

## Day 1 AFTERNOON: Aerial Infrared and Drones - Panel Q & A

Asked To	Asked By	Q & A
Daniel Melody	Michelle Tirhi	<p>How accurate is aerial IR for identifying small mammals and birds?</p> <p><b>Drew Trausch's (Owyhee Air Research) reply from chat:</b> We do regularly detect mesocarnivores, rodents, and even passerines during our surveys, but these would be incidental detections. We would not be confident in our ability to provide robust data for small animals, ungulates are what we do best. The larger the body/thermal mass, the higher the detection probability.</p>
Daniel Melody, Nicholas Coops	Anne Hubbs	<p>Has remote counting using AI been used for ungulates? If not, what is required to do so (e.g., more training datasets)?</p> <p><b>Daniels' Reply:</b> not tested on ungulates yet but will be doing so this year. Need open landscape with minimal canopy cover. Need 1 pixel AI can id for parameters it's trying to ID.</p> <p><b>Nicholas's reply:</b> confident we'll get there with AI. It requires a lot of data; compiling datasets from companies and agencies will be required. A lot of AI has been done on mammals in general. Canopy cover, terrain, shading etc. are expected to impact the ability of AI capabilities. May be done in a hierarchy where start with species, then sex/age etc., or could be building datasets and id to species that a biologist could then analyze later for sex, age etc.</p>
Daniel Melody	Anne Hubbs	<p>How do you envision addressing the mountain goat "issue" where they are difficult to detect even with IR? How can agencies participating in the workshop potentially help?</p> <p><b>Daniels' Reply:</b> we have been working on this issue for &gt; 1 year. Goats are incredibly insulated in winter time and their habitat absorbs IR radiation from the sun and holds onto it which causes a lot of false positives. We haven't tried our 4th generation sensor yet. We will be seeing this summer in the Bitterroots if summer molting plays a role in detectability. We can set our sensors to specific filters (sensitivities) and parameters (offsets) to filter out background noise. Hope to solve the goat issue this year. Bighorn sheep also create challenges. Sometimes they shine bright but a nearby sheep can't be seen with IR. Best time to survey sheep is within 1-1.5h window surrounding sunrise. We have successfully surveyed sheep with aerial IR and telemetry in combinations, using the telemetry to find the herd and then the IR to hone in.</p>
Kanwar Johal	Aaron Springinotic	<p>Do you foresee the restrictions on "visual line of sight" changing in Canada to allow for surveying of larger areas more efficiently via drones?</p> <p><b>Jamin Doherty's reply from chat:</b> Transport Canada has been working with industry on a solution. Rumours are proposing new regulation in April 2025 for BVLOS (Beyond Visual Line of Sight) at the moment.</p>

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		<p>Right now the best way to alleviate BVLOS (Beyond Visual Line of Sight) is to get an SFOC (Special Flight Operation Certificate).</p> <p><b>Kanwar's reply from chat:</b> SFOC applications will be streamlined, but operators will still need to detect and avoid the system.</p>
Kanwar Johal	Merle	<p>Will the Yukon project move forward based on the results of the smaller survey you conducted?</p> <p>Were you able to sex animals or was the survey timing too late to identify males?</p> <p><b>Kanwar's reply:</b> We were able to sex them, there is hopefully a follow-up larger survey. Nothing confirmed though.</p>
Kanwar Johal	Rebecca Mowry [MTFWP]	<p>My primary challenge has been mountain goats in mountainous, remote terrain; do you think that a drone with a chase aircraft would solve issues with "Beyond Visual Line of Sight"?</p> <p>for context...helicopter scares goats into hiding while terrain is too dangerous for low-altitude fixed wing surveys)</p> <p><b>Kanwar's reply from chat:</b> A chase aircraft would solve the BVLOS issue. Getting waivers from the FAA takes much longer than [in?] Canada. However a new bill was introduced in congress to try to speed up the application process.</p>
Todd Whiklo / Kirsten Solmundson	Dan Farr (EPA)	<p>Could you describe what volunteer training looks like?</p> <p><b>Todd's reply from chat:</b> I will have to dig up the process but it was a standard training session for dedicated observers. We had some issues with maintaining consistency with observers which did cause difficulties</p> <p><b>Dan Farr's reply from chat:</b> For sure - important opportunity but sounds like there's challenges.</p>
Todd Whiklo / Kirsten Solmundson	Alex Kunkel [MT FWP]	<p>In my area, most species don't react negatively to rotary aircraft unless we fly really low. Our agency uses A-star helicopters mostly; in part, to deal with mountainous terrain and wind.</p> <p>Is it possible to use IR cameras with these aircrafts or are you certain that fixed-wing would still be best in this scenario?</p> <p><b>Todd's reply:</b> to purchase own IR equipment, hire aircraft contractors &amp; train staff was not cost feasible. Previously worked with IR contractors with rotary and became cost prohibitive. Ended up being a very expensive traditional survey - still had to have staff on board, imagery wasn't good etc. Manitoba found many more drawbacks than positives.</p> <p><b>Daniel's reply:</b> a lot of agencies have their own helicopters and are asking if they can out own IR on helicopters. Many species have anti-helicopter response and disturbance. IR has a narrow window when most effective, which</p>

