

Drone Mapping

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Associate Director, EDAC

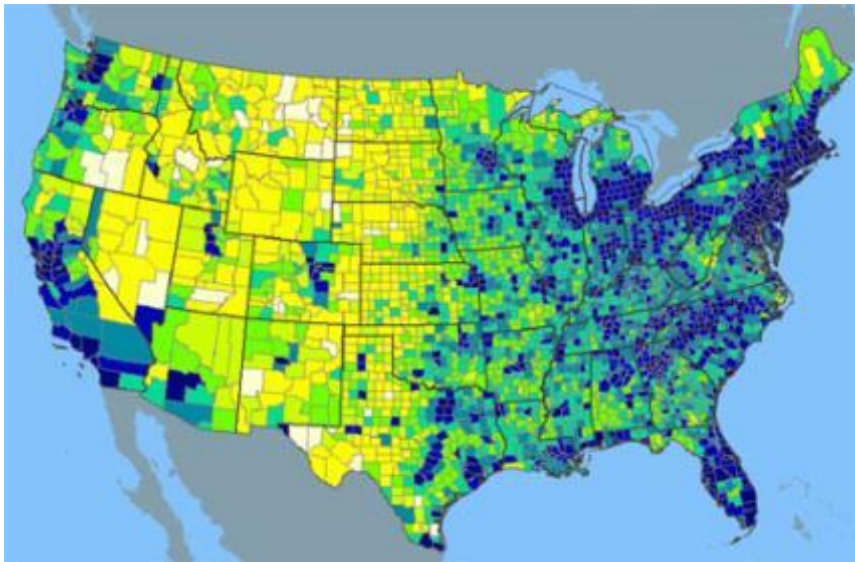
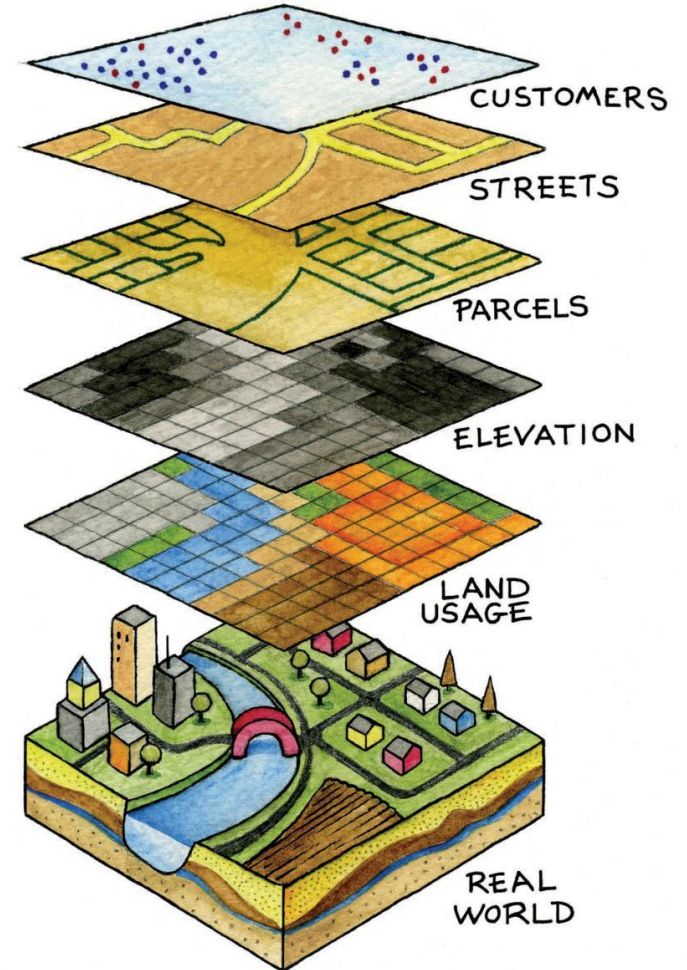
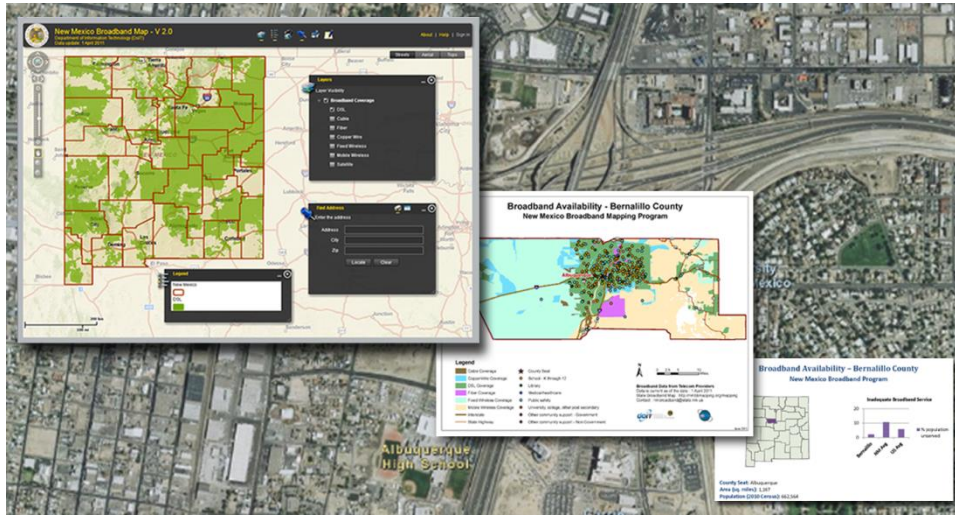
Assistant Professor, GES, CCEE



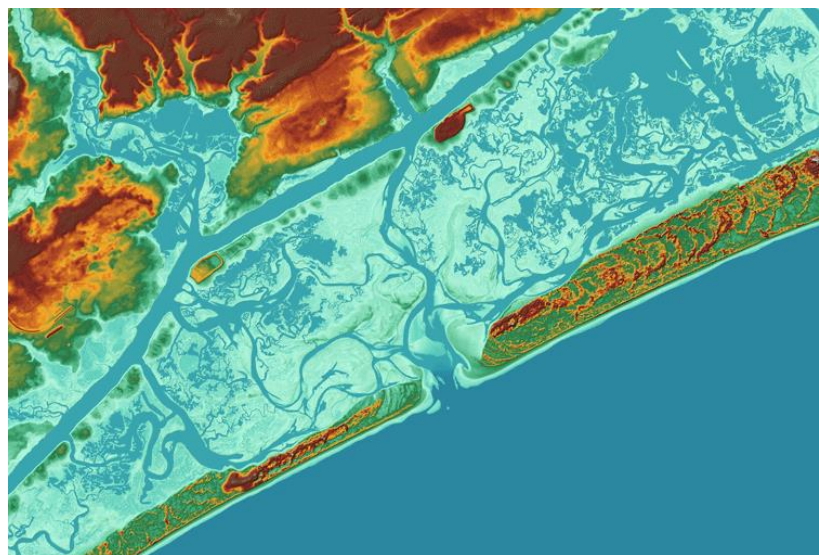
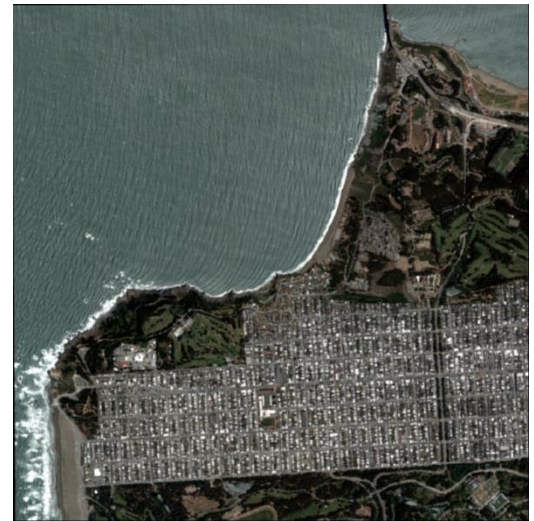
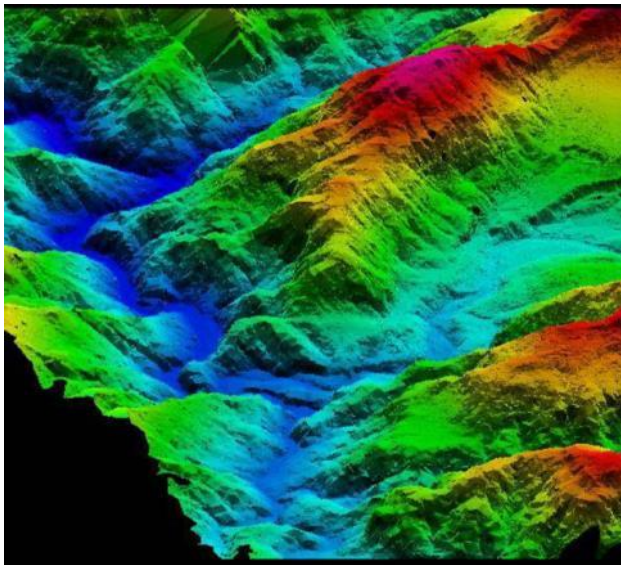
About EDAC

- Earth Data Analysis Center
- Established at UNM in 1964 to Transfer NASA space-based technology to the private and public sectors
- Library Clearinghouse 1968
- Remote Sensing 1973
- GIS Services 1983
- IT 1999
- Digital Data Clearinghouse 1992
- Vision: a center of expertise in geospatial technology
- Mission: Serve the geospatial needs of federal agencies, state/local/tribal governments, professional societies, organizations, and advisory bodies

