



Full Scale Operational Deployment of Unmanned Aircraft Systems for Multispectral Imagery, LiDAR, and Aerial Applications

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Leading Edge Aerial Technologies, Inc.



Real World Operational Uses

- Herbicide - Invasive Aquatic Weeds –
St. Johns River Water Management District, FL
- Pheromone
Vineyard Management - Napa County, CA
- LiDAR, Multispectral Imagery, Aerial Applications –
California State Parks
- Herbicide
Invasive Weed
Solano
Invasive Weed and Right of Way Encroachment - Bartow, FL
- Vector Control
Seminole County, FL

TOPICS

- Key Advantages of Unmanned Aircraft Systems (UAS)
- PrecisionVision® Unmanned Aircraft PV35X and PV40X

Key Advantages of UAS for Aerial Applications

Enhanced Safety for Ground Crews

Efficacy / Precision Applications

Accessibility

Efficiency

Environmental Footprint

Endangered Species, Sensitive Terrain, Fuel

PrecisionVision® Aircraft 40X & 35X



PrecisionVision® 35X UAS



- Fully autonomous or manual flight modes
- Flight plans created in the field or in any GIS system
- Three payload systems (liquid, granular, ULV)
- Payload weight capacity 25 pounds
- Typical acres treated per minute 0.3 – 0.5
- Many safeguards, low battery, lost link, spray override, obstruction avoidance, battery failsafe, GCS failsafe



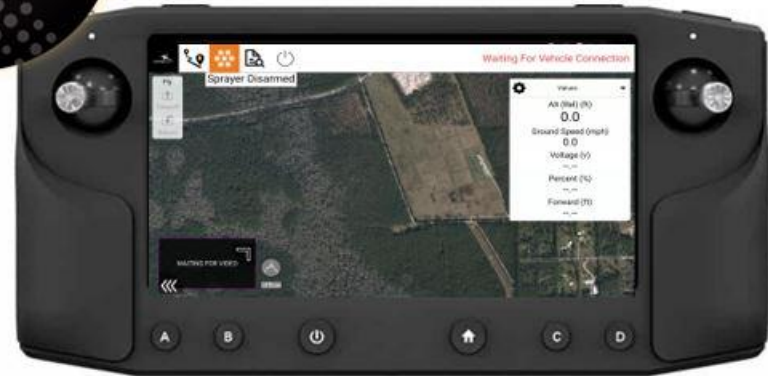
PrecisionVision® 40X UAS



- Fully autonomous or manual flight modes
- Flight plans created in the field or in any GIS system
- Three payload systems, liquid, granular and ULV
- Payload weight capacity 40 pounds
- Typical acres treated per minute 0.5 - 0.7 liquid, 1.5-3 acres/min granule
- Many safeguards, low battery, lost link, spray override, obstruction avoidance, battery failsafe, GCS failsafe

PrecisionVision Ground Control Station

- Pre-flight checks
- Flight planning
 - Points, path, polygon
- Treatment polygons
 - Import shapefiles
 - Save flight plans
- Application rates
 - Reside in material database
 - Swath
 - Speed
 - Application rate
 - Total spray time
- Material selection database
- Post-treatment log files
 - Shapefiles
 - Points
 - Swath



Real World Operational Uses of Drones

Noxious & Aquatic Weeds

Aquatic herbicide applications

St Johns River Water Management District-Brevard County, Florida

- Canal 90 ft x 4,800 ft
- Large trees line both sides
- UAS swath 16-20 ft
- Near residential area (noise, drift considerations)
- Target: Hydrilla, Water Lettuce, Crested Floating Heart

Why UAS? Relatively small acres, sensitive habitat, residential encroachment, affordable

Time savings 3-4 hours vs. two employees, airboat, loud, near neighborhood and 8-10 hr. day



Aquatic herbicide applications

St Johns River Water Management District-Brevard County, Florida



Aquatic herbicide applications Birds and Safety

St Johns River Water Management District-Brevard County, Florida



Real World Operational Uses of Drones

Pheromone Applications

Pheromone applications

Napa Valley, California 2022 Vine Mealybug

- Damage by the vine mealybug is like that of other grape-infesting mealybugs in that it produces honeydew that drops onto the branches and other vine parts and serves as a substrate for black sooty mold
- Biological control
- Organic methods

- Mating disruption – applying Checkmate Dry Flowable, one ounce to the acre, as applied at 3 GPA



