



## WILD SHEEP INITIATIVE/WORKING GROUP 2022 JANUARY MEETING NOTES

Hybrid In-person/Virtual Zoom at WSF Sheep Show , Reno, NV

January 11, 1 - 5 pm and January 12, 8 am - Noon PST



Meeting Chaired by: Mike Cox, WAFWA/Nevada Department of Wildlife

In person (36): Kate Huyvaert, Kevin Hurley, Clay Brewer, Tony Mong, Melanie Woolever, Tony Kavalok, Riley Peck, Nate LaHue, Froylan Hernandez, Brian Wakeling, Hollie Miyasaki, Kylie Sinclair, Todd Nordeen, Kaytlin Bohr, Frances Cassirer, Tim Schommer, Lance ?, Justin French? From Texas?, Becky Schwanke, Karen Gordon, Coke? Wallace (AK), Gregg Bird, Kyle Smith, Terry Meyers, Katie ??Schrow WSF?, Brian Hansen, Kurt Alt, Julie Stiver, Peri Wolff, , missing a few names.

Remote (38): Andy Holland, Anne Hubbs, Margo Pybus, Bill Jex, Brad Wendling, Brent Lonner, Brett Wiedmann, Brian Logan, Caeley Thacker, Chad Lehman, Brian Wolfer, Colin Gillin, Craig McClean, Darren Brunning, Daryl Lutz, Daryl Ratajczak, Frank Quamen, Doug McWhirter, Clint Epps, Eric Rominger, Jeremy Ayotte, John Shivik, Joe Want, Josh Jahner, Julia Burco, Kezia Manlove, Kimberlee Beckmen, Lacey Greene, Mary Wood, Nathan Galloway, Tom Besser, Tom Stephenson, Vern Bleich, Amber Munig, Pat Klein, Meghan Lariviee, Helen Schwantje, Dustin Darveau, Don Whittaker, missing some names.

### **WAFWA Directors' Wild Sheep Initiative Strategic Discussion from January 8 – Mike and Kevin**

- New WAFWA Executive Director Zach Lowe reached out to all WAFWA working groups when he started and he identified WSWG on Winter WAFWA meeting agenda to discuss chair selection and strategize on the Initiative's future
  - o At WAFWA mtg Mike gave overview of WSWG origin, accomplishments, highlighting DMV, Test-and-Remove
  - o What difficulties we are looking at in the future
    - Disease (still not in thinhorns)
    - Climate change (drought, unstable snowpack and temperature swings)
  - o Explained its discouraging to work hard to get a herd on its feet again only to watch the next herd go down
  - o Should be more preventative than reactionary but not sure what to do
  - o Mike tried to spur WAFWA Directors' engagement with various directions WSWG could move into:
    - Domestic sheep vaccine? Super expensive, not sure where it would come from, wouldn't work for wild sheep
    - Accommodating operators on the landscape, alternative grazing sites on ag fields in the valley instead of being on the mountain, incentive programs to leave the mountain?
- Did not get a lot of feedback from the directors on a plan
- Where are the directors with current and future support of WSWG and wild sheep conservation?
  - o Every director that spoke was supportive of the WSWG; unfortunately only 4 in meeting from NV, NE, BC, and OR
  - o Kevin Hurley: It was clear that directors from sheep states want the WSWG to keep going, good opportunity to educate everyone who doesn't know as much about the sheep issues
- Zach's other concern is who is going to fill the WSWG chair when Mike steps down
  - o Do we need a working group?

- Is WSWG a working group or an initiative?
- Never got a straight answer; Directors don't care what we call ourselves;
  - o Kevin: WSWG would consider stepping up to support an agency that's experiencing assessment fatigue (typically \$3,000/year toward WSWG chair position)
  - o Kevin: If there is someone in your agency that is interested in being chair have them reach out to Mike
  - o Kevin: Initiatives have WAFWA contract worker involved
- Winter WAFWA meeting, discussion about needing to have more cooperation with agencies and NGOs
  - o How can we promote wild sheep and connect people without getting agency staff in hot water?
- Mike's goal is to finish capture guidelines, won't be chair by summer meeting
  - o Leaning towards finding a retiree for the new chair
  - o Don't necessarily have to have in depth background in sheep
  - o Mike can't balance leading the WSWG and Nevada Department of Wildlife job
  - o Kevin: If anyone has thoughts, share with Mike, Kevin, or Kurt
- Melanie: Are you saying no one can balance an agency job and being chair?
- Mike: Might depend on the agency and the structure, still believe in the WSWG