GIS Services



Remote Sensing



Information Technology

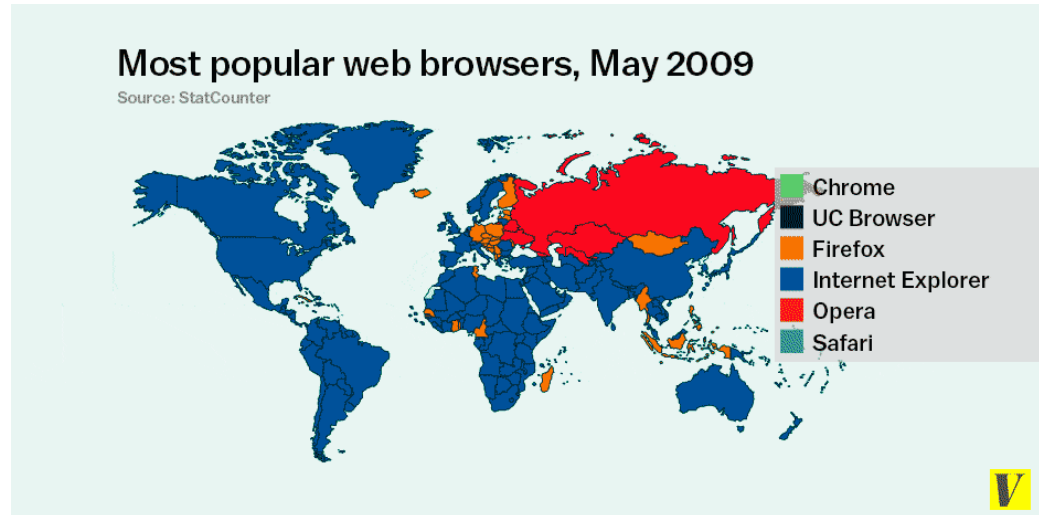
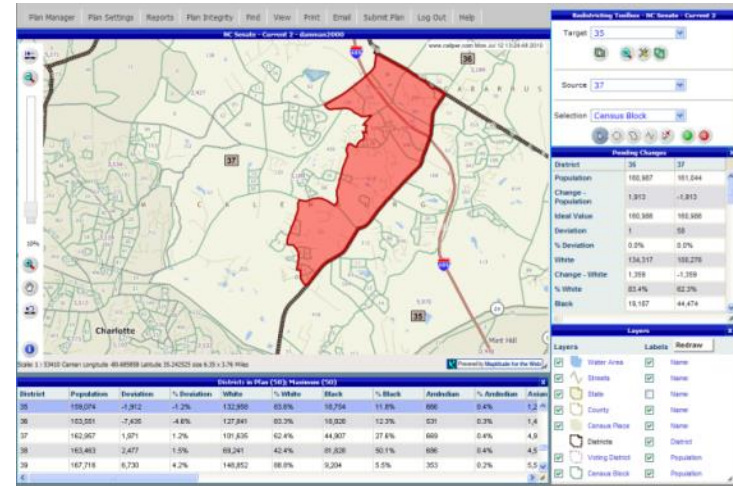
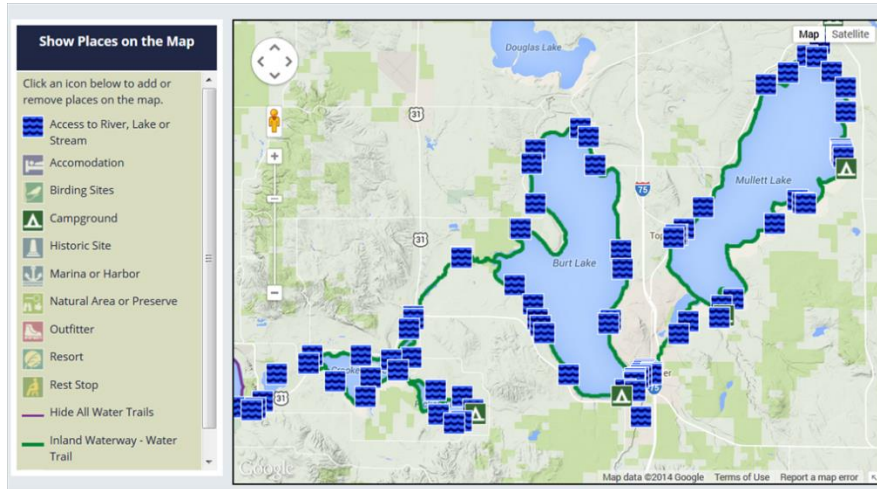
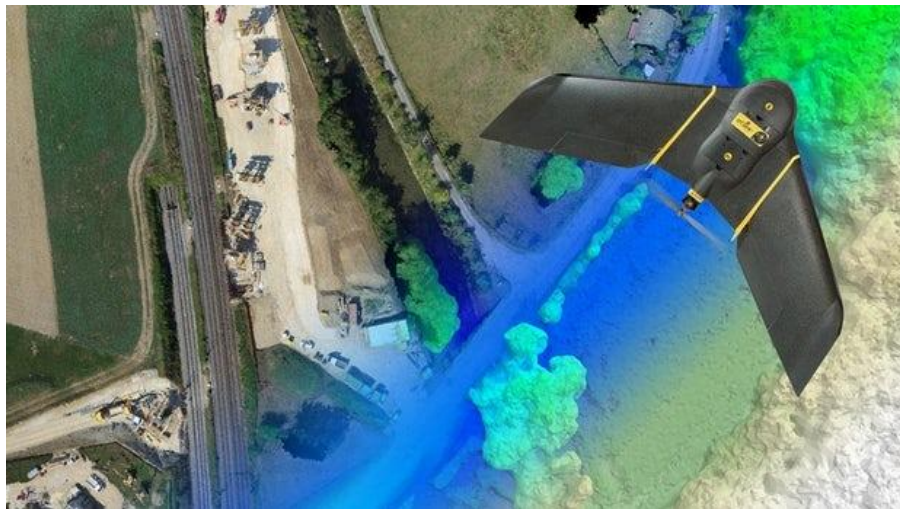


Image Archive



Unmanned Aircraft Systems (UAS) Mapping



Something about Drones

- Also known as unmanned (unpiloted, uncrewed) aerial vehicles (UAVs)
- With sensors attached, they are unmanned (unpiloted, uncrewed) aircraft systems (UAS)
 - Autonomous flight
 - Remotely piloted
 - Hybrid



