

3D Printing Potential: How 3D printing technology can help pest management.

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Bureau of Methods Development and Biological Control: Techniques Development Laboratory

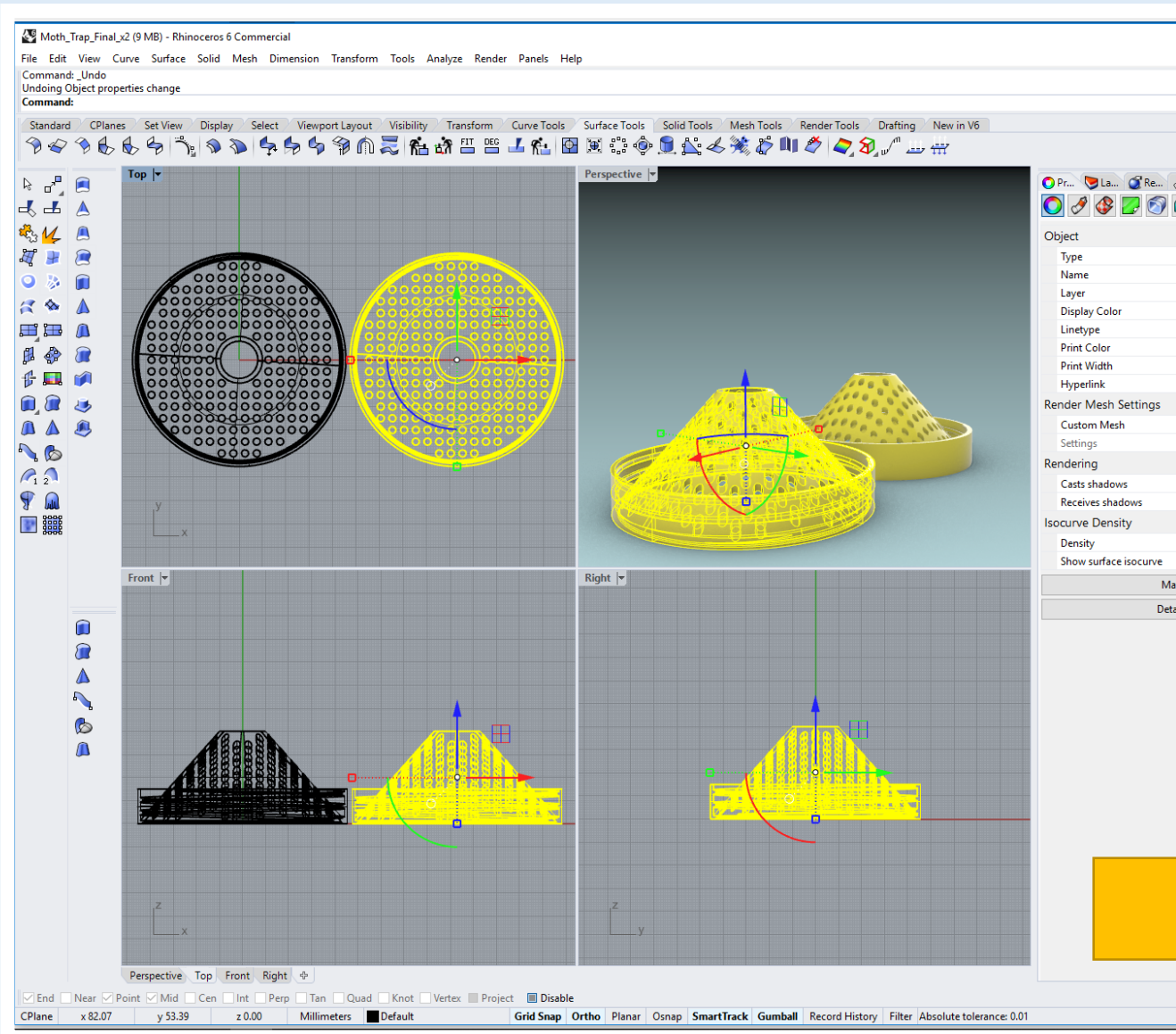
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Florida Department of Agriculture and Consumer Services • Division of Plant Industry