### **Jurisdictional Status Reports**

- Wyoming (Tony Mong)
  - Harvest uptick (144 rams) last year, 7.5 avg. age, still down from last 10 years, 41% decrease in number harvested since late 1980s, increase in success. Couple big units in Absaroka not doing as well (Wapiti Ridge), physically counted 3,000 sheep recently, but likely down 40-50% from peak years. Herd outside of Jackson have been monitoring body condition for 5-6 years, seeing precursor to die-off, body condition has decreased as population reaches 500, trying to do ewe harvest in that unit to get numbers down, same with Devil's Canyon. Major fire in southern Wyoming, did cheatgrass treatment
  - Ryan Amundson: 176,000 acres burned in fall 2020, treated cheatgrass with new herbicide Rejuvra® (can only be used on USFS) in that area; able to get 6,000 acres of wilderness area treated! Think we'll see big movement of sheep into that area now timber is gone and improved forage availability.
  - Tony: Work continuing in Whiskey Mountain herd, has been declining for 30 years, continued work with nutrition, body condition, disease. Greg Anderson retired.
- Washington (no one)
- Utah (Riley Peck)
  - Permits and harvest 2021 mirrored 2020, decrease in desert permits by 2%, Rocky Mountain up slightly. Zion NP bighorn sheep significant decrease in population from recent flights, collar data did not reflect that. Working on nursery herd location, required in state management plan, challenge has been finding a location, found private landowner with 3,000 acres who is entering an agreement for \$0 and no expectation for compensation, may not be ideal habitat but great opportunity. Also built a quarantine facility to hold sheep while being tested if captured on foray or other pathogen circumstances. (Mike asked about Mineral Mountain translocation) Some initial wandering but has settled down and doing well, would like to see another augmentation. (Mike asked on lion predation) Got that under control, local houndsmen helped. (Vern asked about status of Antelope Island) Also doing well as far as lamb recruitment and staying put but not growing as quick as we'd like, big concern. Addressed the recent likely pathogen source and transmission pathway by building

a fence on the island to prevent another outbreak. (Out of the ones translocated how are they) 21 of 25 are still alive and well. (Kelsey asked about the private land nurse site) We were looking at 4-5 locations but some of them were eliminated because partners didn't work out, domestic sheep too close, domestic sheep operators opposed. But the current site is surrounded by Division of Wildlife land but did have to compromise on habitat quality.

- Yukon (Megan Larivee)

- Thinhorn sheep and mountain goat ungulate biologist for Government of Yukon. Harvested 234 sheep past year (keeping with average), increase in resident interest (applying for a "seal"), more sheep harvested by non-resident (only 99 by resident this year). One-third of thinhorn sheep inhabit southern Yukon. Moved to sustainable harvest limit in heavier hit areas (4% of non-lamb population). Recently radio collared some sheep for first time in a very long time in the Yukon. Deployed 12 collared ewes in March 2021 to monitor movement, interesting findings following lambing period. Considering further modifications to permits in heavier hunted areas to establish restricted "permit" hunts. Planning to fly another comprehensive survey for an area that hasn't been flown in a long time but need funding. Did hunter effort surveys, concern for hunter crowding, having hunters pushing sheep. (Mike asked for more information on remote nature of units and guided hunts) Most of the mega sheep herds are very remote and mostly accessed by outfitters using horses. Near Whitehorse, access is increasing. Was a switch with residents taking more than non-residents with the inability of nonresidents to fly during the pandemic. In "open" areas, any resident can buy a seal to hunt a thinhorn sheep for \$10. (Mike asked if BC helped with first captures) Bill Jex was a huge help. Looked at BC protocols. Challenge was pilots weren't experienced working with sheep. Capture success was dependent on weather conditions. Looking to put out 15 more collars and hopefully collar some rams in the future to look at movement data.