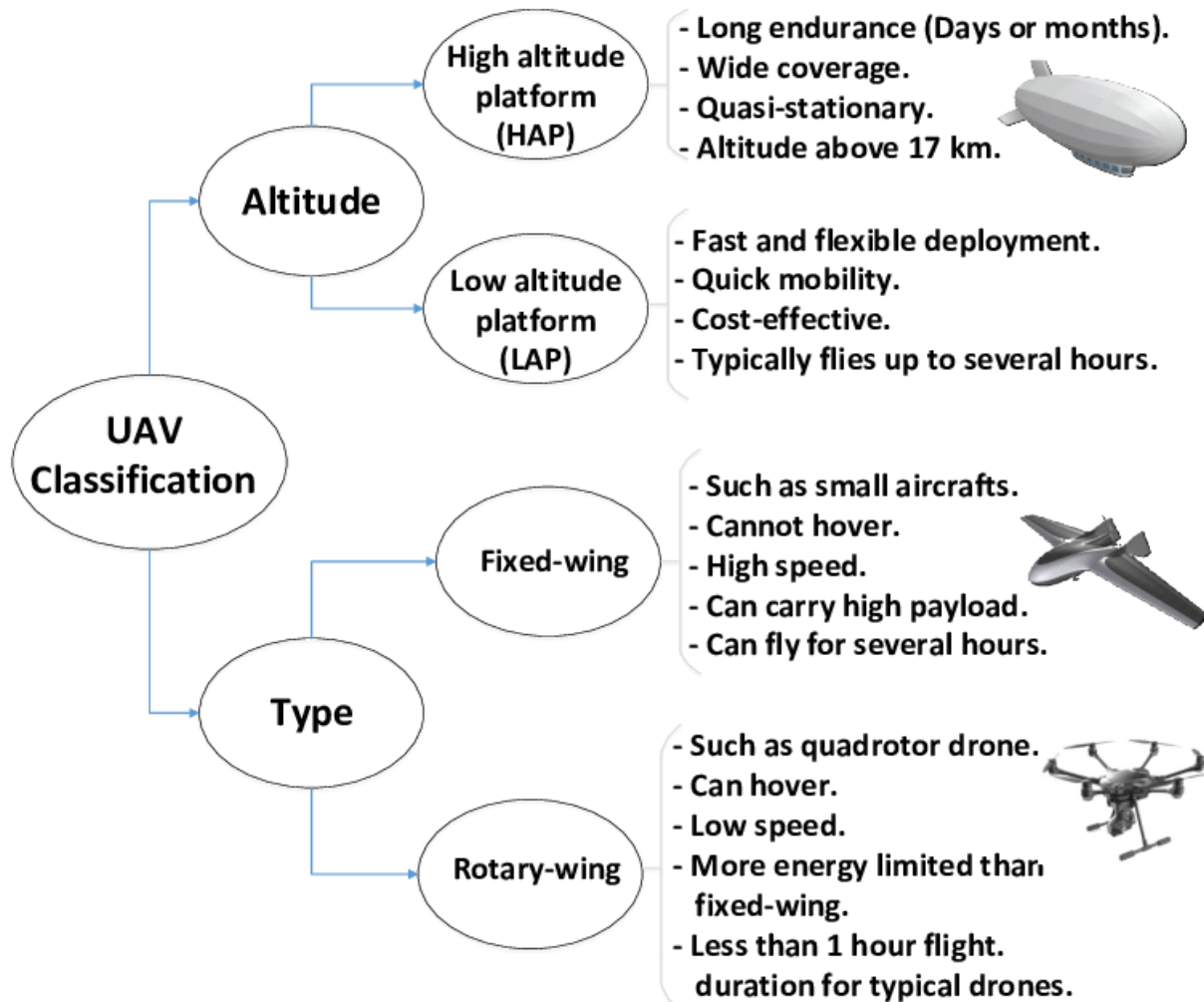
UAV Classification

Federal Aviation
Administration
FAA
Classification

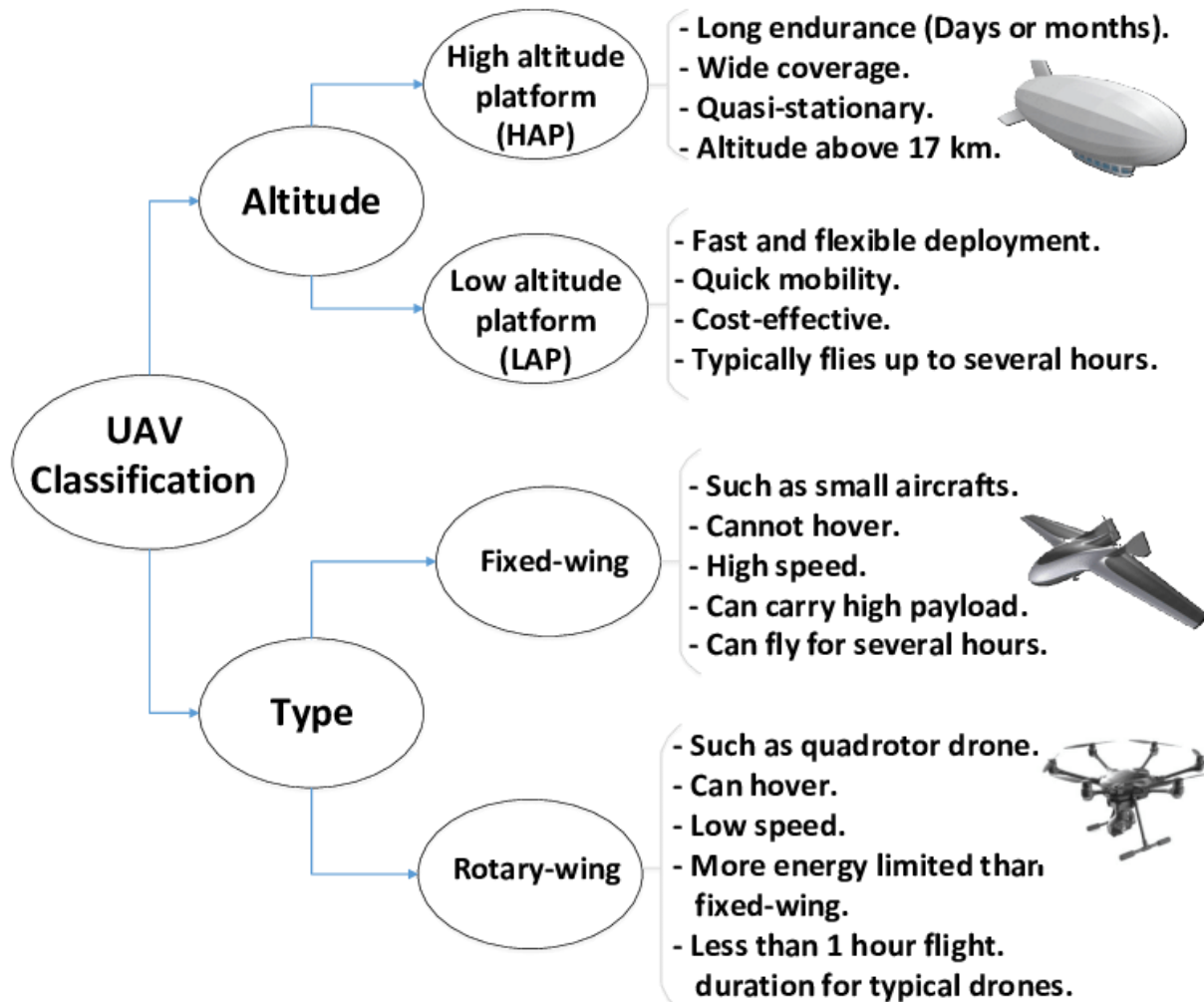
CLASS	SIZE	ALTITUDE and/or SPEED	TRAINING and/or REGISTRATION	Line of Sight and Sense and Avoid	Airspace / Other
Large UAVs	≥55lbs	The NPRM is not changing the rules for Large UAVs—i.e., you need a special airworthiness certificate, exemption or cert. of waiver or authorization. Expect to spend between \$10,000.00 and \$20,000.00 in legal fees.			
Small UAVs	<55lbs	500 ft. max and 100 mph limit	Certified operators of individually registered drones. (No airworthiness cert. needed)	Visual line of sight operations only. Potential for autonomous flight. Daytime Operations Only.	Only operate over individuals involved in the project. Only one UAV per operator. (A definite limiting factor for companies running large projects) No operations in Class A airspace. Operation in Class B, C, D and E airspace allowed with pre-clearance from ATC. Class G airspace does not require pre-clearance.
Micro UAVs	<4.4lbs	400 ft. and 30 knot limit (34.5 mph)	"Self-certified" operator. This is a TBD category.	Within 1,500 feet of operator. No autonomous flight. (Hopefully this will change)	Can fly over bystanders. Class G airspace. Built from frangible materials.
Model airplanes	55lbs or less	Not to be operated in a careless or reckless manner under 400ft.	Anyone.	Visual line of sight (VLOS) only	Operated purely for recreational or hobby purposes. Don't get any funny ideas, "commercial purposes" is <u>very</u> broadly defined.

0.55 lbs < sUAS < 55lbs

UAV/UAS Classification



UAV Classification



UAV Classification



Toy Drones

FPV & Racing Drones

Consumer Camera Drones

Prosumer Camera Drones

Commercial, Industrial, AG
NGO Drones

Winged and VTOL Drones



Bicopter



Tricopter



Quadcopter



Pentacopter



Hexacopter



Octocopter

	Multicopter	Small Fixed Wing	Traditional Helicopter	Mid Sized Fixed Wing
Cost	\$100-\$5000	\$100-\$5000	\$5k+	\$10k-\$100k+
Flight time	10-30 min	20min- 4hr	15min-2hr	1-16hr
Payload	1-2kg	1-4kg	1-20kg	5-50 kg
Complexity	Vey low	Moderate	High	Very High
Training Req.	Minimal	Some	Very High	High
Takeoff	Vertical	Hand/Launcher	Vertical	Launcher/Runway

Comprehensive Review of UAVs <http://uaviators.org/docs>



Drone Use Cases



20 Commercial Drone Use Cases



Remote Pilot Certificate



Current UAS Options

	Aircraft Requirements*	Pilot Requirements	Airspace Requirements	Types of Operation
Part 107	UAS < 55 lbs.	Part 107 remote pilot certificate with small UAS rating	Airspace waiver or authorization for Class B, C, D, E airspace	VLOS, daytime, Class G, 400 ft., not over people OR waiver provisions
Section 333	As specified in exemption	Part 61 airman certificate	Blanket COA or Standard COA for specific airspace	UAS > 55 lbs.
Experimental Aircraft	Experimental Special Airworthiness Certificate	Part 61 airman certificate	Standard COA for specific airspace	Research and development, crew training, and market survey
Type Certificated Aircraft	Restricted type or special class certification	Part 61 airman certificate	Part 91 airspace requirements	Specified in operating authorization
Public Aircraft	Self-certification by public agency	Self-certification by public agency	Blanket COA or Standard COA for specific airspace	Public Aircraft Operations (AC 00-1.1A); UAS Test Site operations
Part 101 Model Aircraft	UAS < 55 lbs.	Community-based organization (CBO) standards	Notification requirement within 5 miles of an airport	Hobby or recreational, VLOS, Part 101 operating rules, CBO standards

Remote Pilot Certificate for sUAS

- For sUAS that is 0.55 lbs. to 55 lbs.
- At least 16 years old to apply for the remote pilot license
- Pass the Aeronautical Knowledge Test (at least 14 years old to take the exam)
- Only required if you are flying UAS for commercial purpose
- The sUAS must be registered by a person who is at least 13 years old
- Remote pilot-in-command
- Visual observer
- < 400 feet above ground level
- Visual line of view (VLOS) within 3 statute miles