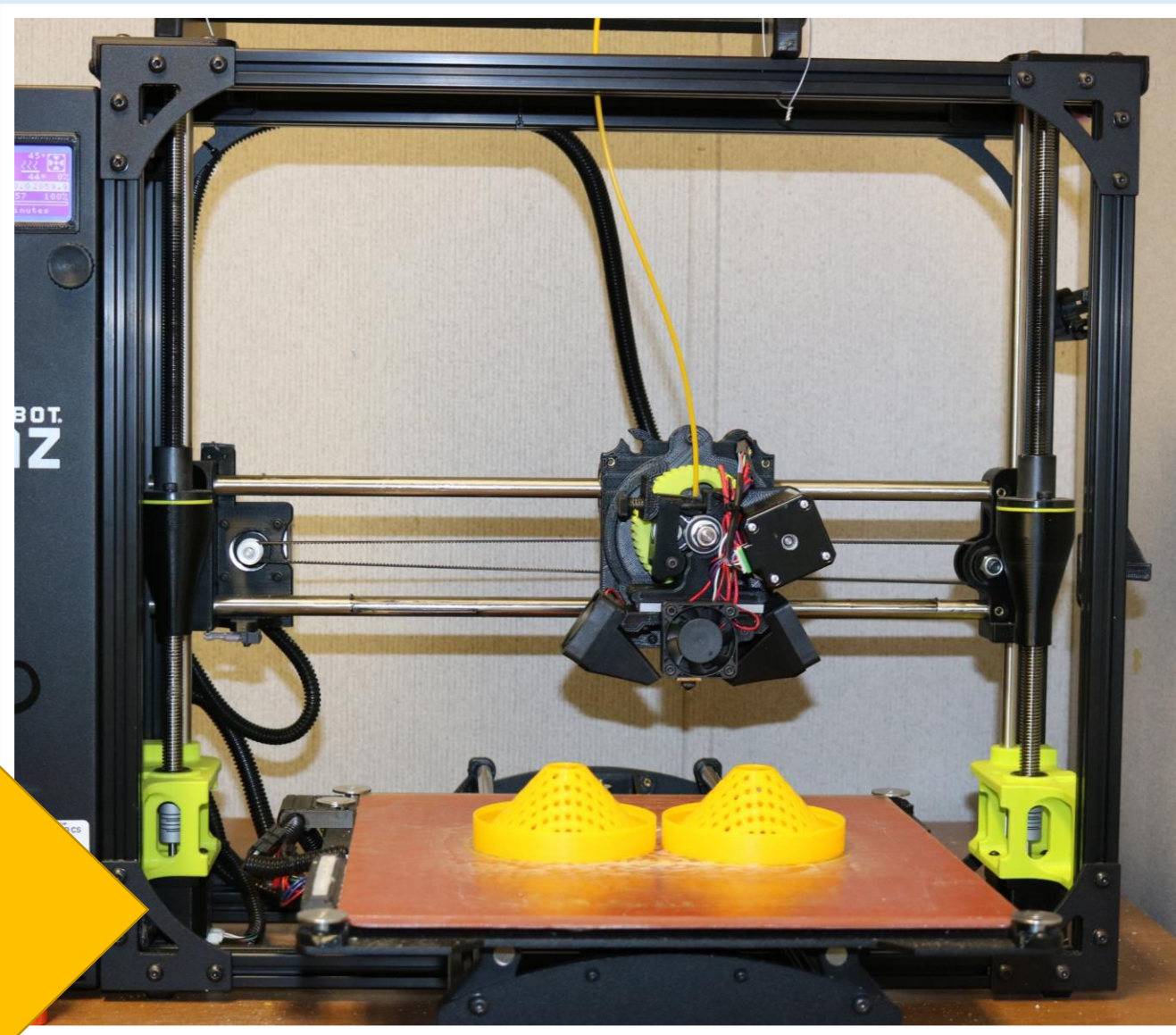


Design Software



Objects are designed using Rhinoceros 6 computer software.

3D Prints



Objects are printed with a 3D printer, which deposits successive layers of heated plastic until the object is created.

Other Project Collaborations

Asian Citrus Psyllid Monitoring and Early HLB (CLas) Detection



Asian Citrus Psyllid
Diaphorina citri

DPI's 3D Print Lab has created a trap (below: Cylinder Trap) for the Asian citrus psyllid (ACP), *Diaphorina citri*, which has near-equal trapping rates to the industry-standard yellow sticky card—without the sticky mess and with the added ability to preserve the psyllids for DNA analysis for early detection of the bacterium, *Candidatus Liberibacter asiaticus* (CLas), that is associated with citrus greening.