- Texas (Froylan)

- First two bighorn die-offs came through Texas (Black Gap WMA in Fall 2019 and Van Horn Mountains in Spring 2020). Had collars in both populations and were able to detect die-offs early on in the pathogen spillover. Strain typing didn't match any other states. Initial signs indicated it was a novel strain and might be a Movi goat strain. Both herds border against the Rio Grande and Mexico. Lots of hobby sheep and goat herds that are likely the source. Working on trying to get samples from them. Lost Dr. Bob Dittmar their vet in the helo accident around the same time of investigating the dieoffs. Challenging times. Haven't had a disease mortality in about a year. (Mike asked about lamb recruitment in 2021) It was only 16% at Black Gap, but used different helo contractor and flew it later in the year that normal survey. The other herd, Van Horn Mountains only had 1 ewe classified on survey, but may have missed animals due to aerial deer surveys flights just a few days before along with heavy Border Patrol aerial activity. (Melanie asked about adult loss during die-off) Probably 50%.

- South Dakota (Chad)

- o 8 licenses this past fall, largest number in recent history. 8 of 8 hunters were successful, several Boone & Crocket, expecting 10 tags next year. Test and Remove completed in Custer State Park and in Hell Canyon in southern Black Hills with strong population growth rate. Same true for Badlands herd, which has contributed to increase in young rams dispersing leading to domestic sheep/goat interactions. In Badlands disease event hit August/September, 30 dead sheep confirmed initially. Its pre spillover estimate was about 250 and post-spillover at 90 sheep. Also had the Bluetongue

mortalities. National Park Service interested in doing a Test and Remove project in Badlands. Estimating 100 bighorn in Custer State Park, over a 100 in Hell Canyon. Developing a sightability model to improve on estimate of Elk Mountain herd. Thought that Deadwood herd was cleaned up of Movi (18 out of 23 sheep tested Movi negative) last year but a lamb came up sick this fall. Same strain so likely missed a shedder. Going back in again to remove shedder. (Mike asked if previous agreement between SDGFP and NPS to kill bighorn that poses a threat to herd would have made a difference) The issue was limited cell service with the right person. Chad is pursuing with his administration ability to allow landowners to kill bighorn who make interaction with domestics. Seems like a good avenue. Have a pretty good relationship with the domestic livestock owners. As we all know, bighorn can be there and gone interacting with domestic sheep and time is of the essence.

- Oregon (Colin)

- Population numbers about the same as they have been (3,700 California bighorn and 800 Rocky Mtn. >70 tags last year. 70 were filled. Brian - Don't have places to bighorn sheep because of domestic issues so ODFW implemented ewe hunts in Deshutes/John Day/Canyon River area; 10 tags and 3 unsuccessful in ewe hunt.
- (Colin) Been getting hit with drought pretty bad for the last few years. Most of state is considered in severe drought. Concerned about impact on recruitment. Hart Mountain herd has dropped 67% since 2016 (148 to 48) due primarily to lion predation. Currently working on a Test and Cull project. Looking at putting out 130 collars in Lookout Mtn, 40 in SE Oregon near NV border. (Mike asked if there was pushback on the ewe hunts and when is the final decision period for predator control on Hart Mountain) (Brian) Nothing terrible pushback in getting ewe hunts on, and those herds are doing well. The predation discussion is done but will do some work on that soon. (Kevin) USFWS took into account our comments but not taking any more, final report should be out soon. (Don Whittaker from chat: Was signed Friday). (Mike asked if anyone has ever allowed landowners to kill BHS after domestic interaction) Wyoming, Montana, and Texas. (Texas) Offer a supplemental tag that can be given out to a landowner to take out a sick animal, hasn't been used on BHS yet. (Tony) Issued a Chapter 56 permit to a landowner to take out a wandering BHS, wasn't used though.

- North Dakota (Brett)

- Good lamb recruitment, most populations pre die-off levels, looking at two years of record high numbers. Translocated sheep recently have been doing really well. Has increased from 30 to 60 in 2 years. Finished a wildlife crossing on the Little Missouri River crossing last fall, will have more details at Professionals Meeting tomorrow. Each successive year over last 6 years have set new B&C ram harvest record in ND. ~400 BHS in the state including those released in early 2020 on the Mandaree and Twin Buttes areas of the Fort Berthold Reservation of the Three Affiliated Tribes of the Mandan Hidatsa, and Arikara Nation.