* Checkmate is a product of Suterra, Inc. <https://www.suterra.com/>

Pheromone applications


Napa Valley, California 2022 Vine mealybug application of Suterra Checkmate DF



Pheromone applications Terrain Following Radar

Napa Valley, California 2022 Vine mealybug application of Suterra Checkmate DF





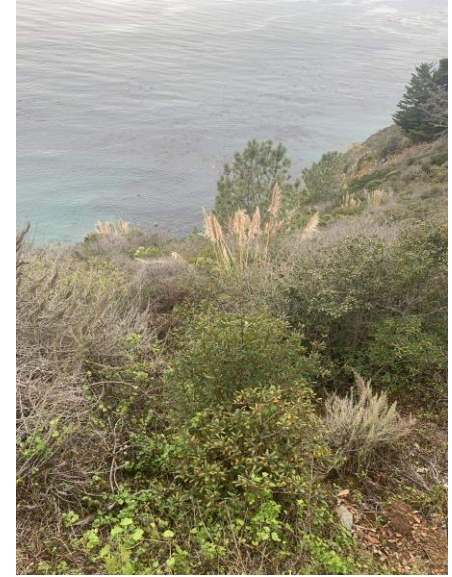
Real World Operational Uses of Drones; Imagery, Lidar, Aerial Applications

Noxious Weeds, California

Lidar Multispectral Imagery and Applications

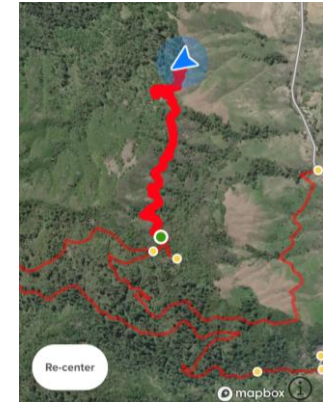
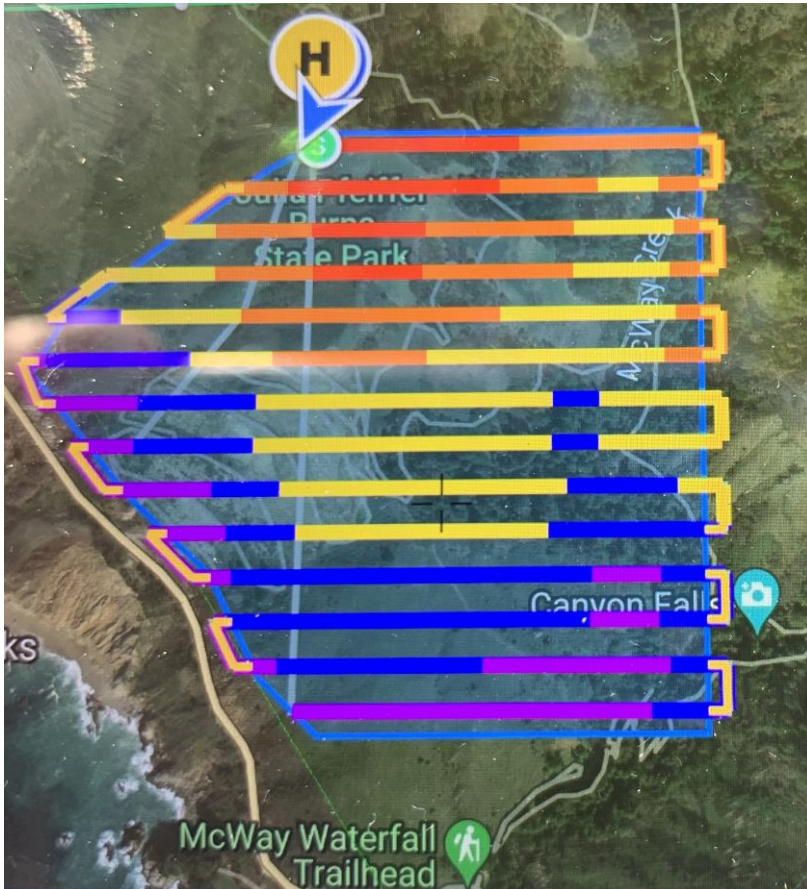
Invasive weed – Cortaderia jubata (Jubatagrass)

- After the 2020 fires in Big Sur, Julia Pfeiffer and Limekiln State Parks, Jubatagrass established itself along the coast
- 2022 Deployed Multispectral and LiDAR UAS services to identify the exact locations (3cm accuracy using RTK) of the Jubatagrass
- Spring of 2023 UAS aerial applications begin



