

Preparation

A cloud-shaped graphic containing three small icons representing the preparation phase of the UAV process.

Post Processing

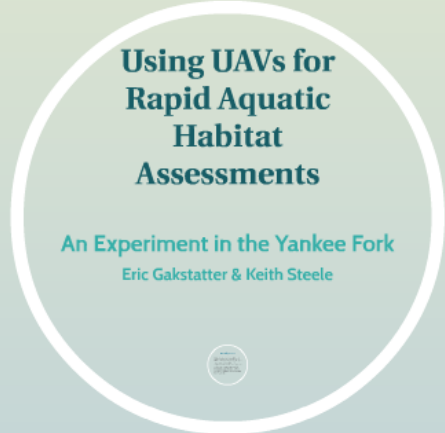
A large yellow sun icon with rays, containing the text "Post Processing" and two small square icons.

Lessons Learned

A white cloud-shaped graphic containing the text "Lessons Learned" and a small icon.

Using UAVs for Rapid Aquatic Habitat Assessments

An Experiment in the Yankee Fork
Eric Gakstatter & Keith Steele

A large white circle containing the main title and authors' names.

What's Next?

A white circle containing the text "What's Next?" and a small icon.

Preparation



Post Processing

Lessons Learned

Using UAVs for Rapid Aquatic Habitat Assessments

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What's Next?



Using UAVs for Rapid Aquatic Habitat Assessments

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Our Objectives

- Understand current capabilities of UAV photography technology
- Gain understanding of the workflow and critical success factors with respect to aerial photography
- Investigate potential use of drone imagery in natural resource management
- Present our findings

Our Objectives

- **Understand current capabilities of UAV photogrammetry technologies.**
- **Gain an understanding of the workflow and critical success factors with an eye toward repeatability.**
- **Investigate potential use of drone imagery in habitat metric generation.**
- **Have some fun!**

Preparation

ations



The Yankee Fork Site



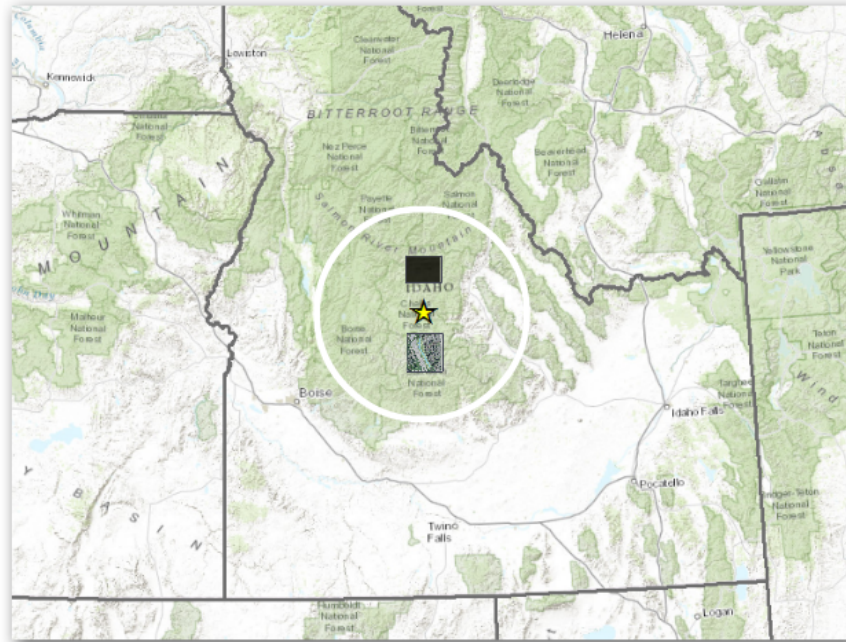
Mission Planning



Legal Considerations



The Yankee Fork Site





Salmon River Mountain

IDAHO

Challis National Forest

Boise National Forest

National Forest

Boise





Mission Planning

Site Evaluation

- In restricted airspace?
- Size of the site
- Character of the terrain
- Landowner permission



Flight Plan

Goal is to fly an efficient path over the entire extent, capturing images at consistent spatial intervals that meet or exceed overlap requirements for the site.