- New Mexico (Eric)

- 1700 RMBH (about two-fold increase), increased forays, sheep in new areas never seen before. Movi detected in Rio Grande herd that were supposed to go to Utah and tested, don't think any sheep have died from disease, one ewe harvested in that area. Does seem to have a second wave of lamb mortalities. Strain typed as goat strain. Experienced some major landscape changes due to drought the last 2 years. Desert herds in the Boothills are all Movi free. Battling lions everywhere, can be as high as 85%. Translocated sheep to a new area that looked great, recent surveys showed

no lambs, no yearlings, half the adults. They found 20 mountain lions in the area but only spotted 2 deer.

- Nevada (Mike)

- Summer 2020 started water hauls, 104,000 gallons to 27 guzzlers across several desert bighorn herds, 7 guzzlers had 2 separate water hauls because they were being drunk dry. Also hauled in January and July 2021, another 85,000 gallons. Still wasn't enough, lost a lot of sheep. 2021 population estimate was 9,500 in 2021; estimating a loss of 1,000 over the last year. ~300 RMBH, most herds still recovering from disease events. Maintaining hunter success. Have a program where a hunter can return their tag and it goes back to a first come first serve pool online, 7 were returned this year from residents, 5 of those were bought by non-residents, all 7 were purchased after season started and were all successful. CBH success is lower than average. Had a longtime desert bighorn biologist retire (Pat Cummings); huge knowledge loss. Looking at reinstating the use of drop nets, maybe as soon as summer 2022. Looking to provide desert bighorn for the Utah nursery site. Been doing a few Test and Remove projects. Snowstorms started in 2014. Thought it was going well, 2020 lamb recruitment was down, recaptured and found Movi again. Had to also test rams and remove a couple that were Movi positive in early 2021. Think Movi is gone, looking to augment in next few years. Sold on summer captures, captured ~33 animals in August 2021 during 80s/90s temps, no mortalities, only gave fluids to 2 animals, they all dissipated heat very well in very short time. Started another Test and Remove on NTTR (DOD/US Air Force). Herd went from 500 animals to <120 since 2014. Department of Defense has been great to work with. Had spillover in 2006 another desert bighorn in west central NV following giving Utah 30 animals that were clean, strain wasn't overly virulent, now that population is 3X the population prior to die-off. Then out of the blue in 2018 that strain shows up in nearby herd. (Vern asked about summer capture chase times) No longer than normal, most <1 minute with a few up to 3 minutes.

- Nebraska (Todd)

- Our Northern NE herds struggle, southern herds in and around the Wildcat Hills doing well. Still working on the test and remove methods. Had a BT/EHD event, hit one herd hard where Test and Remove had been working. Working on an advisory committee with domestic sheep owners. 250-275 sheep in Nebraska, looking into getting more soon. 2 harvested BHS, one was a new state record. Kaitlyn Bohr out of SDSU has been working with us on the risk of contact tool. (Kevin asked about mountain lion issues) research looking into it, may be more of an issue with the deer though, do get occasional sheep kills.

- Montana (Brent)

- General stability. ~6000 BHS in state, including tribal and NPS. Harvest ~120 rams a year, 90%+ success rate. Do allow some ewe harvest. Going through a substantial state overview of hunting regulations for big game, looking to add hunting opportunity in some areas and take away in others, some boundary changes. Finished statewide BHS project in the past year. Final report available. Included big picture things: movement, migration, habitat, genomics, demographic, disease. Done some relocations to reestablish sheep in two new areas. Went through the Tendoy Mountains to remove any sheep associated with the disease, added 26 sheep from Wild Horse Island. 21-23 still alive. Could only find 4 lambs on last count a month ago. 20 of 50 lost from the Little Belt Mountains translocation primarily due to lion predation. An additional augmentation of