Herbicide applications – Invasive Species

California Parks, Big Sur, California; Imagery & LiDAR flight planning



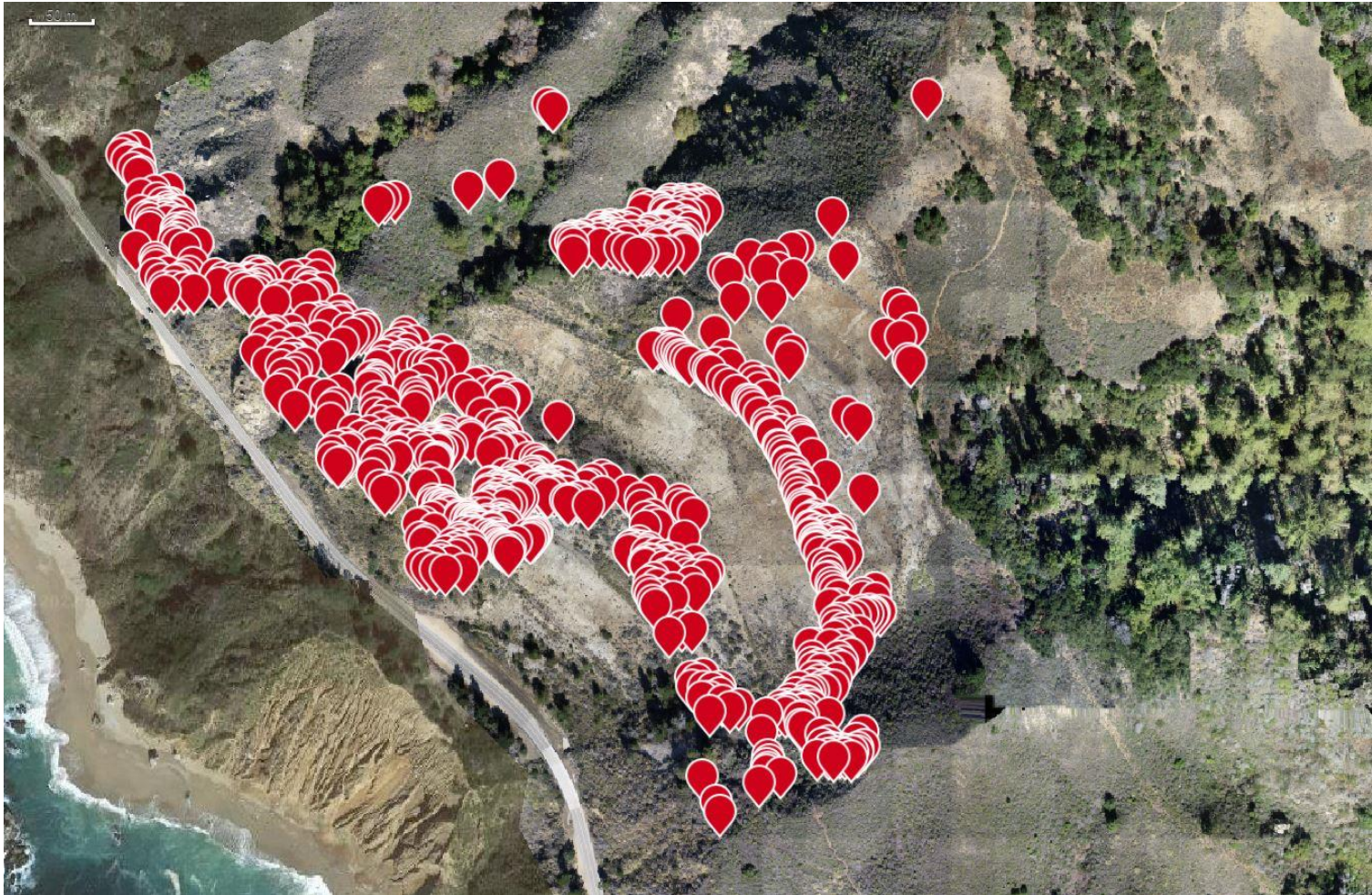
Herbicide applications – Invasive Species

California Parks, Big Sur, California; First target Jubadagrass



Herbicide applications – Invasive Species

California Parks, Big Sur, Ca.; First target Jubadagrass – only 1/3rd of park 943