Financial support was provided by NIFA (2015-70016-22992) James Snyder¹, Katrina L. Dickens¹, Stefanie Dowling¹, Shweta Sharma¹, Amy Howe¹, Eric Rohrig¹, Trevor Smith¹, Anthony Dickens¹, Susan Halbert¹, Chandrika Ramadugu², Gregory Simmons², Russell Mizell³, Ruth Henderson⁴
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ACP Trap Design Progression



Industry-Standard Yellow Sticky Card



All models (right) utilize a funnel and collection vial of propylene glycol to preserve psyllids.



Previous hand-constructed traps



Previous 3D printed traps



Stem Trap

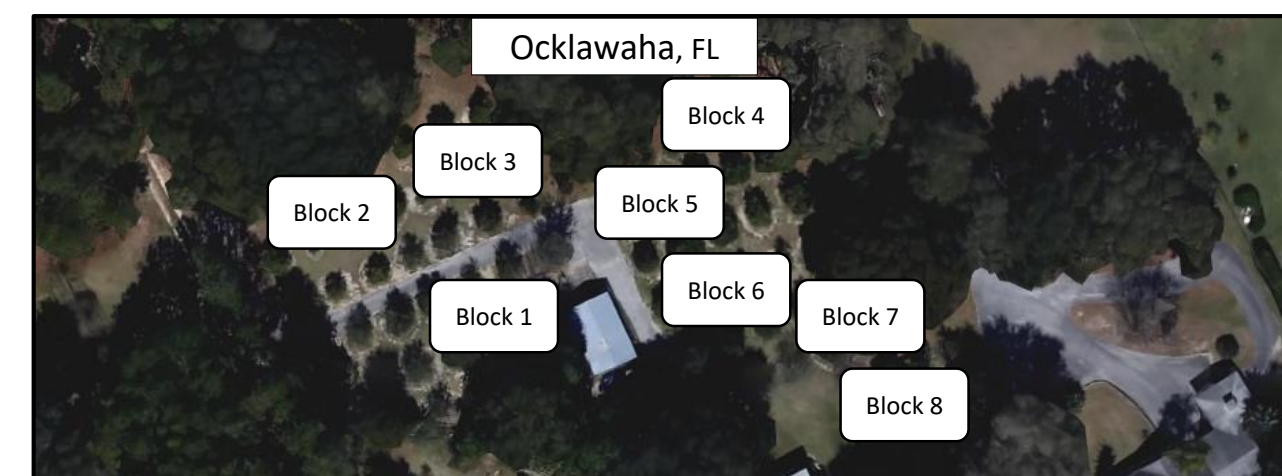


Cylinder Trap

ACP Field Research

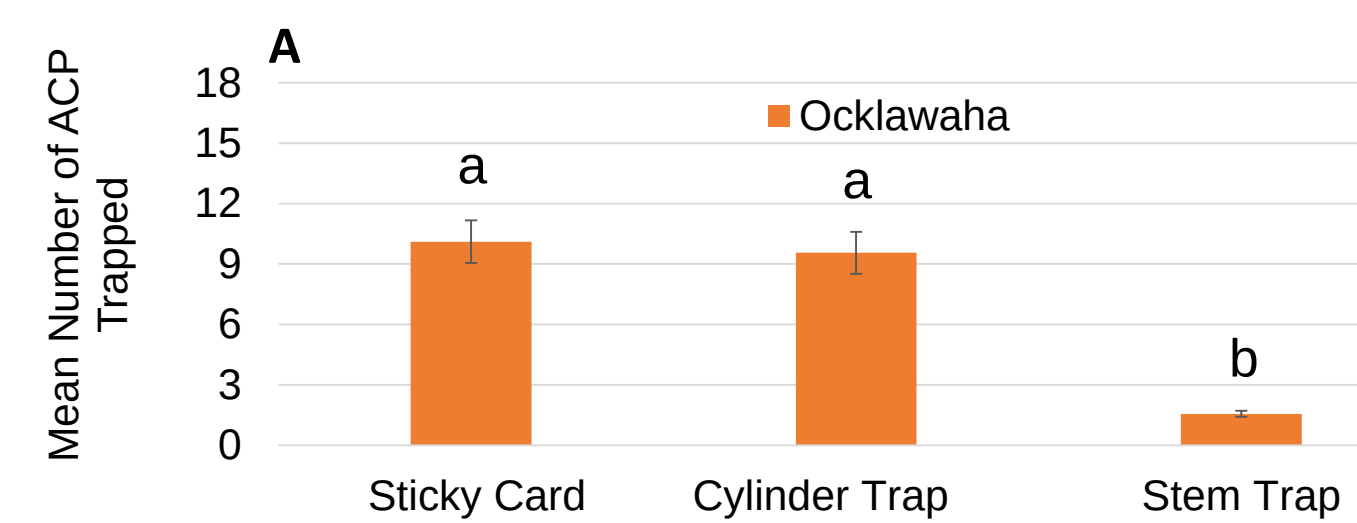
Methods

2018 field trails utilized a randomized complete block design at two sites and tested 4 treatments: two 3D printed trap prototypes (Stem Trap and Cylinder