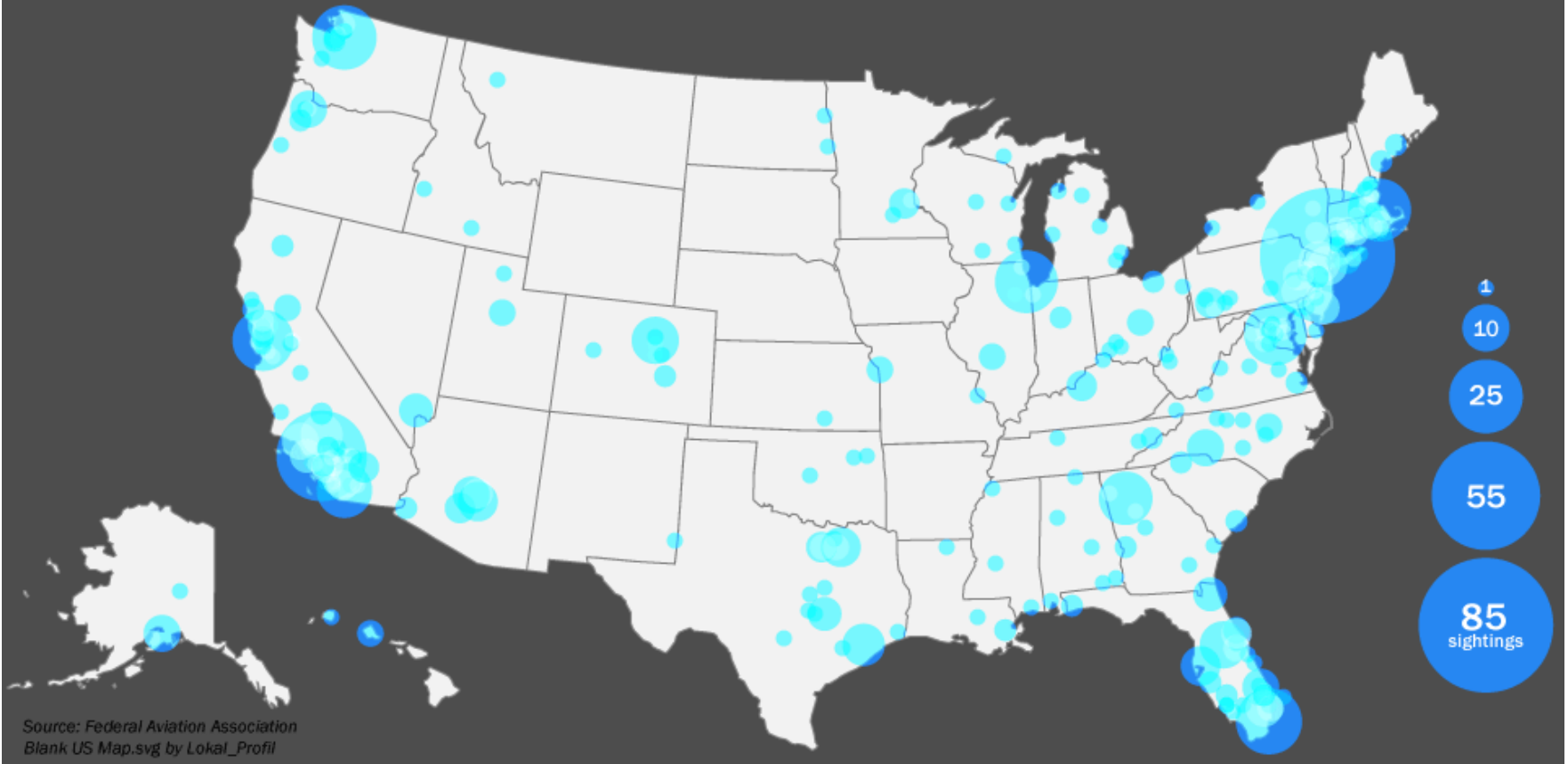


Drone Sightings

THE UNITED STATES OF DRONES

Drone sightings by location between November 13, 2014 and August 20, 2015, reported to the Federal Aviation Administration

F



Source: Federal Aviation Association
Blank US Map.svg by Lokal_Profil

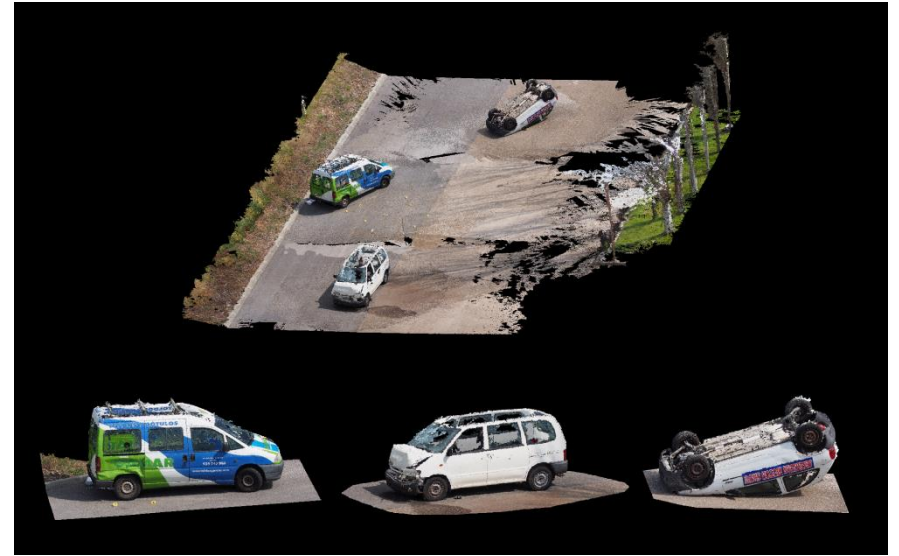
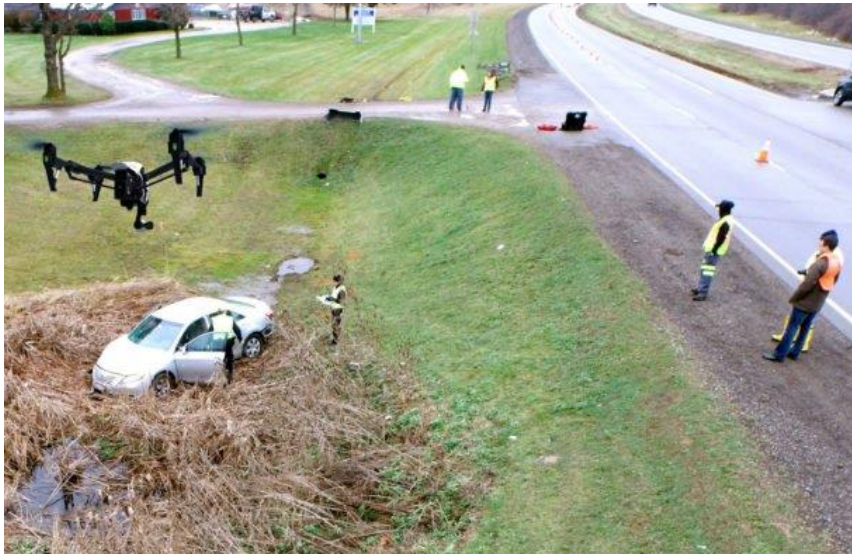
sUAS for Airborne Imaging



sUAS for Airborne Imaging



sUAS for Airborne Imaging



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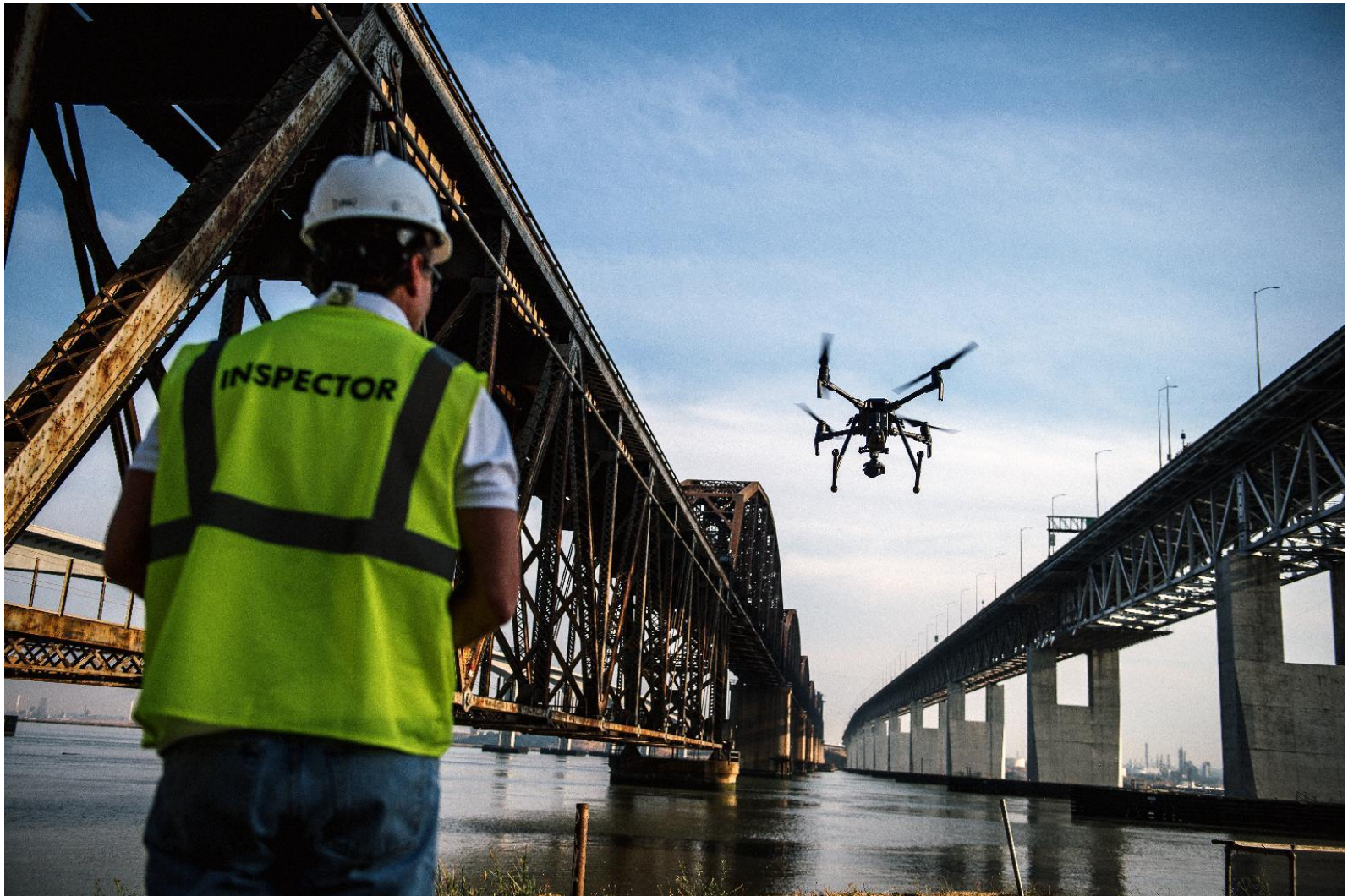
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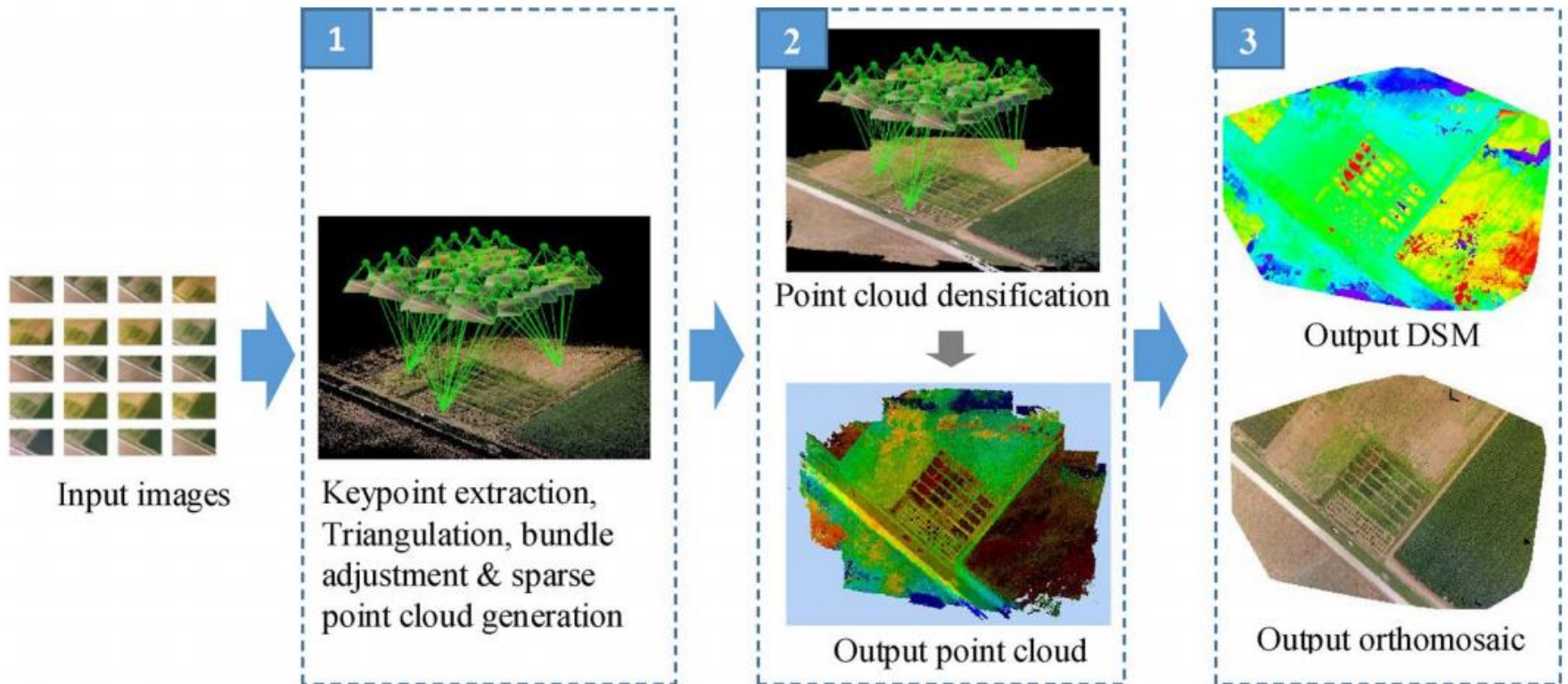