Safety

- Access / egress routes safe?
- Weather considerations
- Power lines or cell towers
- Populated areas or other aircraft nearby?
- Can you maintain LOS?

Ground Control

- Required to georeference imagery
- More points needed with poor terrain or noisy imagery
- RTK for $\sim 2\text{cm}$ (horiz) $\sim 10\text{cm}$ (vert) RMS
- Closest base station?
- Satellite availability



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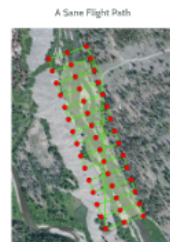
Ground Control

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- Satellite availability

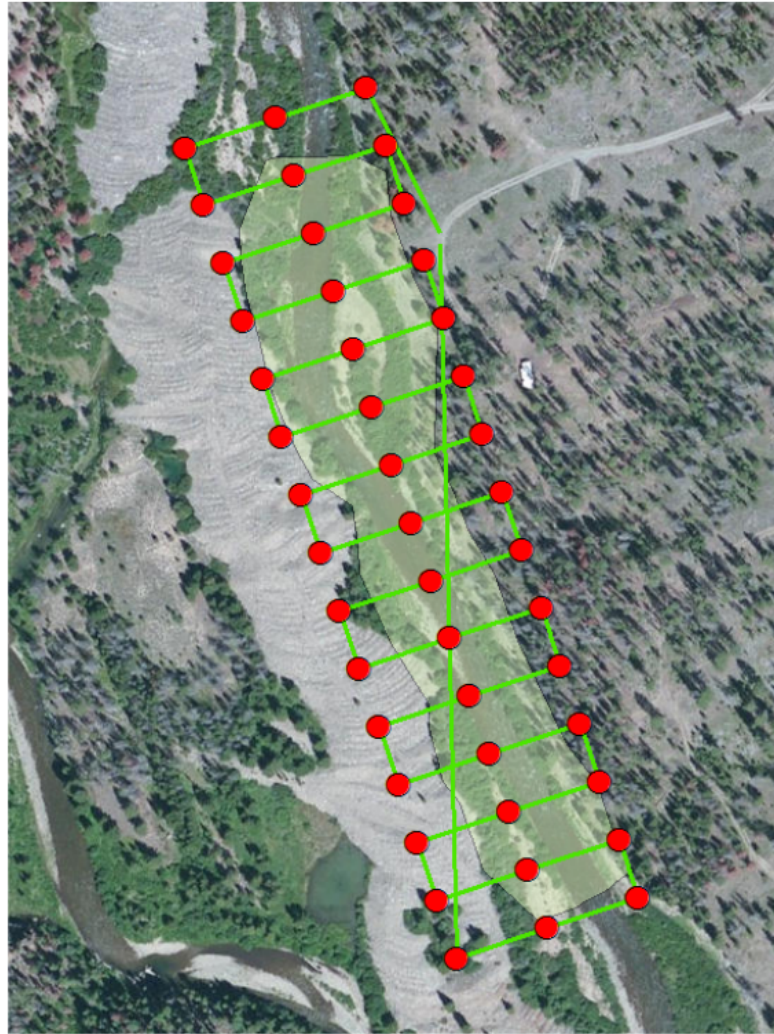


Flight Plan

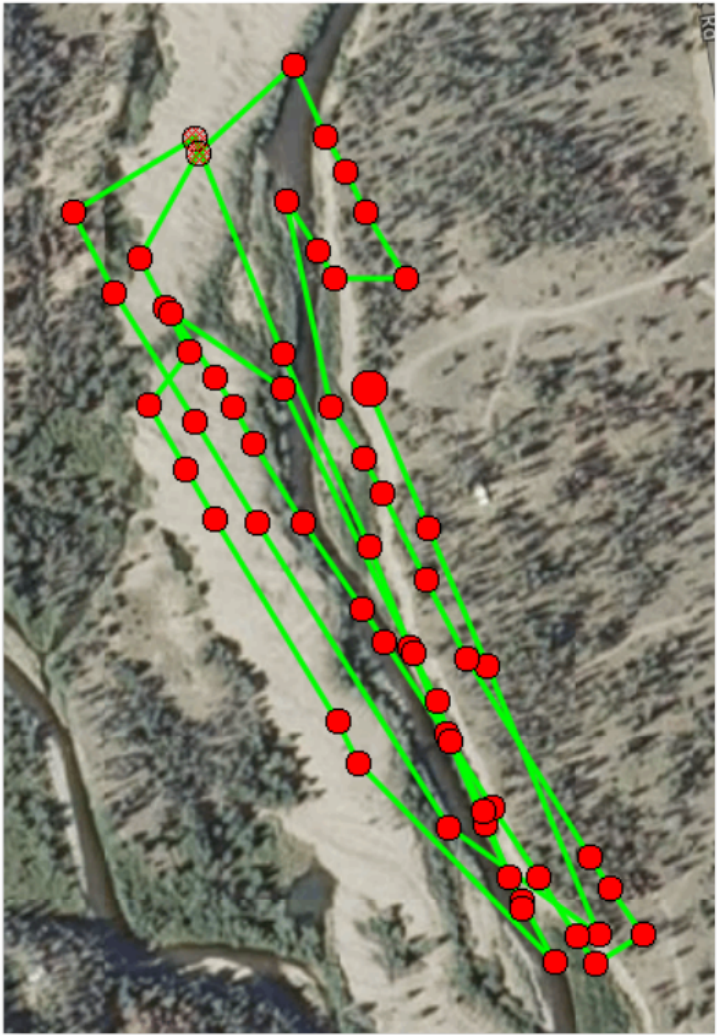
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A Sane Flight Path