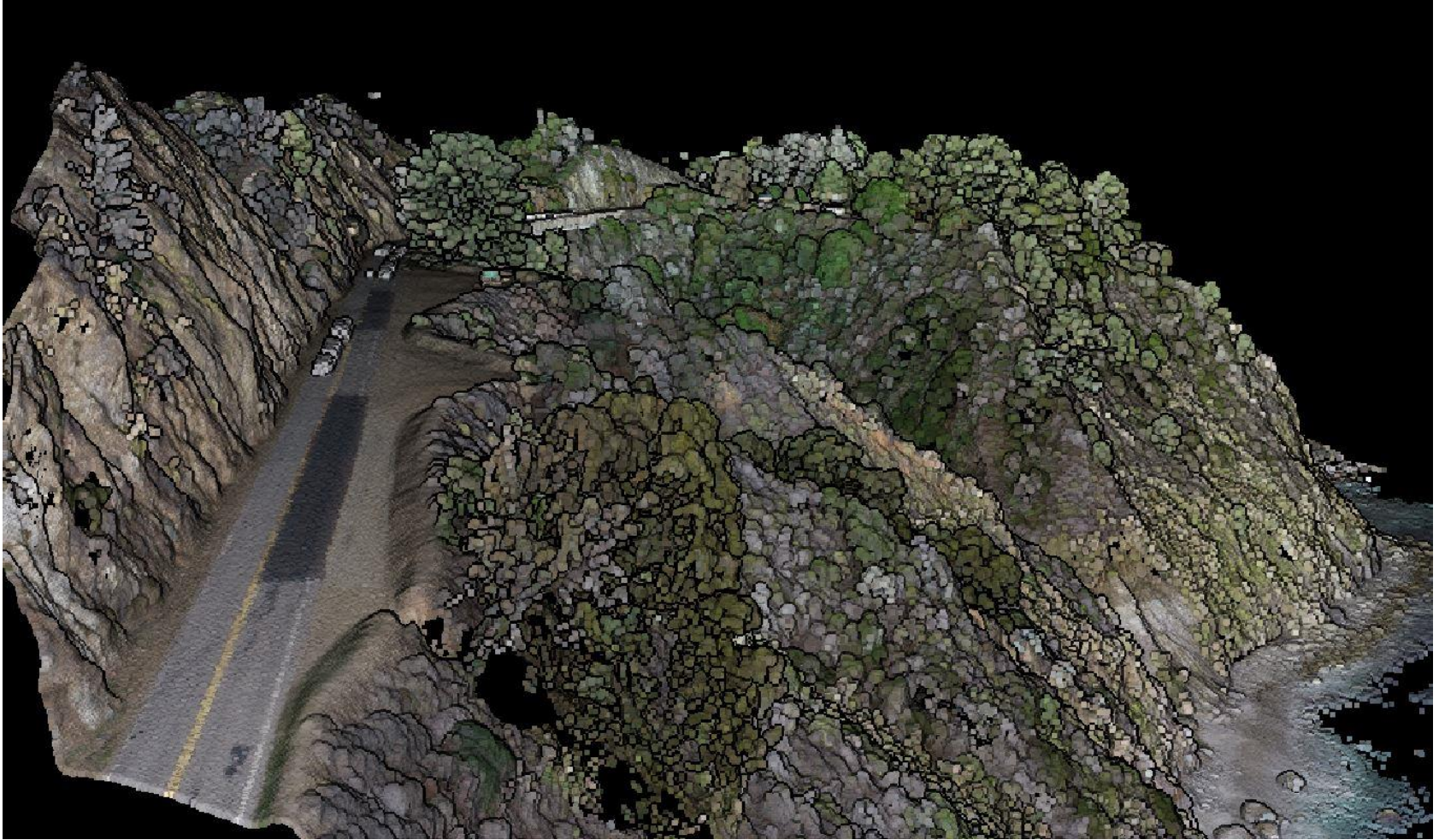
Herbicide applications – Invasive Species





Herbicide applications – Invasive Species

California Parks, Big Sur, California; First target Jubadagrass



Herbicide applications – Invasive Species

California Parks, Big Sur, California; First target Jubadagrass



Herbicide applications – Invasive Species

Solano Resource Conservation District, Solano, Ca.

Vision and Mission Statement

“Improve programs and services to provide the Suisun Marsh land-owners technical assistance in environmental permitting, habitat management, water control, and funding to ensure the wetland and wildlife values of the Suisun Marsh are sustained and enhanced”

Invasive weeds:

Phragmites
Lepidium



Herbicide applications – Invasive Species

Solano Resource Conservation District, Solano, Ca.