sUAS for Airborne Imaging

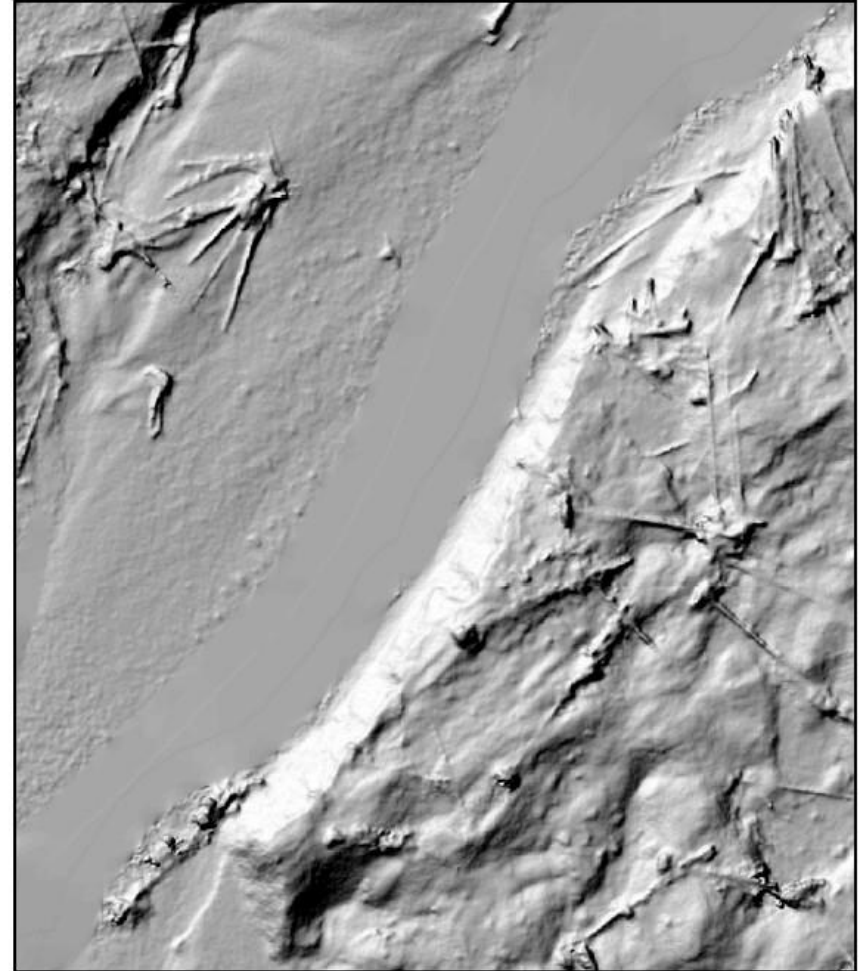


sUAS for Airborne Imaging - SfM

Structure from Motion



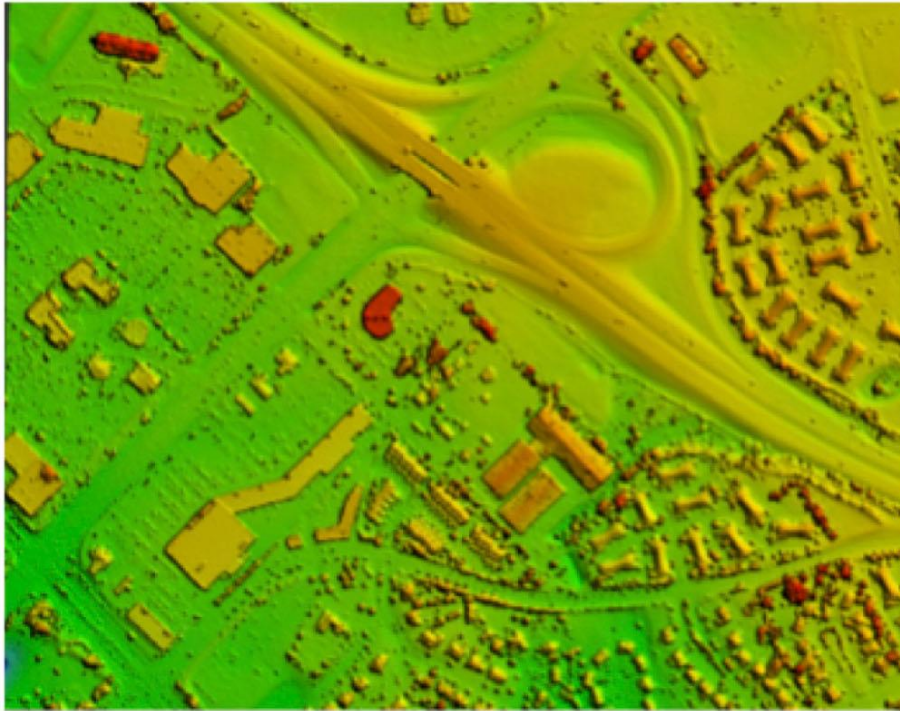
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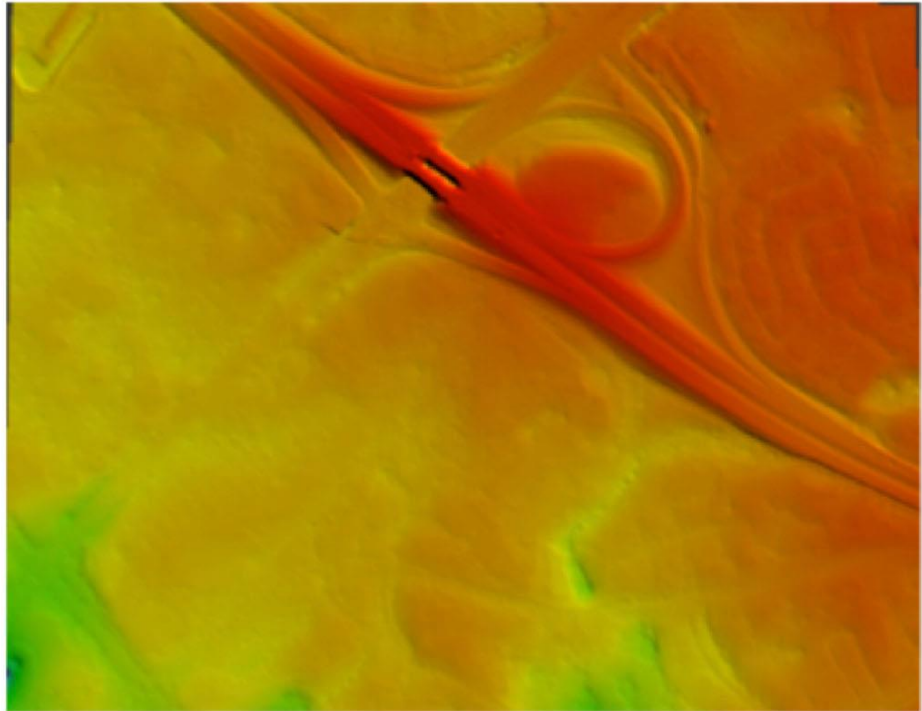
0 20 40
Meters