- 33, have added more sheep, going to wait to add any more for now. Doing BHS captures for general BHS health assessment including the Highlands herd.
- (Brian) MDFWP is developing an adaptive bighorn management strategy. Previously WSF and MT Woolgrowers had a working group and for the last 1.5 years with MDFWP looking for projects, funding, planning and feel it plays into the DMV. Looking to put together a 5-year federal aid project working with landowners and domestic sheep producers in concert with Montana State University. Looking at mitigation options. Still in planning stage but hoping to have some grants put together in the next couple of months.
  - (Kurt) We are trying to find a better place involving domestic/wild sheep comingling and separation in MT. Have a project that just started with Montana State University led by Dr. Mark Jutila looking at immunological treatment for domestic sheep, looking at how pathogen moves through domestic sheep.
- Idaho (Holly)
- Working on update to our Idaho BHS Management Plan and seeking public input including that from WSWG members. Idaho WSF chapter was awarded a Wildlife Commission grant to work with small domestic sheep flock owners in Movi free domestic flock program. Have bighorn nutrition project going on in collaboration with Wyoming and Washington. Lots of fires this year, a big one in Hell's Canyon that burned a ton of bighorn habitat. Big concern over CBH population in Bruneau/Jarbridge Rivers along NV border with detection of Movi in hunter harvest sample in 2016. Aerial surveys in 2015 counted 120 but by 2021 only 26 were counted. Wanting to do more testing, strain typing, looking at predation. State is working through predation management plan. After Hell's Canyon successful Test and Remove, continue to monitor the growing subherds especially with possible increase in forays. Did some captures via jet boat in lower Hell's Canyon. What to expand captures using helicopter but dealing with wilderness capture restrictions. Also have other locations we're looking at doing Test and Remove projects.
- Colorado (Andy)
- CPW is recommending 15-tag increase in RMBS tags (315 to 330; 12 ram and 3 ewe tags), 15% to NR. Most herds doing well except S39 in Breckinridge/Fairplay area where sheep aren't being seen. Population been steady around 7,000, this year estimate is 7500 with January 2021 winter surveys having average of 49 lambs:100 ewes that supports this population increase. DBH have been increasing with current estimate of 550, highest ever in CO. 73 of 239 ram tags are archery tags! Have a lot of archery licenses so success is a little lower than what you see in other states. Increasing Mt Goat licenses by 40 tags. (Kevin asked about response for fires) Nothing known yet.
- California (Tom)
- Also working on a statewide sheep plan. Initial phase was to work on a statewide desert bighorn plan. Drought has been a big issue, really dry winter last year, spotty monsoons during the summer, hauled a lot of water. Big storms in October, late December, snowpack is looking good right now. A lot of populations have rebounded. Clint Epps has students doing some work. Paige resigned at beginning of the year to finish her Master's degree. Recovery of Sierra Nevada bighorn has made progress in the years since they were listed but still have a ways to go, likely going to need translocations. If we're going to be able to do the recovery then we need to manage the lions. Have four source herds with a lot of nutritional research, and the source with the best nutrition was

- knocked almost in half over the winter due to a lion. Gone from lethal removal of lions to translocating lions.
- (Mike) we need to have a predator management discussion at some point
- British Columbia (Bill)
    - 4 subspecies (CBH, RMBH, Stone and Dall Sheep) that are stable to declining, dealing with the same struggles as everyone (Movi, BT, psoroptes). Lost 75% of collared BHS to BT in one CBH herd in the Okanagan Region. Also lost some quality habitat that reduces herd resilience. COVID restrictions dropped thinhorn harvest to about 2/3. Actually had an uptick of resident hunters. Dall sheep numbers are down. Working on a thinhorn management plan to be available by April, looking to incorporate indigenous knowledge. Stone harvest is down, had a record number of non-compliances. BHS had big drop. Looking at regulation changes, partially to help with disease losses. Looking at going to a full draw system in one area. A major source population has been hit with Movi, been doing some Test and Remove, starting to see a noticeable increase in lamb recruitment. First record of elk liver fluke in BHS, likely a result of a wet year, no record this year with it being dry. Dealing with predation on thinhorns with grizzlies and golden eagles. Also compliance issues for age restrictions in curl restricted hunting areas. Looking at getting some better information out on aging. Agriculture Department getting educational information out for domestic livestock owners. Biggest challenge has been hunt structure. Have some landowner covenants where these properties will not be allowed to have domestic sheep or goats.
  - Arizona (Amber)
    - Little change in hunting opportunities still about 120 permits (16-18 RMBH, rest are deserts). No new cases of Movi. Unit 15 Herd (Black Mountains) had its second pathogen exposure to Movi in 2015; thought it was stabilizing but located more dead animals this year so going to follow up with more testing. Translocated 88 BHS across 4 events. Partnered with KUIU and they funded the whole thing except staff time. Two monitoring projects: collaring for movement and disease monitoring and a new one for disease testing and movement in new area near Black Mountain. Established a new population, its doing well. Another population was reestablished, have had three translocations, is doing really well even with mountain lions in the area.

