

### Day 3 MORNING: Genetics / DNA - Panel Q & A

Asked To	Asked By	Q & A
Lalena Neufeld	Cassie	<p>You mentioned that you have excellent DNA recovery from pellet samples; are there times of the year when DNA extraction seems better than others?</p> <p><b>Lalena's reply:</b> yes, we do see good extraction in the fall (Oct./Nov.). Have done pellet sampling later in spring (Feb/March) - poor; could be warming temperatures, diet related or method.</p> <p><b>Jami's reply:</b> they did get winter samples from backcountry skiers. Will be looking at those variables and see how it affects quality.</p>
All Panelists	Mark Edwards	<p>As a follow-up to an earlier question, are there times of the year when scat collection is not advisable due to DNA degradation?</p> <p><b>Lalena's reply:</b> we have only tried collecting samples in the winter; would expect to see degradation in summer (and we have seen poor quality in late spring).</p> <p><b>Tabitha's and Jami's reply:</b> we looked at several variables (e.g. age of scat, rain/sun effects etc.; small sample sizes though). Definitely environmental variables will affect scat quality. One also needs to consider when sites and animals are accessible to get samples too. We sometimes have to take lower quality samples to simply get samples when we can.</p>
Lalena Neufeld	Unknown	<p>The six-month delay seems like a long time to wait for your results, has this impacted your management actions?</p> <p><b>Lalena's reply:</b> we are always collecting additional data so no. In some cases we've implemented actions for rec users (e.g., all winter ranges are closed to recreation despite delays). Looking forward to things advancing, especially with SNP (single-nucleotide polymorphism) arrays coming online, to more quickly get more accurate info on genotypes.</p>
All Panelists	Unknown	<p>What is the future of this monitoring technique –how do you think it will change in the future? What is the next frontier?</p> <p><b>Lalena's reply:</b> genomics; rapidly evolving techniques to extract high quality genomic DNA from pellets. Universities of Trent and Calgary are looking into this. Will get additional information like pedigree, relatedness, inbreeding depression etc. Important for conservation breeding etc.</p>

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		<p><b>Tabitha's reply:</b> based on earlier estimates Glacier could have anywhere from 500 to 2,000 goats (high uncertainty in trend). Have done work on bighorn sheep using SNP chips with Montana State University - able to look at pedigree etc. We hope that information on genetic structure and population estimates will help determine next steps for goats.</p> <p><b>Jami's reply:</b> Our trend estimates are statistically robust but lacking context and understanding what 40% decline means based on initial population size for goats.</p>
Lalenia Neufeld	Paul Jones	<p>With climate change, are you seeing a difference in distribution of caribou and timing of when you need to collect pellets?</p> <p><b>Lalenia's reply:</b> In 2021, needed to collect without snow and need to collect in rut when caribou grouped. We had trouble finding samples (couldn't backtrack to the foraging site). Still got good results. No, we have not seen changes in distribution; caribou are in the same locations they have always been in the rut.</p>
Tabitha Graves/I/Jami Belt	Anne	<p>What kind of resources (time / cost) are required to run the goat sampling component of the citizen science program?</p> <p><b>Jami's and Tabitha's response:</b> We hire one full time 6 month coordinator to run our goat counts and goat pellet collection each year. They devote approx 25%- 40% of their time to the goat pellet efforts.</p>
Tabitha Graves/I/Jami Belt	Cassie	<p>Are there any unique features of the situation in Glacier that would allow this, or prevent it, from working in other locations?</p> <p><b>Jami's and Tabitha's response:</b> we have a large visitor population and are close to medium-sized population centers so it is easy to get dedicated volunteers. We also have a lot of trails to access goat populations. The program would be more challenging to implement in more remote areas.</p>
Tabitha Graves/I/Jami Belt	Anne	<p>How is the precision of estimates influenced by multiple sampling occasions?</p> <p><b>Tabitha's reply:</b> it definitely helps to have more sampling occasions. In the case of the N-mixture model we benefited from having areas that were more accessible to get more sampling occasions. In Dinosaur Monument they were able to go three times a year which brought down credible interval size (vs. Grand Canyon CIs were wide). Can still get some info even if there's 1 occasion.</p>
Tabitha Graves/I/Jami Belt	Anne	<p>I understand that at least 3 States (SD, Washington and Montana) are using volunteers for ground counts, and in some cases comparing these results with other methods (e.g., aerial surveys). Do you know how many jurisdictions are using the citizen science approach? And how do these results compare with other methods (e.g., aerial surveys in SD)?</p>

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		<p><b>Jami's reply:</b> I'm not familiar with these other programs. We've been working with Rocky Mountain Goat Alliance to develop a program along with Julie Cunningham's work. B.C. is also developing a program with volunteers. The different jurisdictions haven't been broadly communicating to date but hopefully will happen in the future and we can compare results.</p>
Tabitha Graves/I/Jami Belt	Paul Jones	<p>How do you recruit and maintain citizen sciences for the goat program?</p> <p><b>Jami's reply:</b> recruit people via press releases, newspaper articles and word of mouth. It's not a problem for us to get volunteers; in fact we have to turn away some people. To maintain people, we give more instantaneous feedback, set them up so they can go into the field when they want, make it seem like a treasure hunt so more fun, have ambassador level for people who have committed to so many hours and they then get access to more remote parts of Glacier Park. Have about half dozen long-term volunteers. We still get a lot of turn-over.</p>
All Panelists	Emberle Hall	<p>Can you speak to how population size (especially larger populations) may influence the success of scat based approaches?</p> <p><b>Lalenia's reply:</b> looked at caribou populations of 100 animals; we haven't used spatial methods. In our case, the caribou range is enclosed and we know where to sample.</p> <p><b>Tabitha's reply:</b> there are a certain # of recaptures you need to have generally a certain proportion of those that narrows your spatial estimates. That spatial recapture is also really important to avoid imprecise and biased estimates. A large proportion of costs is getting to remote locations.</p> <p>Variance decreases with increasing sample size. For SCR analytical methods, this includes sample number for individuals, cumulative detection rate, and number of detections at different locations. There is a certain level needed for reasonable estimates. See our paper with Schmidt et al. Utah black bears for more.</p> <p><b>Jami's reply:</b> The sampling effort needs to be scaled according to population size and your objectives (genetic structure vs population size for example).</p>
Tabitha Graves/I/Jami Belt	Paul Jones	<p>When you collect pellets, do you specify elevation (to reduce collection of samples from other species)? Are you collecting other species' pellets? Were the deer samples at low or high elevation?</p> <p><b>Jami's reply:</b> we didn't set elevation limits for how high people could go.</p> <p><b>Tabitha's reply:</b> some deer go high and goats can go low.</p>