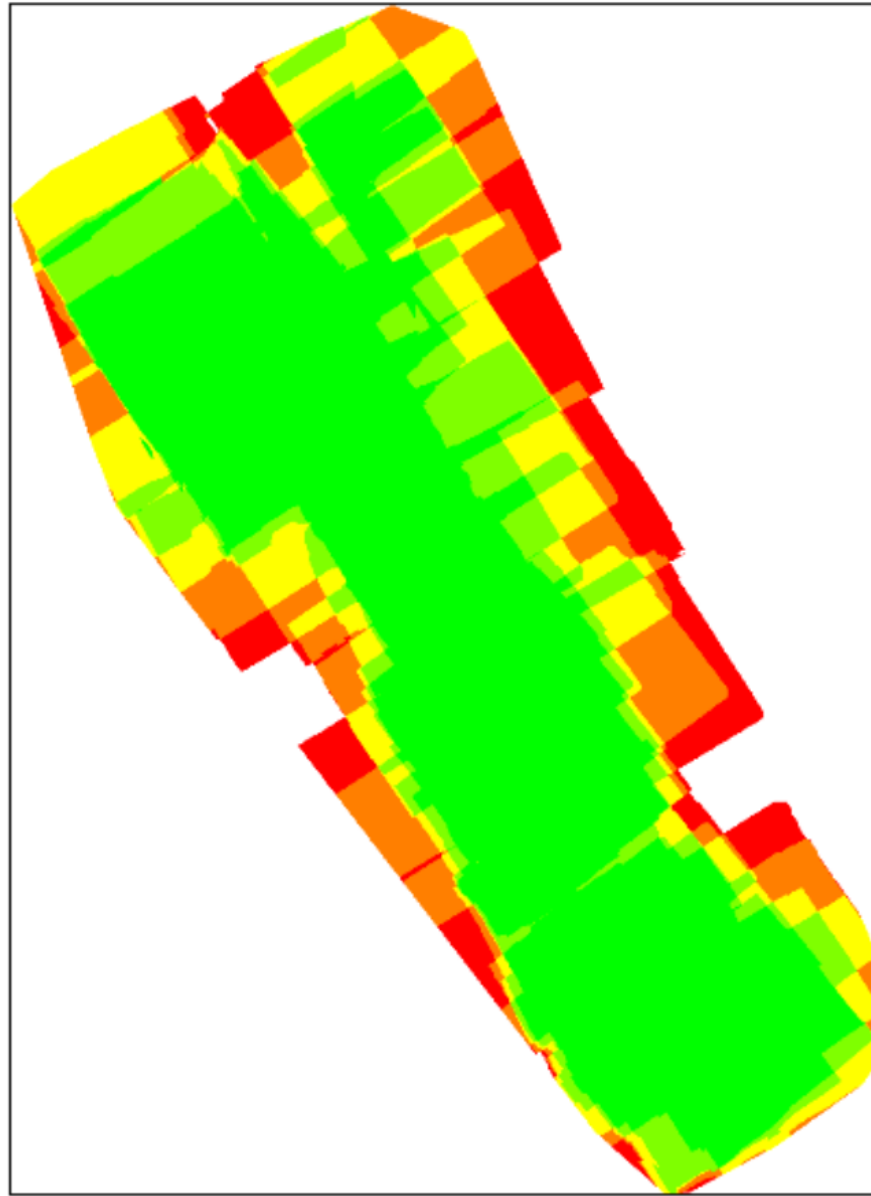
Actual Flight Path



The Fun Part!



Overlap Analysis



Number of overlapping images: 1 2 3 4 5+

4K Video



2.4cm Resolution



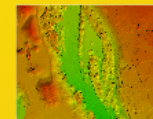
Post Processing



Orthomosaics



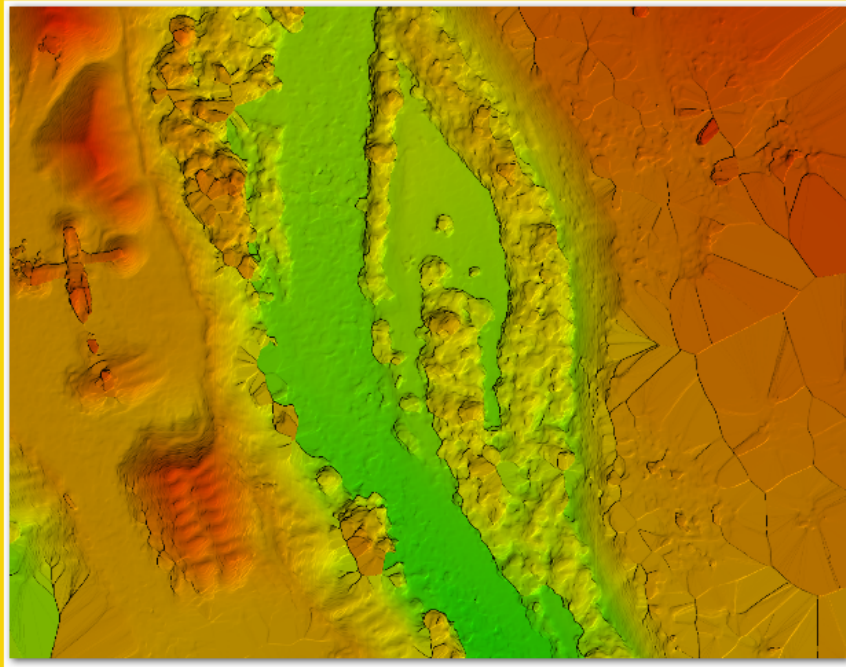
Surface Models



Orthomosaics



Surface Models



Lessons Learned

- UAVs with EO sensors inexpensively can deliver amazing resolution at project / reach scales.
- Proper mission planning and autopilot are essential.
- Multi-disciplinary undertaking, requires practice.
- Configure camera to capture RAW images.
- Don't use paper plates for ground targets!
- And...



Trees are Bad!



What's Next?

- More flights, workflow refinement & automation
- Ground-truthing of DSM to available LIDAR
- 2D image analysis, habitat metrics
- Feature extraction techniques
- 3D analysis, volume calculations

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What's Next?

Identify the most effective assessment process
by testing different drone configurations
to determine the most effective
assessment process.