Herbicide applications – Invasive Species

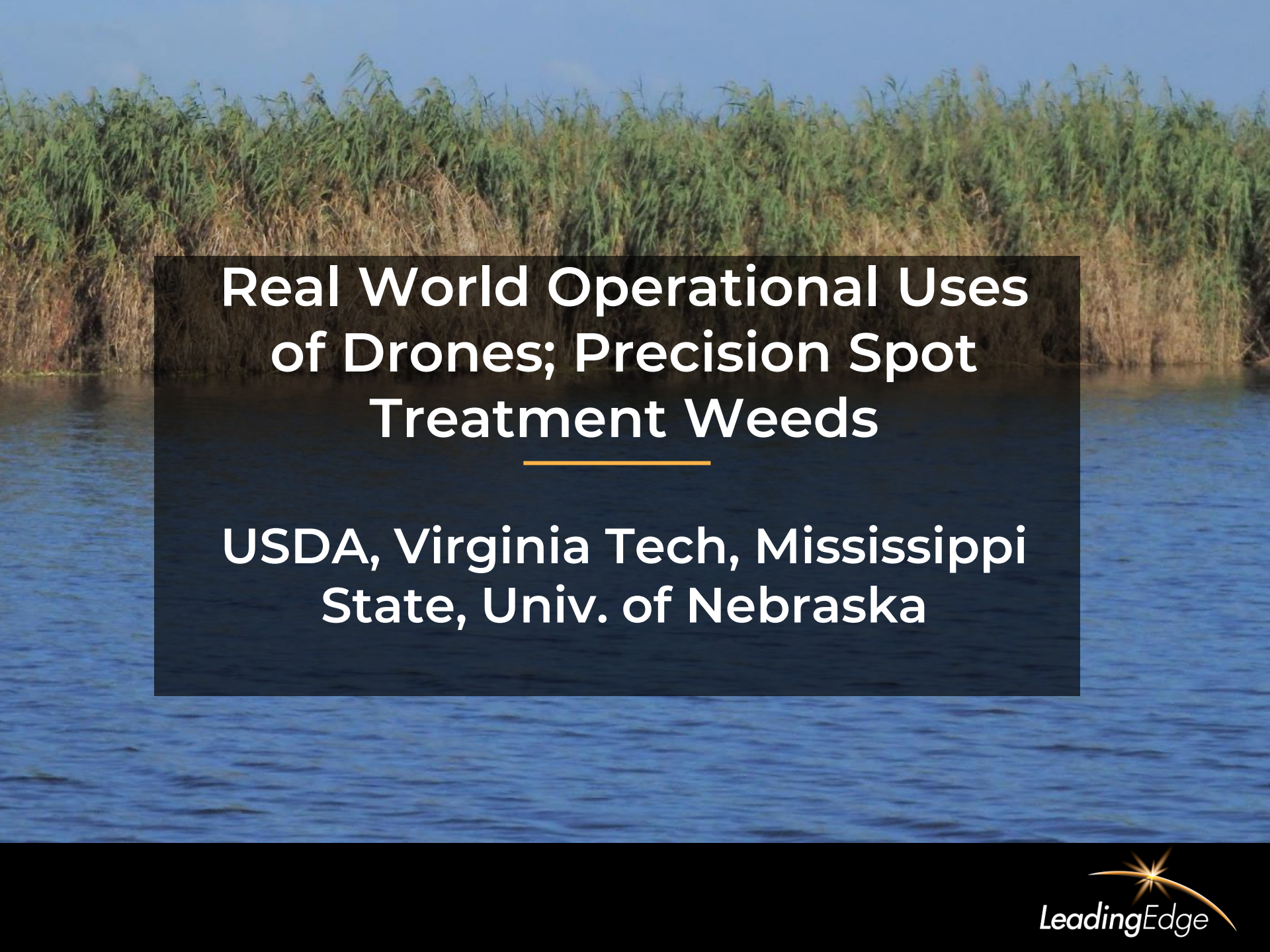
Solano Resource Conservation District, Solano, Ca.



Herbicide applications – Invasive Species

Solano Resource Conservation District, Solano, Ca.