Trap) and one yellow sticky card as a standard of measure. The mean number of psyllids trapped during weekly deployments were compared at each site.

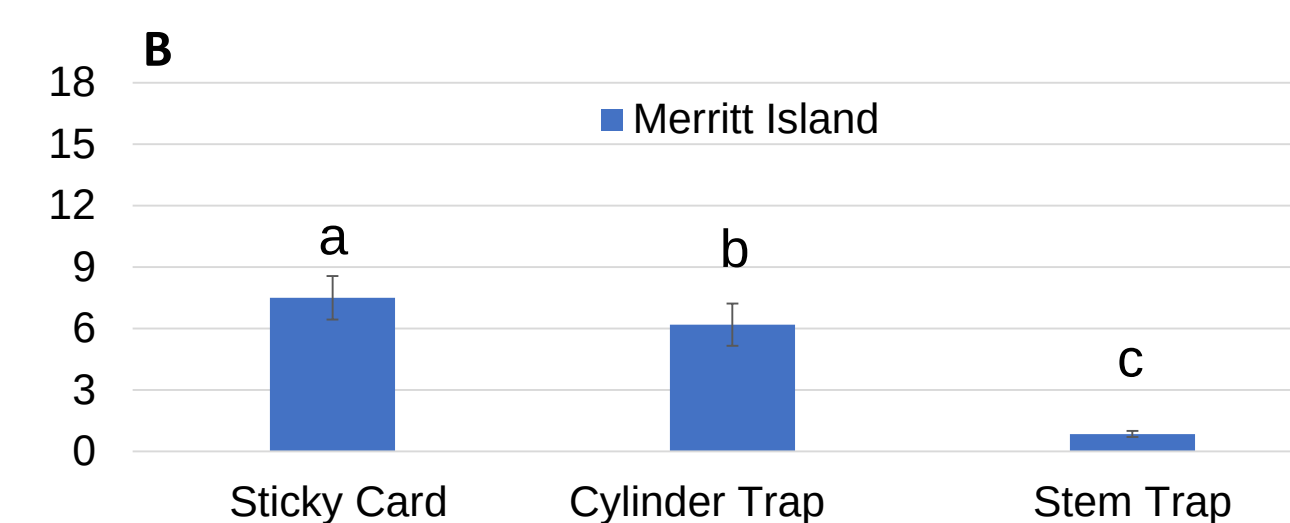


Results

The Cylinder Traps caught as many psyllids on average as the sticky cards in Ocklawaha, FL (Fig. A). In Merritt Island (Fig. B), the mean number of ACP trapped are significantly different but more similar than the means trapped by the sticky cards and the Stem Traps.



Mean number of ACP trapped with standard error bars. Means topped by the same lowercase letters are not significantly different ($P > 0.05$).



Corn Earworm

The UF-IFAS West Florida Research and Education Center requested a trap for emerging pupae of the corn earworm, *Helicoverpa zea*, to understand pupal survival rates and active times, and collect samples for genetic studies.

