Stop 2&11. Remote Sensing & GIS Unmanned Aerial Systems (UAS)

Robert Goodwin, Joe Welsh, and Dr. Dave Lusch

RS&GIS UAS research services utilizes multiple platform-sensor combinations paired with advanced image processing techniques. This diverse toolset allows RS&GIS to collect and process a wide range of remote sensing data and create secondary imagery products such as NDVI mosaics and Digital Terrain Models. For maximum flexibility, RS&GIS employs both fixed-wing craft and multi-rotor craft for its UAS projects. Currently, RS&GIS operates the Aeromao Aeromapper glider UAS and the 3D Robotics X8 multi-rotor UAS.

	
Aeromao Aeromapper fixed-wing UAS. Image courtesy of Aeromao.com.	3DR X8 rotor-craft UAS. Image courtesy of 3D Robotics.

RS&GIS is currently utilizing the above platforms to conduct research on the efficacy of using small UAS for a variety of applications, including turf management. RS&GIS staff fly their UAS in semi-autonomous or manual mode. In semi-autonomous mode, the craft follows pre-loaded instructions navigating via GPS positioning and barometer measurements. A variety of sensors provide remote sensing data at regular intervals. Sensors include RGB and Color Infrared cameras, Thermal Infrared sensors and laser scanners. This data is processed by GIS analysts at RS&GIS to create image mosaics, terrain models, referenced NDVI images and more.

Flight times, payload and mission capabilities vary between platforms but generally rotor-craft are more flexible than fixed-wing aircraft. Rotor-craft are more agile and are not limited by an aerodynamic airframe for sensor deployment. However, flight time is short compared to fixed-wing aircraft, particularly multi-rotor aircraft. For instance, the 3D Robotics X8, powered by a 6000 mAh lithium polymer battery pack, can fly for 10 – 15 minutes carrying 800 grams. The design is such that adding additional battery capacity does not increase flight time substantially. The Aeromapper fixed-wing aircraft can fly for nearly an hour carrying a slightly larger battery pack while carrying about half the weight. A larger airframe improves lifting capacity.

Both of the systems described above are appropriate for turf research and evaluation. The decision on which UAS to use depends primarily on the type & dimensions of the sensor and the flight area.
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Stop 11. Remote Sensing & GIS Unmanned Aerial Systems (UAS)

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Please see report on pg. 8.

Stop 12. MSUTurfInsects.net

Terry Davis and Dr. David Smitley

The Turf Insect ID website (www.msuturfinsects.net) is up and running. It can be used to identify turf pests via entering turf damage symptoms or comparing descriptions and pictures of the damage and insects. Pictures, descriptions, life history and general control measures can be found on this website for all of the major turf insect pests in Michigan. This is the companion website to the turf disease and weed websites.

Stop 13. A Bee-Friendly Approach to Home Lawn Grub Control

Dr. David Smitley

Imidacloprid, clothianidin, and thiomethoxam are the neonicotinoid insecticides used on on home lawns and golf courses for grub control. These insecticides and many other insecticides can be toxic to bees when bee-attractive flowers are sprayed. However, because bees only feed on the nectar and pollen they will not visit turfgrass in home lawns unless flowering weeds like clover are present. If a lawn does not have any flowering weeds there will be no adverse effects on bees when an insecticide is applied for grubs. Let's say that your lawn care company usually treats lawns for grubs, billbugs and chinch bugs in early June. Customer lawns can be divided into two categories with the following bee-friendly grub control options:

1. **Old customers, no flowering weeds present.**
   Standard grub control practices will not harm bees because your outstanding weed control program has eliminated flowering weeds.

2. **New customers, flowering weeds are present.**
   If the lawn is mowed immediately before it is treated with an insecticide for grub control, weed flowers will be removed and the insecticide application will not be harmful to bees. Also, in a recent study in Kentucky, Dr. Dan Potter found no adverse effects to bumble bees visiting clover in a lawn sprayed with chlorantraniliprole (Acelepryn or GrubEx). So, if flowering weeds are present, chlorantraniliprole can be used.

What if linden trees or other flowering trees are present in the lawn? We do not know at this point if the grub control rate of imidacloprid, thiomethoxam or clothianidin applied to turfgrass under flowering trees will be harmful to bees. The trees will absorb some of the neonicotinoid insecticide through their roots and some of the insecticide will be systemically moved