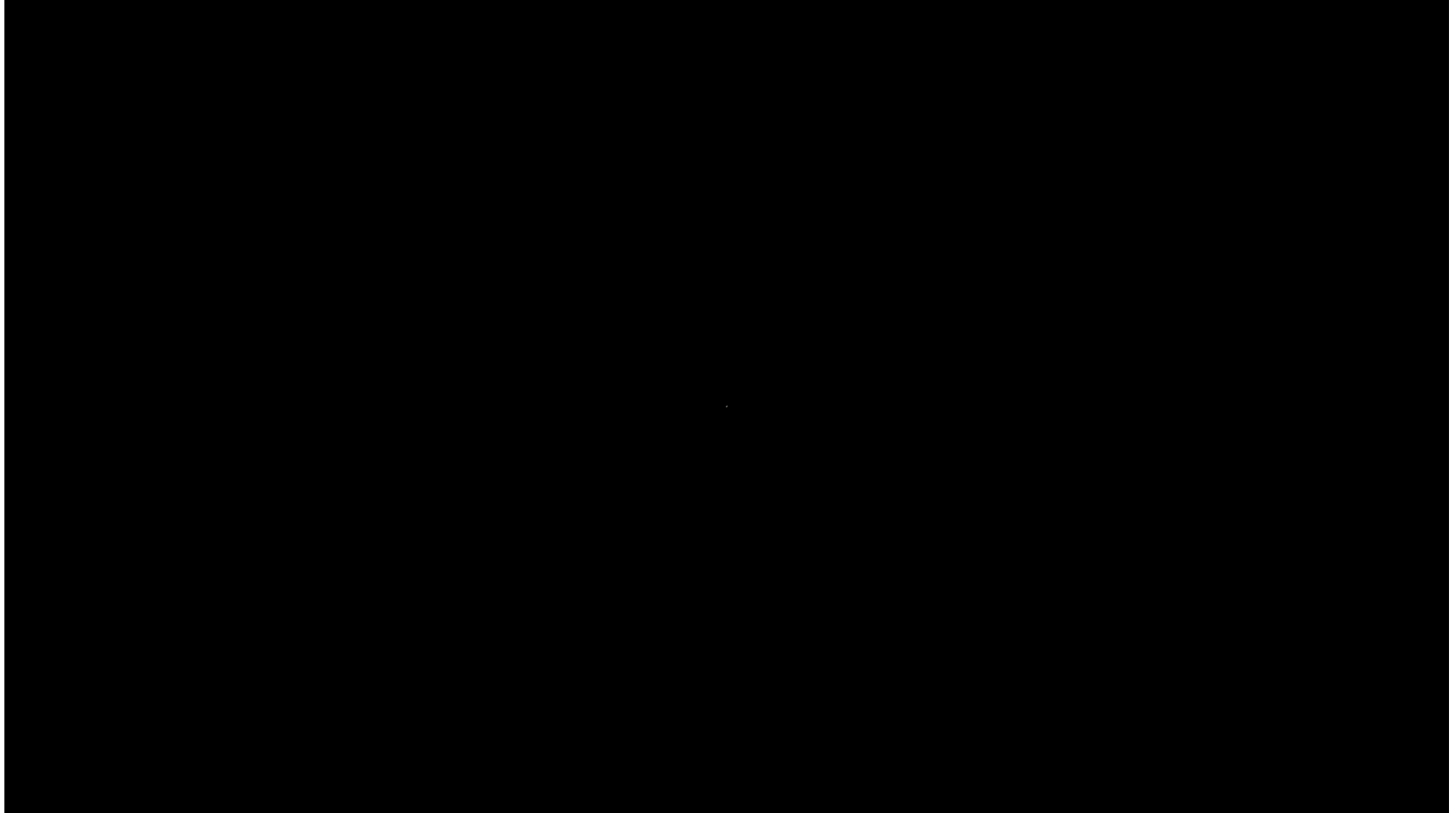


Real World Operational Uses of Drones; Precision Spot Treatment Weeds

USDA, Virginia Tech, Mississippi
State, Univ. of Nebraska

PrecisionVision sub-centimeter spot spraying


USDA College Station Texas and Virginia Tech



PrecisionVision sub-centimeter spot spraying

USDA College Station Texas and Virginia Tech





Real World Operational Uses of Drones

Mosquito Control

Product Labels

“Rotary Aircraft”

Some states are placing UAS under umbrella of “Rotary Aircraft”

“Unmanned Aircraft”

Product Example: Altosid SR-20



PREVENTS ADULT MOSQUITO EMERGENCE (including those which may transmit West Nile virus, Zika, chikungunya and dengue)
For control of mosquito larvae using ULV application

SPECIMEN LABEL

ACTIVE INGREDIENT:
(S)-Methoprene (CAS #65733-16-6).....20%
OTHER INGREDIENTS:.....80%
TOTAL:.....100%
Formulation contains 1.72 lb/gal (205.2 g/liter) active ingredient