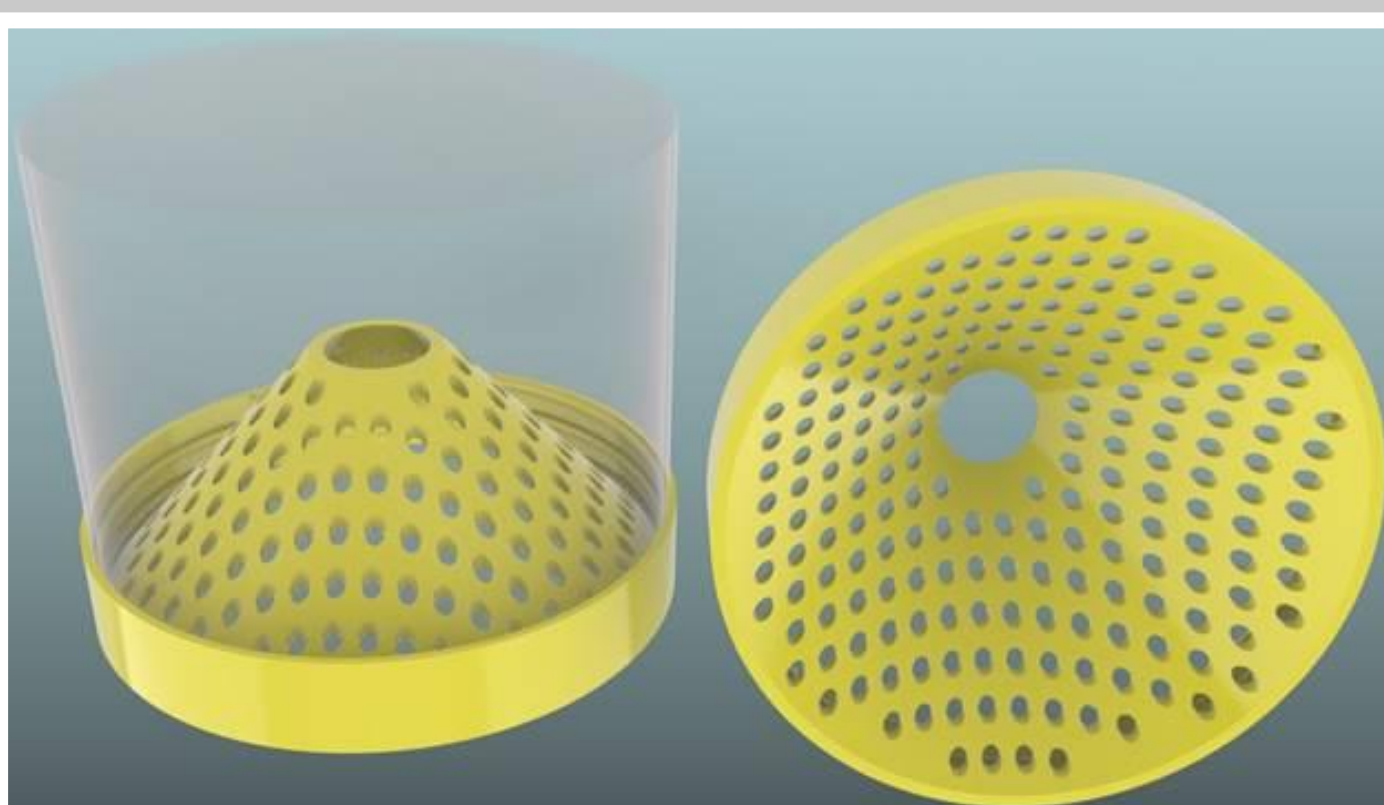


John Capinera



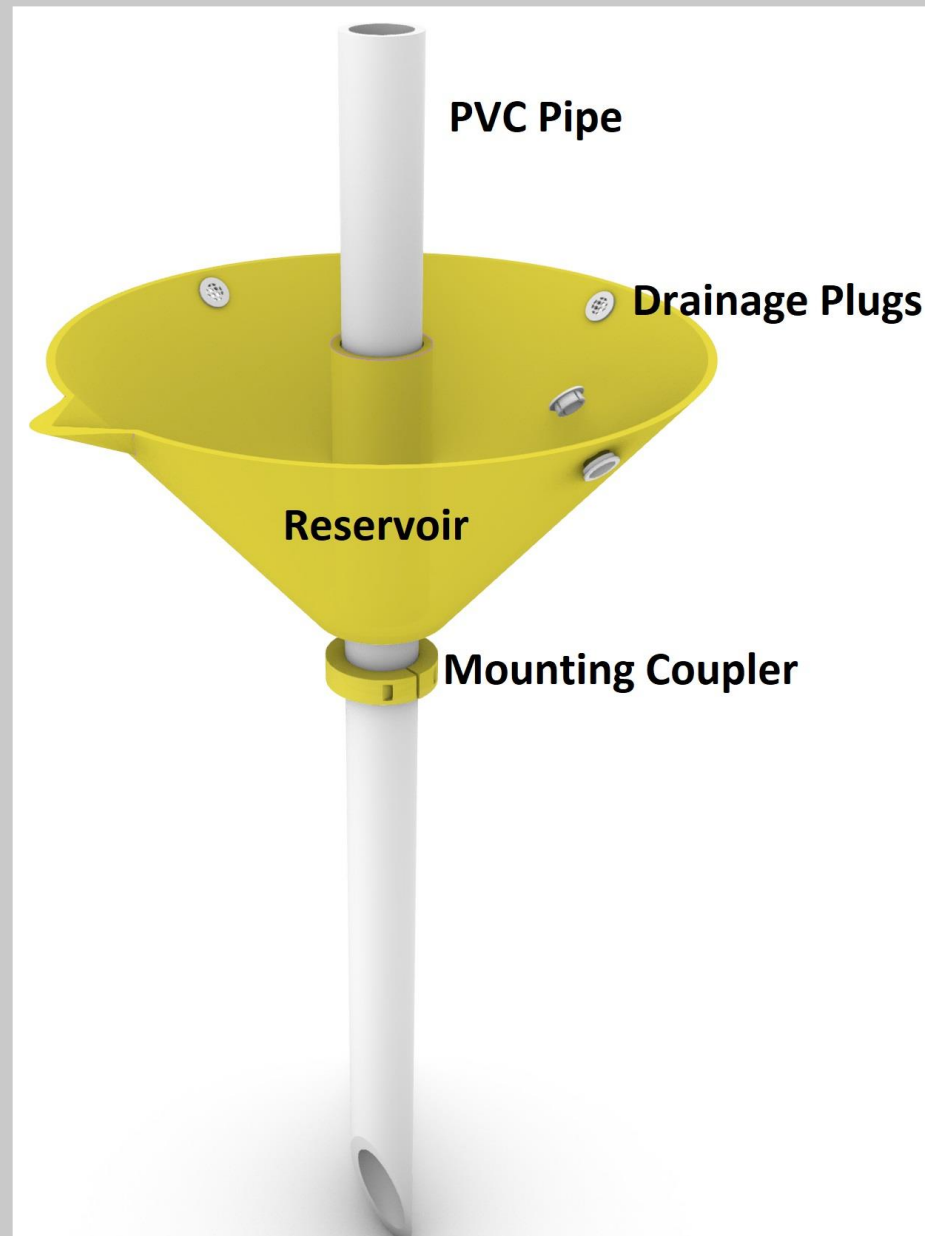
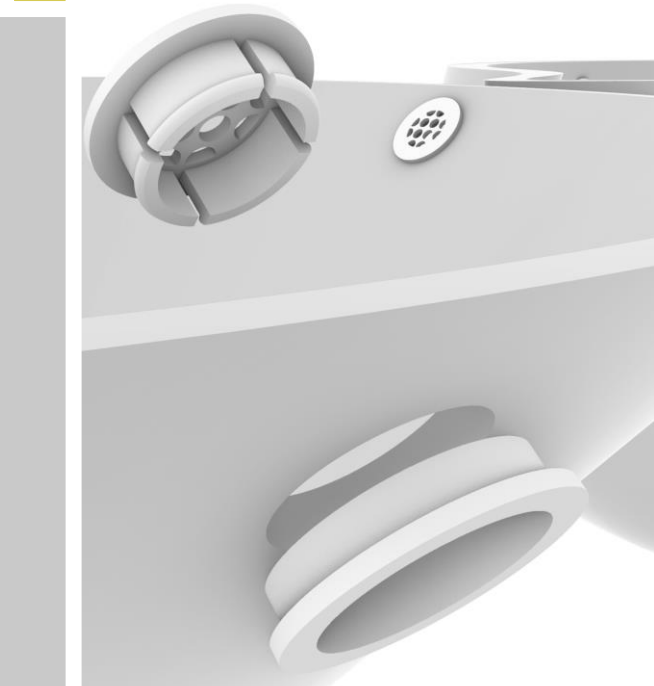
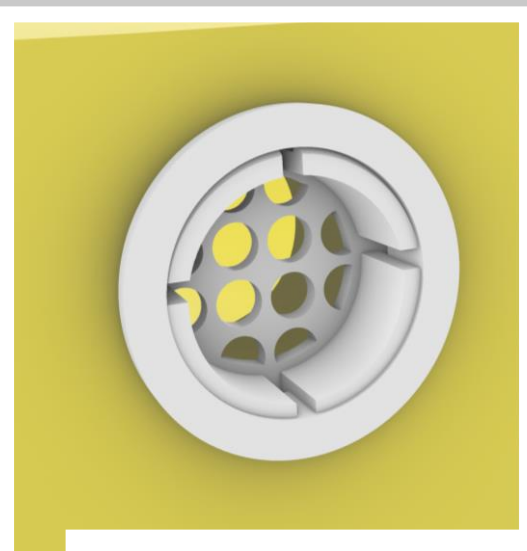
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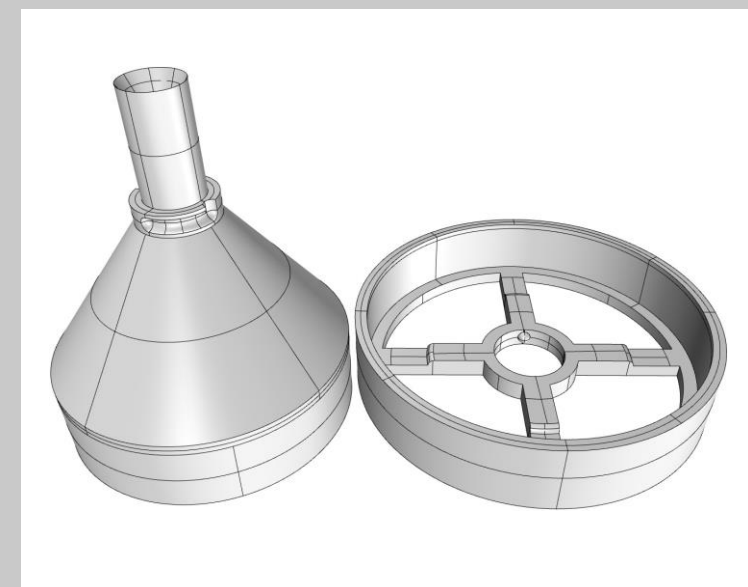
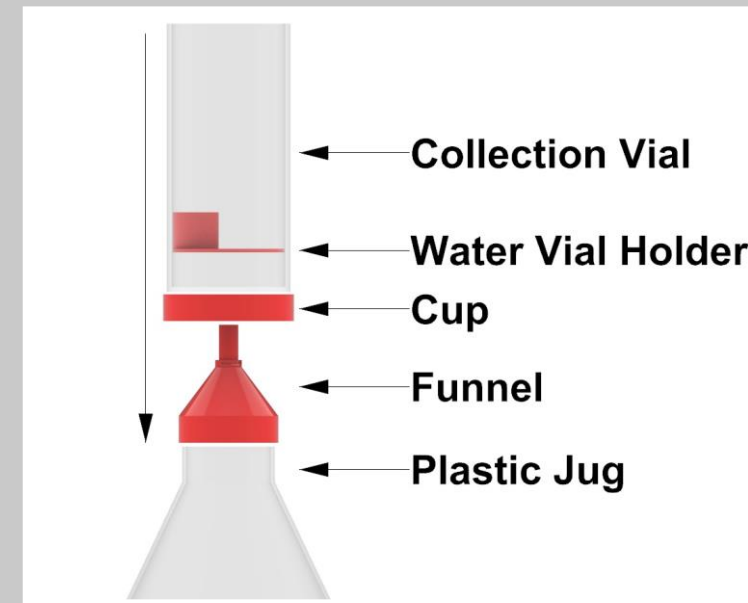
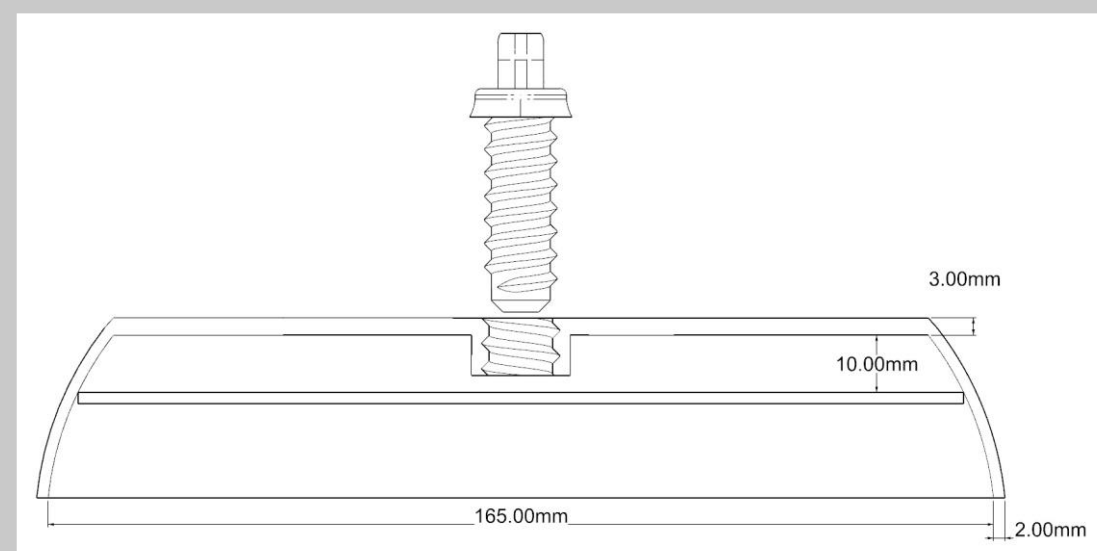
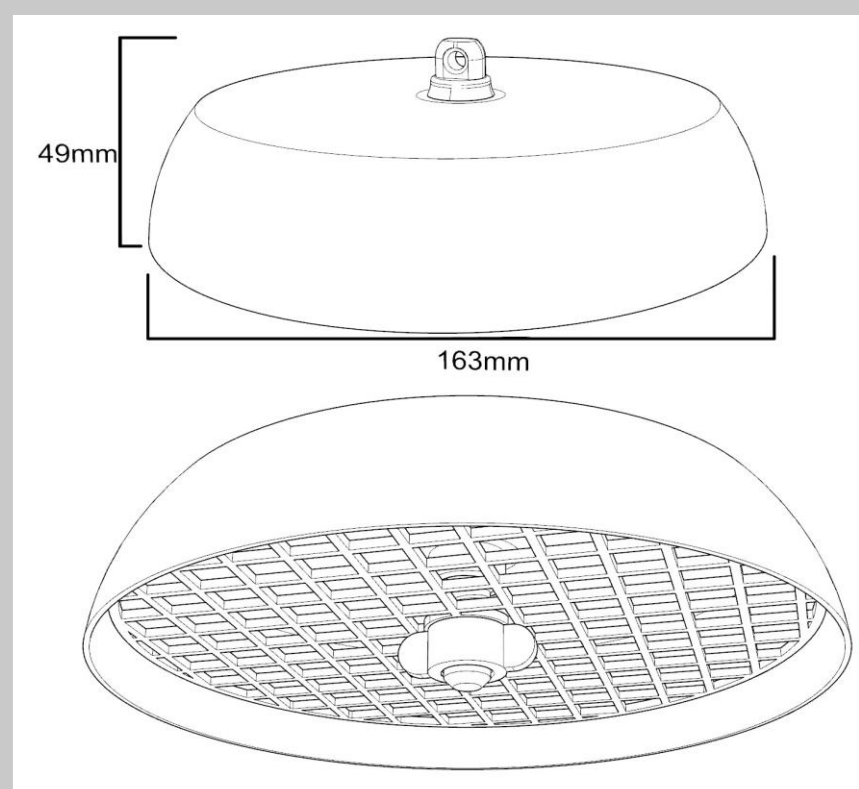
Cotton Aphid

The UF-IFAS West Florida Research and Education Center also requested a pan style trap for the cotton aphid, *Aphis gossypii*. The height of the pan was made adjustable by using a mounting coupler cinched onto the center pipe. Three small holes were designed near the rim of the pan and 3D printed mesh plugs were inserted. This allows water to drain while keeping specimens inside.



Fruit Fly

A fruit fly bait station was produced to deploy bait for various exotic fruit flies in the field. A coconut fiber disk with the liquid pesticide bait is sandwiched between a weatherproof dome and a plastic grid. A bolt passes through the top of the dome and is secured with a wing nut.



Passive Thrips Collection

A funnel was designed to passively collect the thrips, *Pseudophilothrips ichini*, being mass reared as a biological control agent of Brazilian pepper, *Schinus terebinthifolia*. These thrips are minute in size making hand collection difficult and often resulting in specimen injury or mortality. In passive collection, a jug can be placed on top of the host plant nursery pot. Emerging thrips are attracted to the new plant material in the vial and climb upward through the funnel and into the trap.

Giant African Land Snail

Traps are being developed for the giant African land snail, *Lissachatina fulica*, eradication program as a survey tool to ensure properties are snail-free and to monitor for new infestations.



Jeffrey Lotz