### **Wednesday (@8:07)**

- Alberta (Mike for Anne Hubbs)
  - Populations stable @ 9000, 3000 in National Parks, 30% increase in resident harvest. Have a 4/5ths curl restriction in most areas. No known upper respiratory outbreaks since 2000. Plan to expand program to expand domestic testing, incentives for domestic owners to test. Biggest challenge is trying to convince people that transmission will likely occur at some point. Been working on management plan with stakeholders.
- Alaska (Darren)
  - 2021 ram harvest was the lowest since 1962 (479 sheep, average is 985). 2020 was second lowest. Sheep numbers are low in most areas, confirmed by surveys and hunters. Dall's sheep populations do fluctuate occasionally, to be expected. There was poor lamb recruitment from 6-8 years ago, most likely weather related. Winter 2012 had record snow depths. Lower number of legal rams available in last 2 seasons. Lower adult survival last 2 years. Bigger picture, need to be aware of warming environment. We can expect less

habitat for sheep which will lead to fewer sheep and fewer hunting opportunities. Going to keep watching and monitoring for now but may need to limit hunting down the road. Have lowered permits in some areas. Delaying a research project in the Brooks Range that was supposed to start this year collaring 60 Class III rams. Don't want to add extra stress on sheep during this severe winter and make sure sample size is available. This is to look at habitat selection, movement, and looking at role Class III rams play in breeding. Alaska is giving a virtual presentation tomorrow night and already have 500 people registered.

- (Kyle – south central Alaska) The Anchorage area (Chugach Mtns) population is stable to increasing, next area experienced a slight decrease in tags, a population east of there is at its highest number in a long time. Had to stop captures in one area due to low ewe numbers and poor body condition.
- NPS (Nathan Galloway)
  - Have been working with the Badlands. Number of samples came back positive for BT as well as Movi. Grand Teton doing Mt Goat removals, working with Wyoming. Working with Kezia on monitoring the Zion NP outbreak; seems to be low mortality. Working with Mojave project, looking at ground survey system. (Kezia – Zion has apparently cleared Movi according to recent test results). Black Mountains (AZ side above Colorado River, LMNRA?) desert bighorn are suspected as Movi positive, working to try to get in there to get testing done, been slow with working through safety measures for helicopter flights. Working with Risk of Contact Think Tank group.
- BLM (Frank)
  - Continue to be involved with Risk of Contact group and Think Tank. Provided data to FS for GIS allotment layer. Thanks to state biologists working together. Political note – if state agencies aren't willing to take a political risk with wild sheep at the domestic sheep interface, BLM is limited in what they can do. (Vern – same political issues are also applying to the wild horse/burro issue).
- USFS (John)
  - Working with the Risk of Contact Think Tank also. Do not have a current list of when allotments being revised so it's a case-by-case situation as it arrives. Recommend looking at the Monteith paper that assessed Risk of Contact in Sweetwater Rocks in central WY (Mike will send out). Under new, evolving budget model at USFS so waiting to see how that plays out. Bridger Teton herd in Wyoming has caused a pause in forest planning, looking at an advisory board on how to navigate this.

Intro (Kevin Hurley)

- Dr. Kate Huyvaert is new Rocky Crote chair, disease ecologist with background in molecular techniques and behavior. Going to apply information from birds to sheep.

### **Bluetongue Virus Outbreaks Discussion**

- Caeley
  - Late August 2021 southern BC had a BT outbreak, serotype 11. Wondering what other areas had an outbreak, what is ongoing, what is expected, what are people doing for testing?