If in eyes • Hold eye open and rinse slowly and gently with water for 15–20 minutes. • Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
If on skin or clothing • Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15–20 minutes.
Have the product container or label with you when calling a poison control center or doctor, or going for

For aerial application to terrestrial sites, apply by fixed wing or rotary aircraft. Apply at the rate of ¾ – 1 fluid ounce of product to acre diluted with water at a minimum of a 1:1 mix ratio with water. Apply using ULV equipped and capable aircraft. Unlike ULV sprays targeting flying mosquitoes, it is important that spray droplets deposit in targeted areas. Target terrestrial areas where mosquitoes breed. These sites include tires, open containers, garbage bins, birdbaths, and gutters holding small amounts of water. Spray equipment must be adjusted so that the volume median diameter (VMD) produced ranges from 60 microns ($Dv_{0.5} < 60\mu$) to 100 microns ($Dv_{0.5} < 100\mu$), and that 90% of the spray is contained in droplets smaller than 200 microns ($Dv_{0.9} < 200\mu$). Directions from the equipment manufacturer or vendor, pesticide registrant, or test facility using a wind tunnel and laser-based measurement instrument must be used to adjust equipment to produce acceptable droplet size spectra. Application equipment must be calibrated annually to confirm that nozzle flow rate(s) are accurate. Do not apply at altitudes below 100 feet unless using unmanned aircraft designed for low application heights. Apply when wind speed on the ground is ≥ 1 mph and ≤ 10 mph. Apply when wind factors promoting drift are low. For best results, use Global Positioning System (GPS) equipped aircraft.

COLORADO Animas Co. Mosquito Control

Larviciding flooded pastures near Animas River



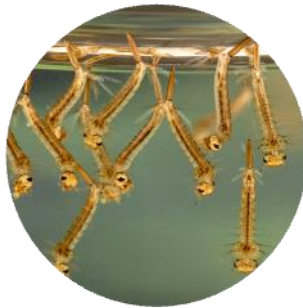
CALIFORNIA Delta Mosquito & Vector Control

Larvicide and adulticide in corn fields



Delta MVCD

Larvicide Application



Mosquitoes

Culex tarsalis
Culex quinquefasciatus
Culex stigmatosoma



Altosid XRG Ultra

Applied at
10 lbs./acre



Why UAS?

- Needed to penetrate dense corn canopy
- Larval surveillance extremely difficult
- Residential habitat
- Affordable



Delta MVCD

Adulticide Application



Mosquitoes

Culex tarsalis
Culex quinquefasciatus
Culex stigmatosoma



Pyronyl 525

Applied at
0.0025 lbs./acre
(0.8 oz/min)



Why UAS?

- Needed to penetrate dense corn canopy
- Residential habitat
- Affordable
- A manned contractor for aerial ULV has never been used by Delta

Delta MVCD

ULV application

Site Type: Corn fields

Acres Treated: Adulticide 160 & 82 acres

Application configurations:

- PV35X
- Micronair nozzles
- 75' AGL release height @ 12 mph
- 300' swath, 7.72 acres/min

Efficacy test:

- 10 droplet collection stations
- 20-25 wild caught adult *Cx. quinqs.* in field cages at each station



Delta MVCD UAS Application Results:

Mosquito abundance: 50% reduction of adults in traps after first control treatments

- Continue to monitor trap counts for Altosid residual effectiveness*

West Nile infection rates:

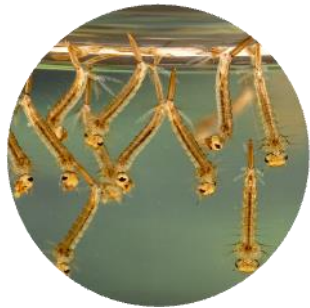
- Definite reduction in treatment area of infected *Culex tarsalis* pools; some reduction in *Culex quinqs*.*

(WNV MIRs were >20% in pools within corn field prior to UAS application)

**Data still under review*



Florida



Mosquito Larvae

Aedes infirmatus
Anopheles crucians
Culex nigripalpus
Psorophora ferox



Altosid P35

Applied at
7 lbs./acre



Why UAS?