sUAS for Airborne Imaging - SfM

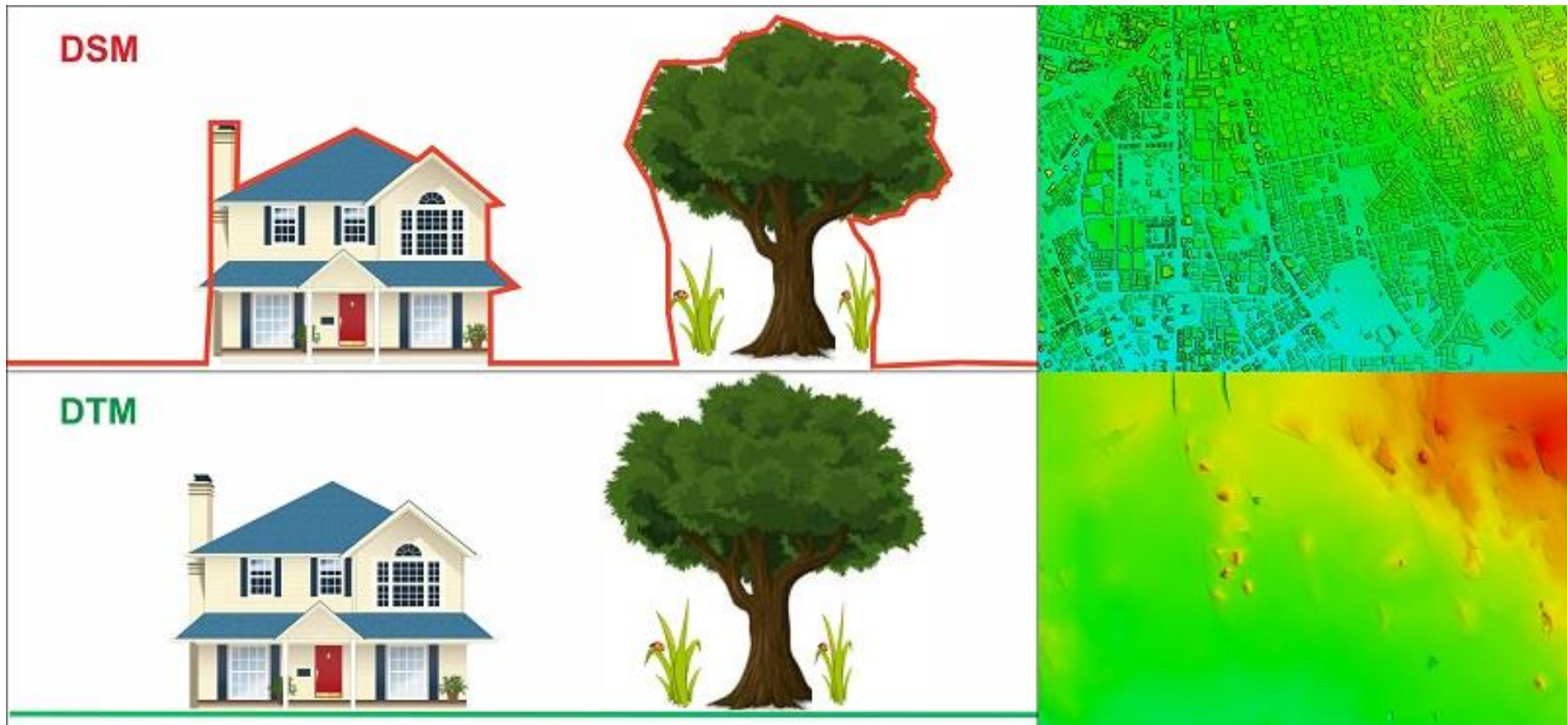
DSM (Digital Surface Model)



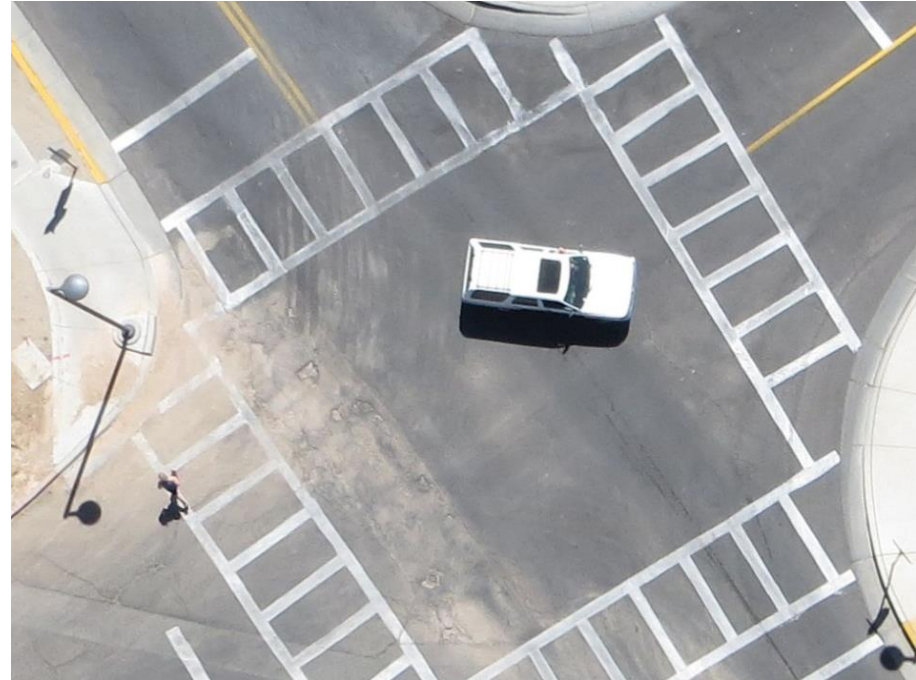
DTM (Digital Terrain Model)