- Anne Justice-Allen
  - o Arizona will be different than northern areas. Typically have endemic areas where regular testing occurs. There are areas where it is not endemic on SW side and plateau. Tends to be seasonal and changes with monsoonal patterns – when there is years of drought then a wet year there is an outbreak. Does not generally cause population declines or impacts. One suspect area had ram declines. Seen about every strain of BT/EHD, just had EHD serotype 6 for first time, first case west of the Mississippi, likely brought in from infected cattle. (Caeley - Do you see more declines right after a new introduction?) Would expect a bigger decline during a new introduction, there is some cross strain immunity. When doing typing, looking at highest titer response to type. Foresee it being a developing issue up north that would likely stabilize.
- Julie (CPW)
  - o Quite a bit of cases in ungulates, detected EHD 6 and 2 serotypes in BHS, BT 13 and 11. Typically just a few animals infected and die from it but rarely see anything that would have population impacts. Other ungulate species had an emerging serotype infection but hasn't been seen in BHS. (Mary Wood) -Had EHD, BT, and adenovirus simultaneously this year which was unusual but only EHD in wild sheep.
- Chad (SD)
  - o BT, not EHD, at Badlands. (Nathan) Think there might be an additive effect, likely more of an Movi outbreak but maybe higher mortality in animals with both BT and Movi. (Chad) Necropsy showed lower mortality after first frost but still having dead animals so likely more Movi. (Kevin) How did the public understand the difference? (Craig McLean in southern BC) Two BT outbreaks, one population lost 8 of 12 collared sheep and lots of mortalities reports, planning on surveys soon to get final counts, know that Movi isn't in the population. Lost 7 or 17 collars in another population but also has Movi. Lots of conversations about whether it was Movi, public seemed to understand the difference, wanted to blame cattle but no evidence of that.
- Todd (NE)
  - o Had a significant die-off in small herd (EHD type 2, BT no serotype ID). Population had Movi detected but couldn't determine what killed them. Found WADDL could ID BT/EHD from bone marrow, better detection from that than spleen sample.
- Helen Schwantje
  - o Big BT outbreak in many species, lasted a few months. 2018 in another area where WTD are at high density, started to die-off, ID'd in rotten spleen. Periodically do sero surveys to look at prevalence. Usually don't hear about dieoffs until public starts reporting deaths. Theory is weather blows infected gnats in and impact WTD and sheep the most. Think we're hearing more now because we have collared animals affected. Expecting to see more with the weather changing. (Anne Justice-Allen) Agree, the host is the gnat so driven by gnat biology. Can be tough to detect in some areas, recommend testing lung, spleen, and bone marrow.
- Peri
  - o Might be a good idea to reach out to SCWDS, been dealing with BT/EHD and mapping it for awhile.
- Mike
  - o Would be nice to get a small committee of veterinarians that can put together a one-page document on what to look for/expect to be shared with staff and constituents.

- Francis
  - o Has anyone else seen a pattern with standing water that might be able to be managed?
- Mike
  - o Caeley, will you work on getting that info pulled together? (Pat Klein from chat – happy to help). (Peri, Anne Justice-Allen). Is there a trend that once its established that there’s less mortality over time?
- Helen
  - o Lots of work on WTD by SCWDS, they might be able to help with that.
- Anne Justice-Allen
  - o Thinks there is some immunity over time, that mortality will lessen over time. Management may be possible at some of these patchy resources.
- Kevin
  - o Maybe Caeley and others can meet at Jackson NWSGC meeting in a few months. (Craig can help)

### **Test and Remove Projects**

- Mike
  - o Let’s look at problems, modifications, etc. Working on a tracking document to share information on agencies work through their projects
- Frances
  - o Looking to see if there is interest in a group with people doing a test and remove with Katie Hyberd(?) to compile the data and look for trends (such as age structure, ecology, etc.) to take advantage of all the data being collected.
- Mike
  - o If we could get a small committee going to work on that document online and look for those trends.
- Frances
  - o Would like to do this to move test and remove forward and make it more effective. (Daryl Lutz, Nate LaHue, Todd(?) will help)
- Mike
  - o Will work on getting the information and group together in the next week so we can move forward.
- Kevin (for Anne Hubbs)
  - o Surveillance vet had question for disease management budget. How many hours would it take to process domestics for testing?
- Nate LaHue
  - o Best time is after they are being pulled for shearing. Can just take a few hours with a couple people. We sampled 400. They would do 100 at a time. They had the age classes different times. Maybe do ewes one day, rams another, yearlings another depending on operation. Could do 50 an hour. Cost was mostly staff time, cheap swabs, then testing (\$50 a test at WADDL). Can also do it when doing lamb tail docking if you’re not interested in testing rams.