- Relatively small acres
- Sensitive habitat
- Residential encroachment
- Affordable

FLORIDA

Seminole County Mosquito Control

Site Type: Woodland freshwater

Acres Treated: 389.00 acres

Application configurations:

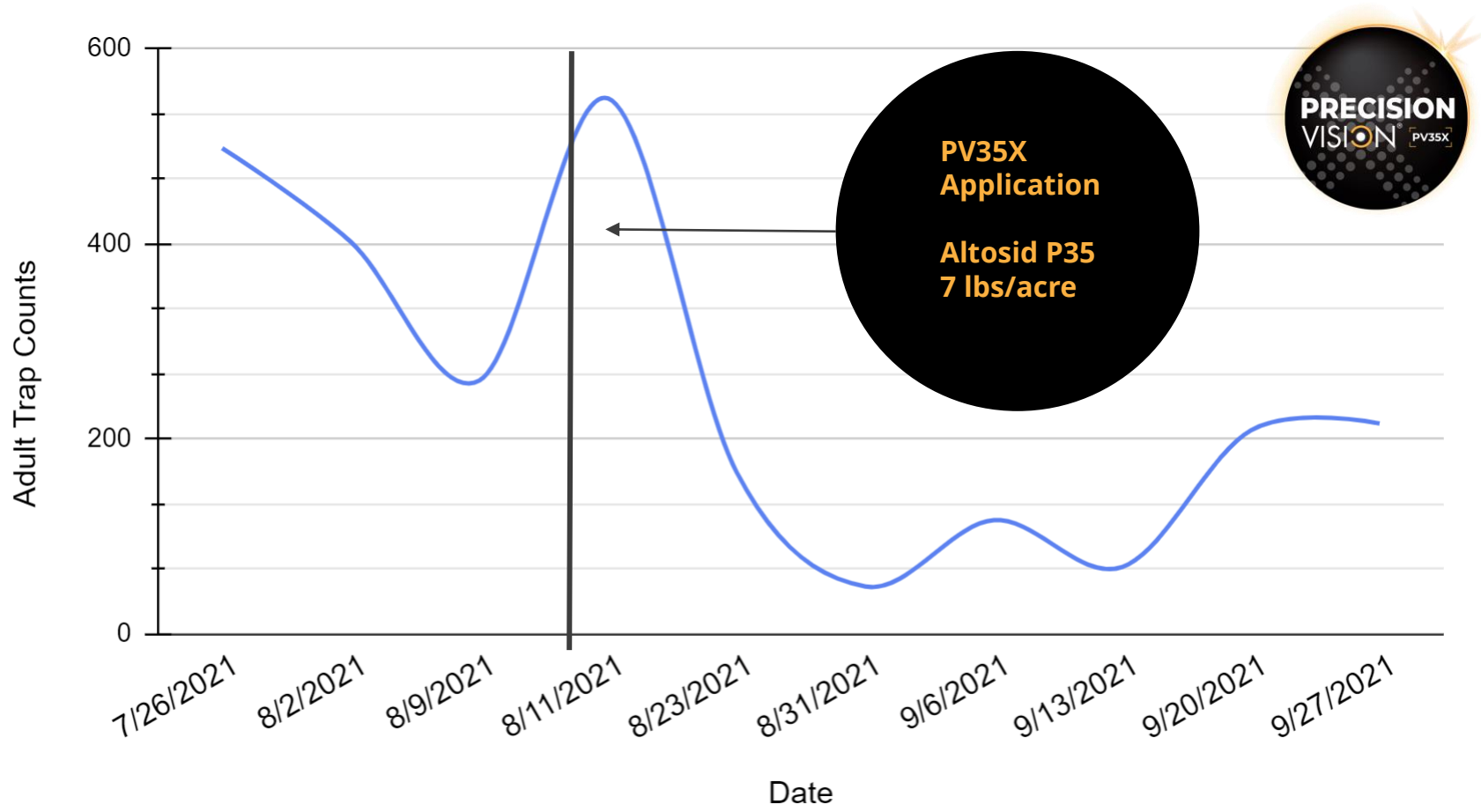
- PV35X, granular payload system
- 17 mph, effective swath width 80'

Acres treated/minute: 2.75

Granular flow rate: 19.23
lbs./min



2021 Adult Mosquito Counts via CO2 Baited Trap Seminole County, FL



**We can help you make unmanned aerial systems
an important part of your operations!**

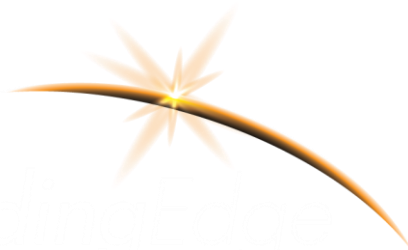


Thank You

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Leaaerialtech.com



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