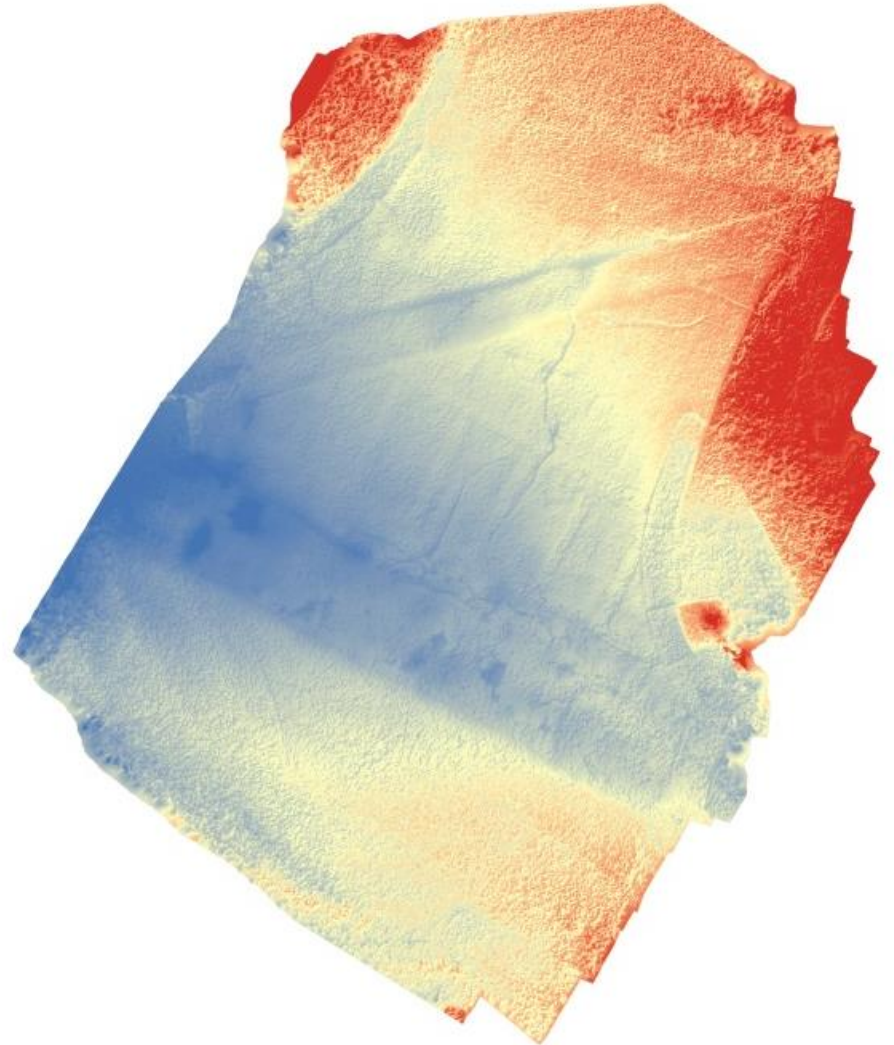
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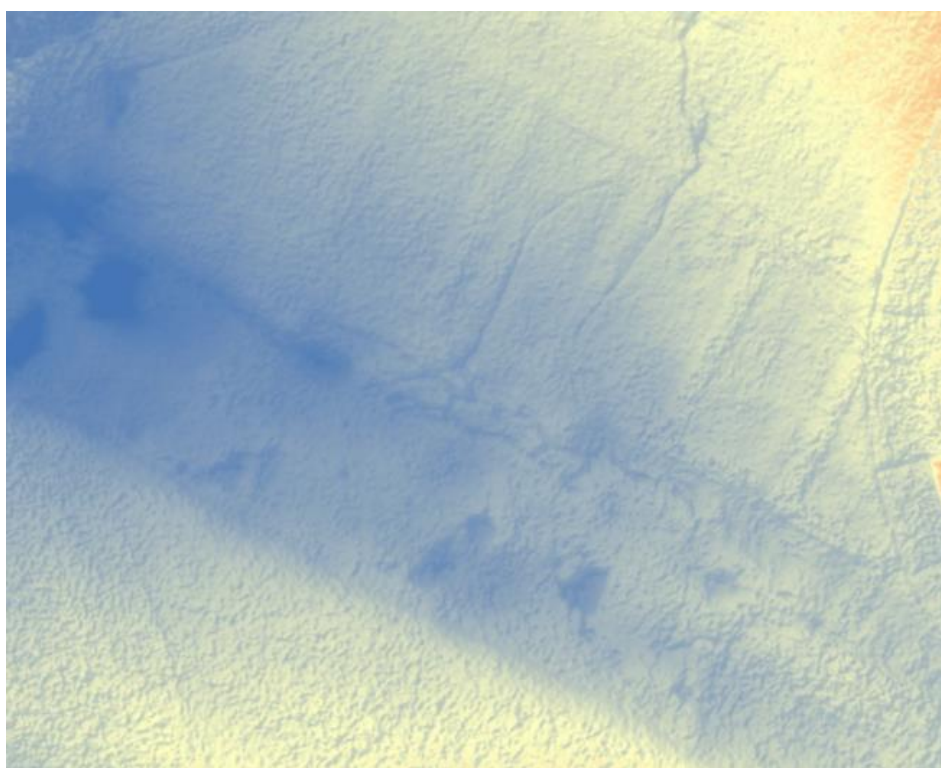
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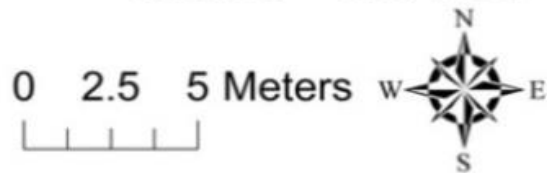
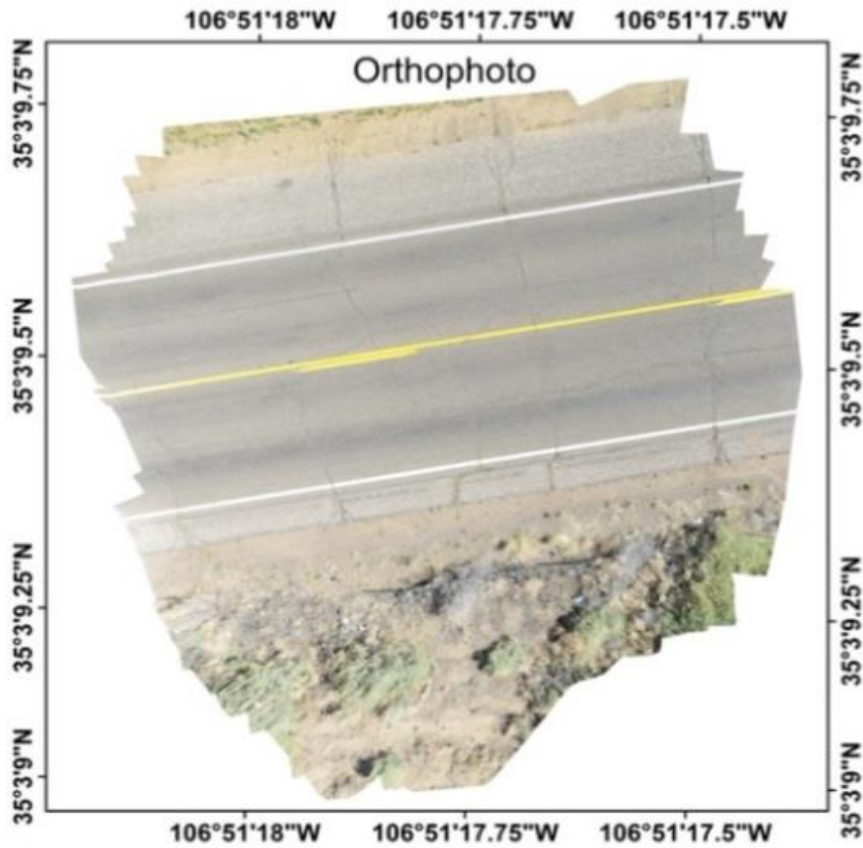
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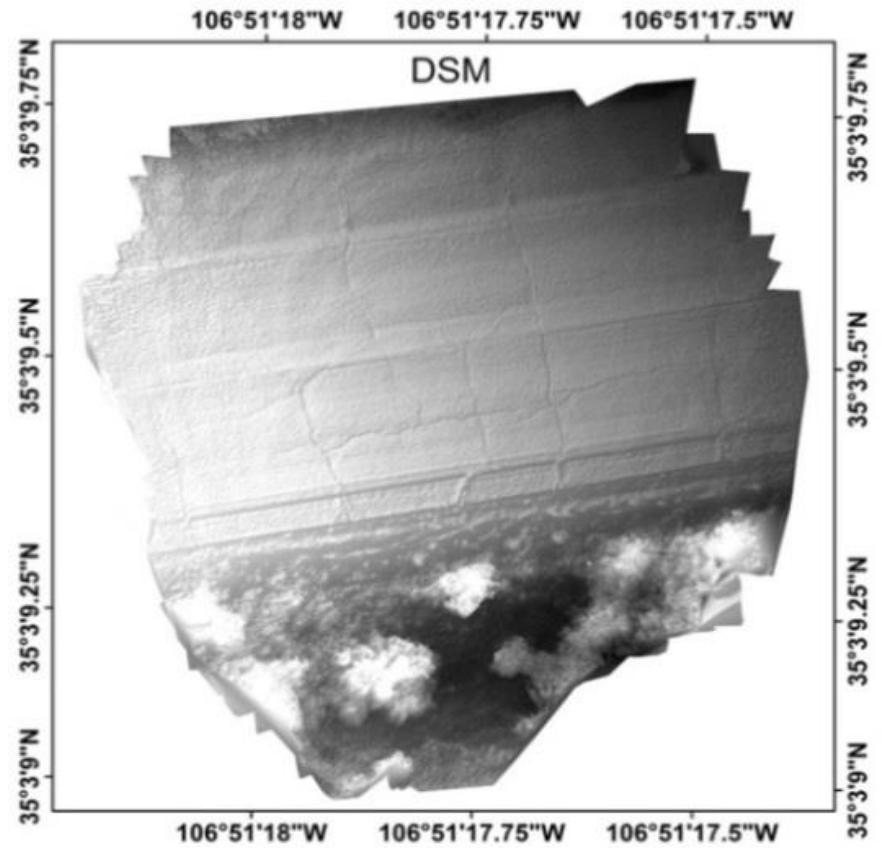
sUAS for Airborne Imaging - SfM



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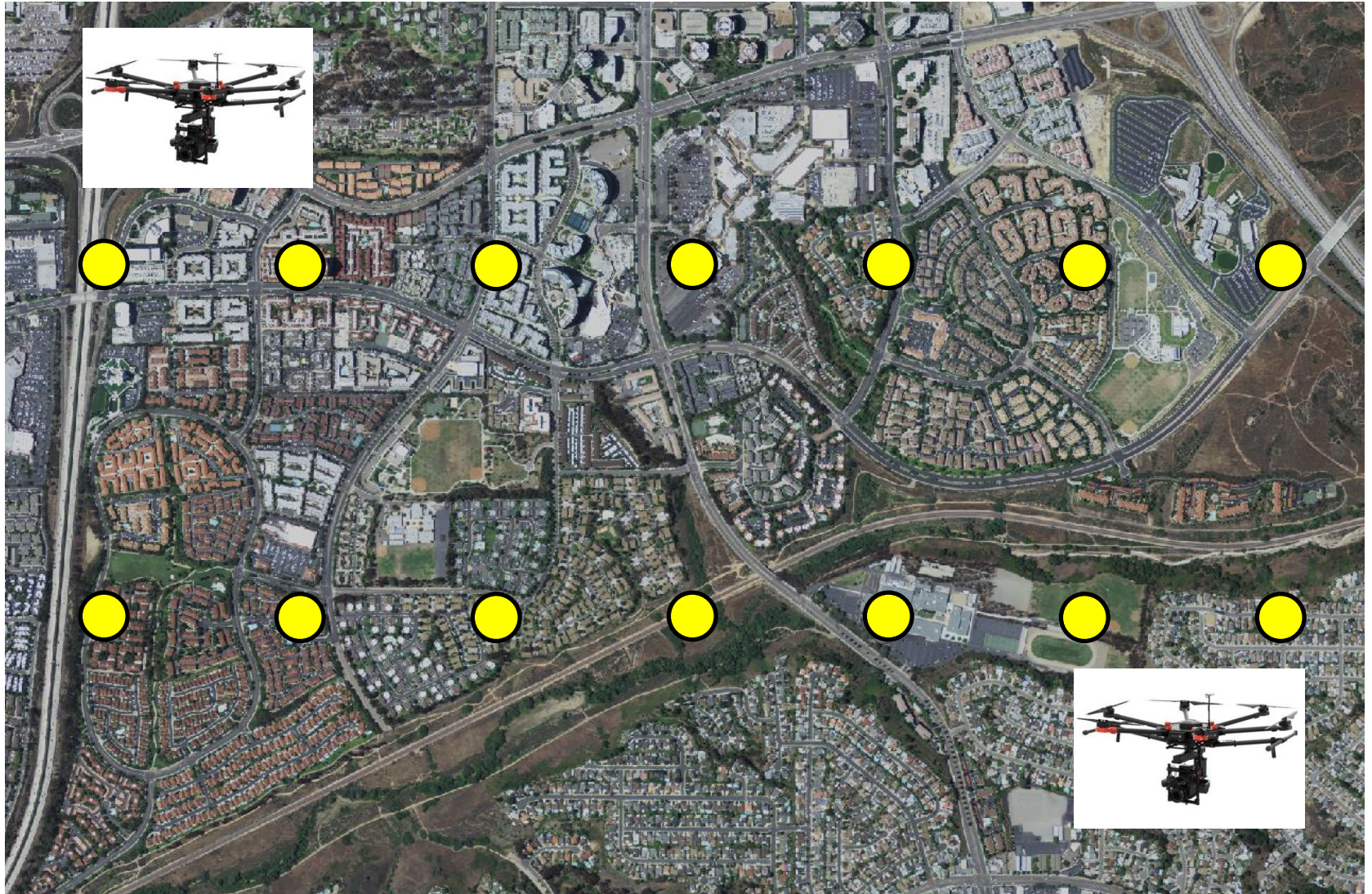