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		<p>is the early morning when ground temperatures are the coldest. Owyhee Air flies 2 h before sunset until it's too bright to be effective. Flying a helicopter in the dark would be ill-advised from safety stand-point.</p>
<p>Todd Whiklo / Kirsten Solmundson</p>	<p>Marcus Atkins BC Gov</p>	<p>Do you have any experience differentiating grizzly from black bear; If so, how reliably can you differentiate them in areas with species overlap?</p> <p><b>Drew Trausch's reply from chat:</b> Absolutely, we conduct grizzly surveys every summer for numerous jurisdictions and are very confident in classifying bears. We have reliable on-screen measuring tools that allow measuring the body size of individuals. The cameras are high definition in both IR and RGB allowing us to look closely at the bear's features. All detections are recorded so they can be reviewed as many times as needed. We regularly speciate between mule and white-tailed deer, so bears are easy in comparison.</p> <p><b>Marcus Atkins's reply from chat:</b> Great, what about colour-phases among black bears (e.g., black, cinnamon, white, etc.). Are cameras high enough definition for this?</p> <p><b>Drew Trausch's reply from chat:</b> Absolutely. We typically fly at night into the early morning hours, so once the sun comes up we can start capturing high resolution color images. If we detect an animal in IR before the sun is up we mark its location and return to get the color imagery after the sun has risen. I'd be happy to send you some recent sample videos of grizzly detections! I will say, canopy closure is the most significant limiting factor, so we would have some challenges in the dense temperate rainforests of coastal BC. We are very effective in the alpine habitats such as northern Idaho and Montana.</p>
<p>Todd Whiklo / Kirsten Solmundson</p>	<p>Dan Farr (EPA)</p>	<p>Can the drone operator travel in a ground vehicle (while operating the drone) - thereby maintaining BVLOS?</p> <p><b>Jamin Doherty's reply from chat:</b> Technically yes, Transport Canada allows it as long as they aren't driving.</p> <p><b>Kanwar Johal's reply from chat :</b> Our BVLOS waiver lets us drive around, or allows people to monitor the airspace and not the drone directly.</p> <p><b>Dan Farr's reply from chat:</b> for sampling units with roads or driveable trails... a larger area could be surveyed compared to more remote locations... correct?</p>
<p>Todd Whiklo / Kirsten Solmundson</p>	<p>Michelle Tirhi</p>	<p>How is identification of sex and age handled? Is this done via AI analysis?</p> <p><b>Edward Trout's reply (Owyhee Air):</b> We use the expertise of the biologist in the plane and comparison between Daylight/RGB and IR to make sex/age identifications. This isn't to rule out machine learning developments in the future but as of now, the best approach is to classify using humans trained in wildlife morphology/behavior and to process the detection in context.</p>

