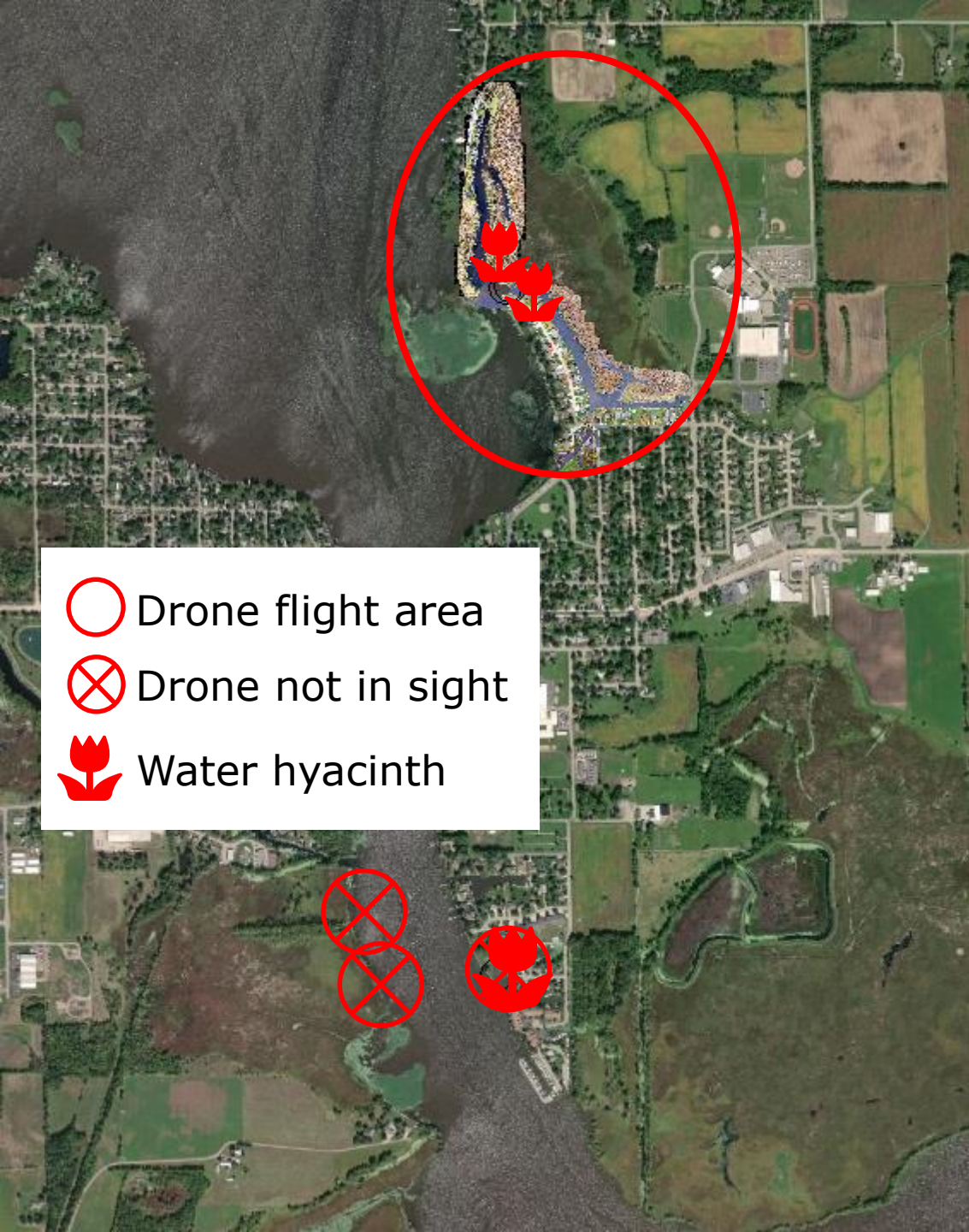







- Drone flight area
- ⊗ Drone not in sight

2020 Water hyacinth boat survey area

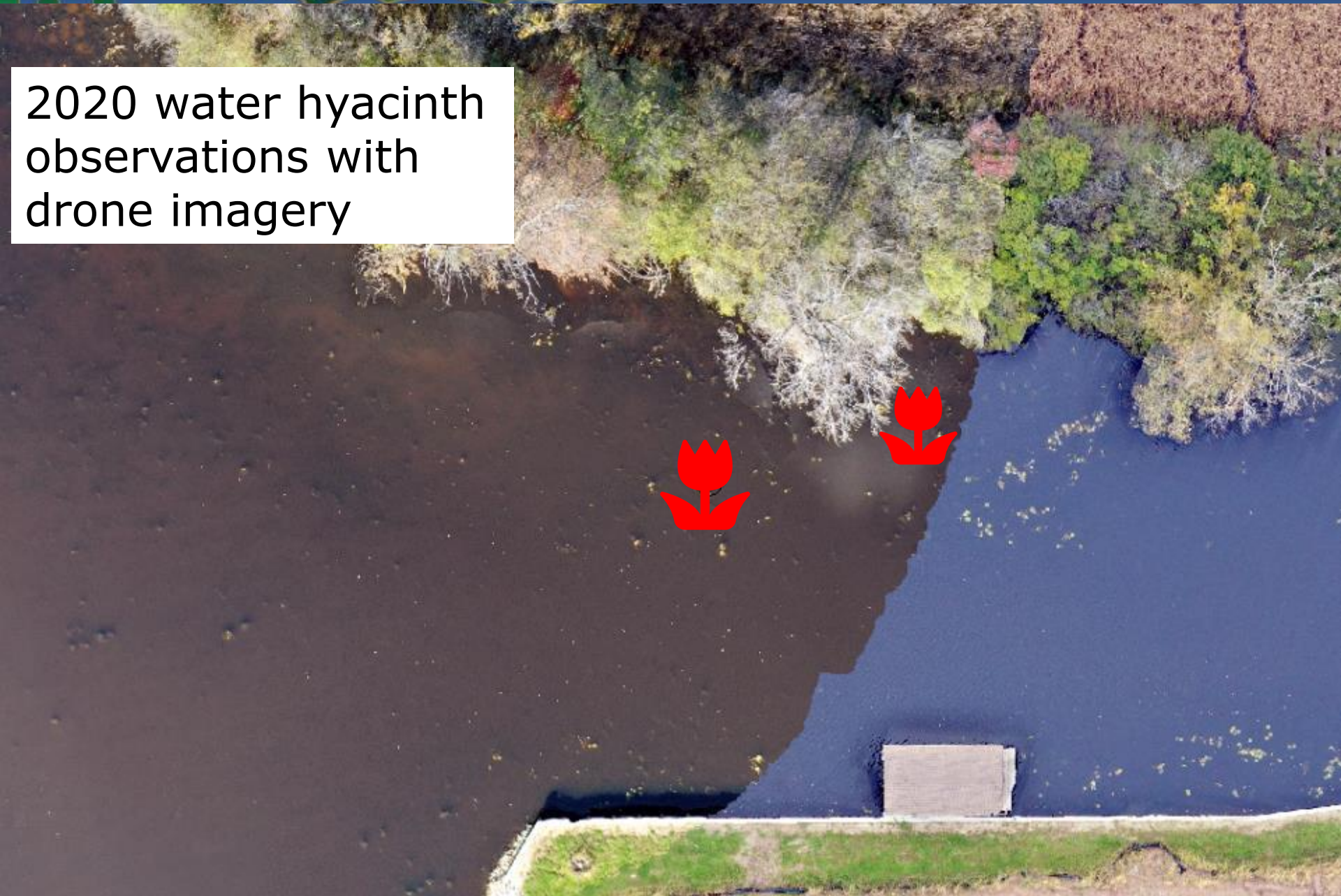




-  Drone flight area
-  Drone not in sight
-  Water hyacinth



2020 water hyacinth observations with drone imagery



2020 water hyacinth observations with drone imagery



Mission: water hyacinth





Lessons Learned

- Location
 - hyacinth observed outside drone survey
 - use a boat to launch drone
 - plane first than drone..?
- Flight height
 - height visibility for various species
- Cost comparison (time, equipment)



Common reed grass
(*Phragmites australis*)

Reed mana grass
(*Glyceria maxima*)

Water hyacinth
(*Eichhornia crassipes*)

Lesser celandine
(*Ranunculus ficaria*)

- Planes?
- Drones at 400, 200, & 100 ft



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Thank you!