(a)



(b)

sUAS for Airborne Imaging – Repeat Station Imaging





Full Frame

Multi family residential - under construction



Full Frame

Multi family residential - under construction

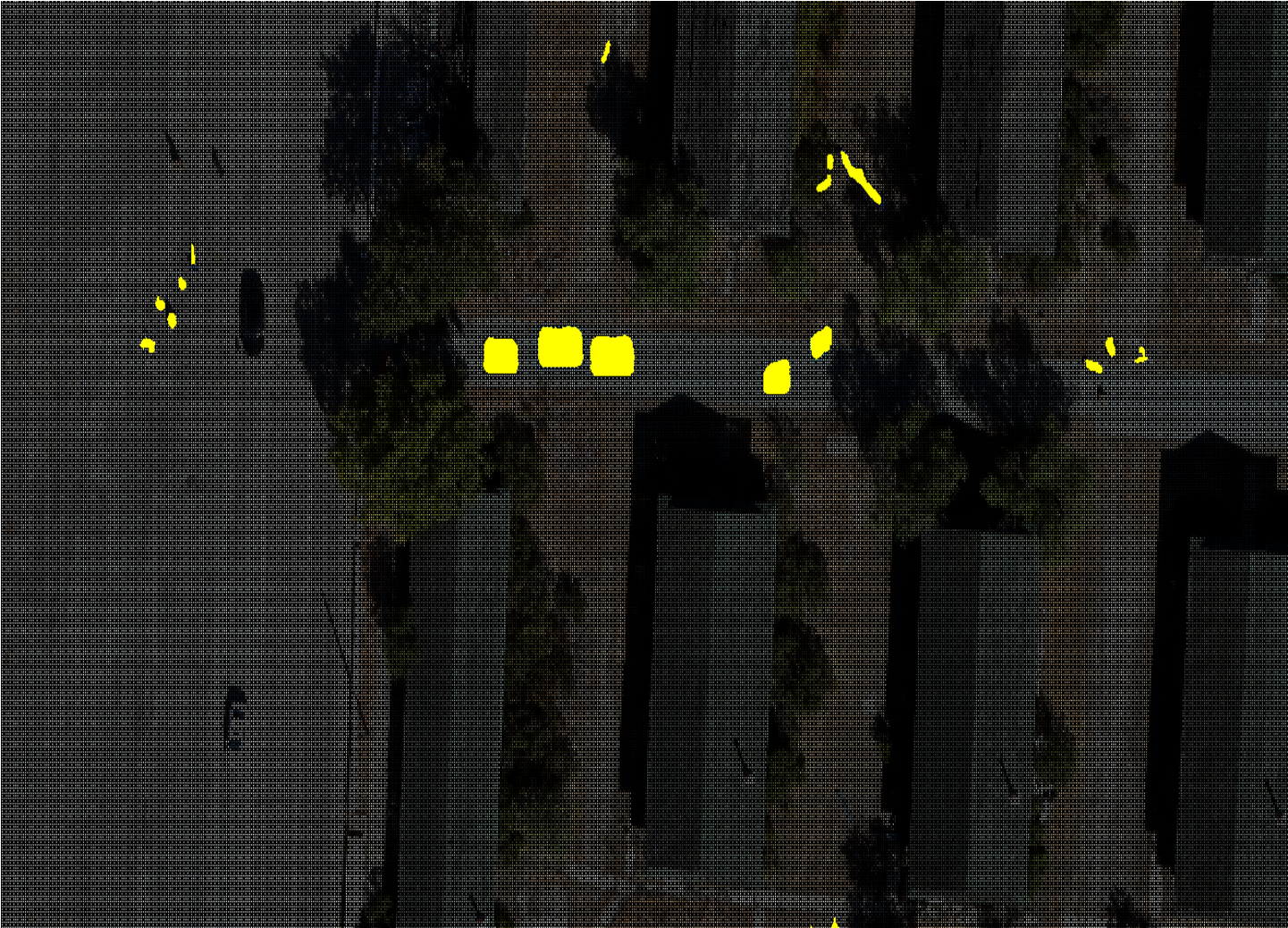








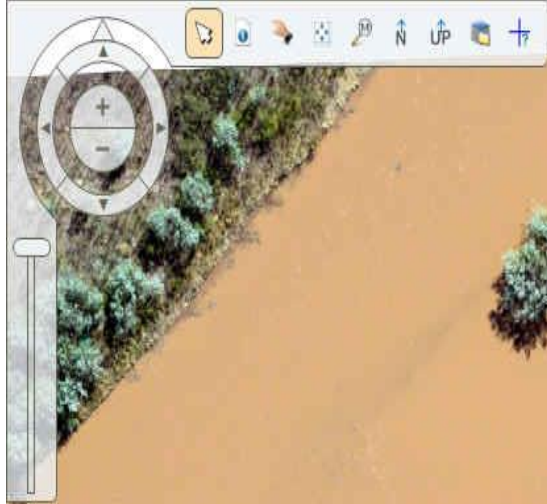




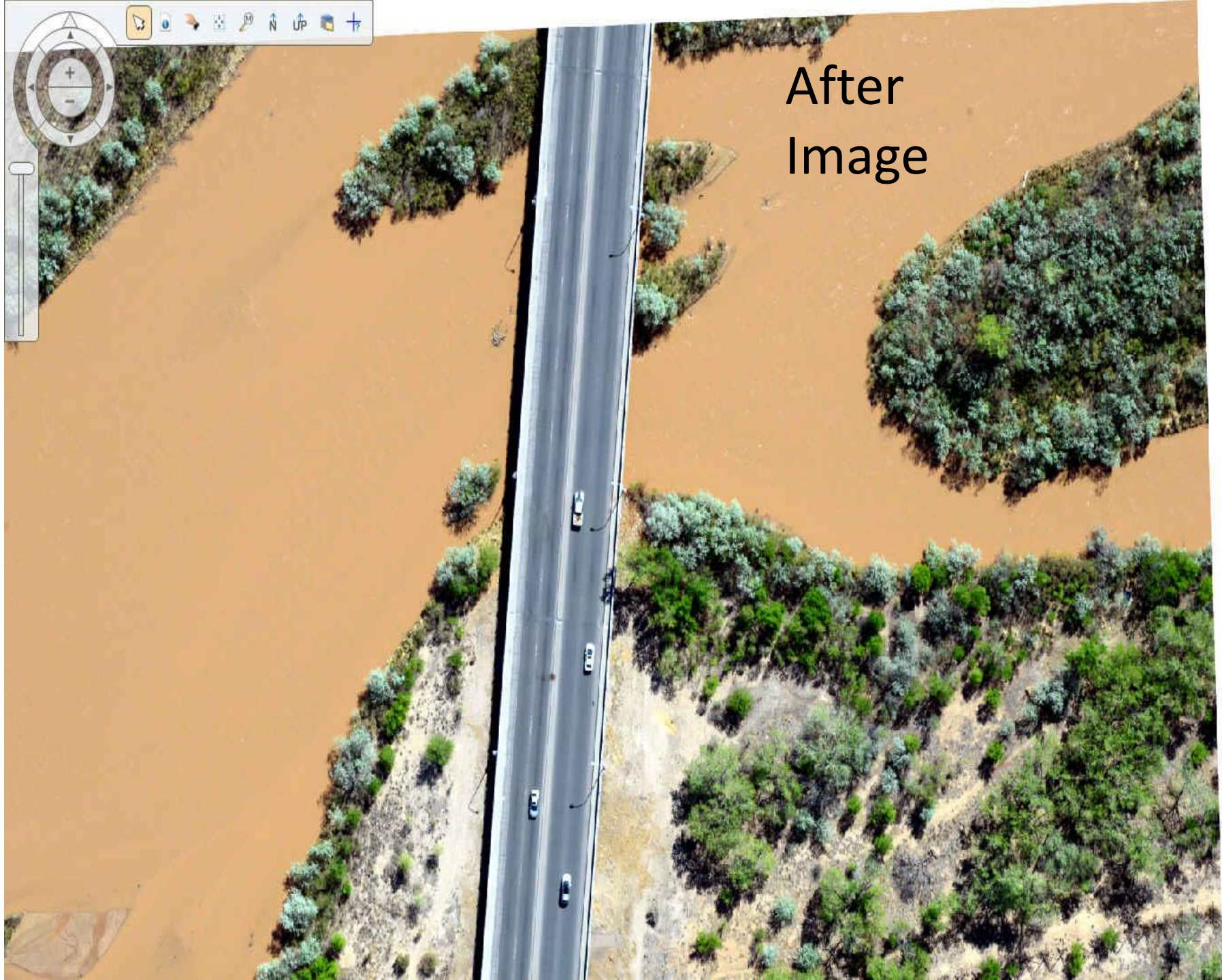


Before
Image





After
Image



sUAS for Airborne Imaging – Repeat Station Imaging