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Todd Whiklo / Kirsten Solmundson	Allison Henderson Hunter (SK Fish and Wildlife)	<p>Any thoughts on how to tackle the challenge mentioned related to internal and external skepticism to new and model-based methods?</p> <p><b>Todd's reply:</b> in Manitoba, this is an ongoing challenge but making good headway. Dealing with comfort level typically vs. issues with data. Internal skepticism (as well as external) from staff having been involved in the past aerial survey process. Staff have been reluctant to apply the same level of criticism to what had already been doing to what potentially would be doing going forward. External stakeholders have been more willing to explore new technology than internal staff.</p> <p>Future perspectives- The advances in technology over the last few years is dramatic. Yearly changes are outstanding. Few years ago it didn't seem like a good fit for wildlife agencies but now in the last 5-7 years new technologies are much more feasible. Alberta Transport hurdle with BLVOS will advance drones.</p> <p><b>Kirsten's reply:</b> Manitoba has made gains by sharing information upfront rather than waiting until challenges or hiding what doing. We have been doing a lot of public outreach events with hunting groups, Indigenous communities, wildlife agencies, researchers etc. from different backgrounds. Transparent to who and what is our obligation?</p> <p><b>Daniel's reply:</b> typically 1-2 people who want to explore new technology; then there's a group who are skeptical of new technology or don't want to give up annual aerial surveys. Public-facing video page is helpful b/c people don't believe one can see from 1 mile away in mixed-wood forest until they can see with their own eyes.</p> <p>Future perspectives- papers in the past that said not feasible have become irrelevant as technology has advanced so quickly.</p> <p><b>Hannah's follow-up question:</b> have you had to manage too high expectations around the technology?</p> <p><b>Daniel's reply:</b> yes. Being transparent upfront is helpful. E.g., not able to do a black-tailed survey in the coastal rainforest.</p>
Kanwar Johal	Dan Farr (EPA)	<p>Are there examples of multiple drones (and multiple operators) simultaneously surveying adjacent areas (thereby effectively increasing the survey area compared to a single drone / operator)?</p> <p><b>Kanwar Johal's reply from chat:</b> We did the 2600 km<sup>2</sup> survey with two drones this year.</p>
All	Dan Farr (EPA)	<p>Data processing must be a big challenge.. have folks in other fields (e.g., agriculture) made progress that can be built upon?</p>

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		<p><b>Kanwar's reply:</b> a lot of data we get is easy to combine. The real hurdle is the volume of data and the time required for staff to review; we can't bring these costs down any further. Once machine learning has automated the processes, it should help bring costs down.</p> <p><b>Hannah's follow-up question:</b> when is it better or more appropriate to process data by human observer watching in real-time vs. bringing the data back and post-processing after flights?</p> <p><b>Daniel's reply:</b> we've done both. Our standard template is for observers to view in real-time and record species, age, sex etc. (what agency requires). When we get back, scrub through the data a second time to make sure geotags and everything is accurate, double tags accounted for etc. There's greater confidence generally with data processed in real-time; more error induced in the post-review process. When we're in the aircraft in real-time, we can position the aircraft to get the images we need to defend the data we've recorded (vs. reviewing after the fact, the opportunity may not have presented itself). Nadar-photographic machines collect a lot of data. Time-consuming process is stitching images together into ortho-mosaics and then we do band math to pull out required info.</p> <p><b>Kanwar's reply:</b> real-time has a labour cost. If you have a Gimbel camera and on-board processor, you can sweep with the camera and take longer to look at a detected object to get id - doing to replace pay-load operator.</p> <p><b>Todd's reply:</b> Not much difference between data coming in from drones or fixed-wing IR than traditional surveys. Compared to camera trapping where you get massive amounts of data, it's been a pretty seamless transition from our agency stand-point.</p>
All	Brett Furnas (CDFW)	<p>How do you obtain data on annotated animals on the ground for training ML models? Where does this data come from? GPS collared animals?</p> <p><b>Tab Graves's reply from chat (USGS):</b> Not ML or AI, but some of the same challenges listed here are still relevant in terms of survey timing, similar backgrounds, resolutions, using combined methods (as suggested by presenters here re: IR).</p> <p><a href="#">Eyes on the herd: Quantifying ungulate density from satellite, unmanned aerial systems, and GPS collar data - Graves - 2022 - Ecological Applications - Wiley Online Library</a></p> <p><b>Drew Trausch's reply from chat: (Owyhee Air Research)</b> We can share sample footage of any species of concern if anyone is curious what they look like in IR! <b>Tracy Davison - GNWT from chat:</b> Do you have any footage of Muskox? <b>Drew:</b> We do! That's one species we don't get to see too often but I can send some your way.</p>
Kanwar Johal	Dan Farr (EPA)	<p>Can a drone be programmed to linger (without an operator instructing it to do so? Drone doing autonomously)</p> <p><b>Kanwar's reply:</b> completely doable.</p>