## Pack Animal Committee Discussion

- Mike
  - Lots of interactions with llama owners. Upset about a few occurrences on public lands where pack llamas are prevented from being used in fear of pathogen transmission to wild sheep. Worked on putting together a document about what we do and do not know. Want to address all pack animals (goats and llamas). Our pack animal committee Met last September. We need to continue to try to meet with the leadership of various groups, haven't reached out to them yet. Need to separate thimhorn and bighorn in this discussion. Need to restructure the mission statement. Daryl suggested a preamble to catch people up on what we do and do not know. Try to identify the need to address pack llama use differently in thimhorn habitat (more restrictive due to greater consequences) vs. bighorn habitat (less restrictive). Llamas seem to be relatively clean compared to domestic sheep and goats. In the lower 48 and southern Canada our plate is full with the domestic sheep issue, we don't need to create another enemy with another group that's been trying to do good on the landscape . Kevin and Mike haven't had time the last several months to move forward with this but would like to get going again with this by summer. (Kevin) working with Peri on questionnaire on husbandry practices (i.e. are the pack animals mingling with other species back at the farm or are they separated). (Peri) Got busy and dropped it but we need to know if people are going to fill it out, otherwise pointless to put the effort into making and sending out a questionnaire. Also look at where people are taking their llamas (i.e. a llama packing outfit in Alabama that doesn't take llamas to sheep country). (Anne Justice-Allen disagrees) easier to transport pack animals than wildlife, know of people from Canada who frequently bring llamas to the US. (Kimberlee) Experience from other pack animal committees, lots of owners are extremely resistant to any health restrictions being in place, don't believe they need to do testing of any kind, already doing a good job taking care of their animals.
  - Mike - We're trying to provide guidelines to land management agencies so they can make informed decisions on permitting the use pack llamas near or in bighorn sheep habitat. I for one would have an open-door policy for pack llama use in Nevada.
  - Tony – Alaska - Don't believe the outspoken people are the voice of the majority of llama owners. Also think international llama travel is minimal. Llama popularity is declining in Alaska. Not worried about llamas in sheep country right now, don't believe the evidence is there.
  - Mike - Daryl, what is the last conversation you've had with the llama outfitters in your area?
  - Daryl Unconcerned about what's happening. They rest their arguments on the old data. It's unfortunate that we want them to work with us to help them get current information using more current technology the key pathogens of concern. The current stance on llamas is they don't pose a significant threat to bighorn sheep but we need more data to strengthen that.
  - Mike We're wanting pack llama owners to engage with us, but if they don't work with us we can't help them.
  - Helen (from chat) Can questionnaire about where and how many llamas would be less controversial? (Kevin) Have that in the drafted questionnaire. Will pick that up again.
  - Becky (Alaska) - For what we don't know we error on the side of caution. Seen almost every large federal restriction across the state has adopted the blanket recommendations for llamas. Gone to pack animal owners and say they can stay locked out or they can work with us to improve knowledge so we can lessen these restrictions.

- Mike - Lets work on getting this committee and survey going again.
- Daryl -Based on last conversation with llama owner, wants to know what we're doing. Are we doing survey and position statement going concurrently.
- Mike - Think that would be good. Will reach out to the group the first of February to get this going.
- Daryl - Also need to remember to put the info with thinhorns into context.
- Helen - Need to be clear we are looking for information, not necessarily guidelines.
- Daryl - Yes, need to be clear what the intent is

### **Viewing GIS spatial files**

- John Shivik - Desire to have an allotment GIS layer where they overlap with wild sheep habitat. This is a way for people to visually see where domestic allotments are. Constantly being updated as USFS gets updated allotment information. (Mike) Better system than PDFs. Can still make PDFs from these maps if needed.
- Frank - BLM does an annual data poll and classifies where domestic sheep or goats are from USFS. Helps inform where we need to get more data for the Risk of Contact tool, biggest bottleneck with that tool has been getting that information.
- Brian Logan -This is a coarse tool to inform for analysis, but nothing is better than contacting local land management for the most current data.
- Korin Miles and Lucretia worked on a story map of the WSWG (presented by Mike)
  - Incorporates the GIS map. Still needs some fine tuning. Will reach out for suggestions.
  - Melanie - The intent was for everyone to have a chance to contribute but not a lot of people responded with being busy so look into what you think should be included now when its sent out for review.
  - Mike - We can keep developing this and add new information through time.
  - Brent Lonner - This is a neat tool for sharing and good to keep growing it in the future. Wondering about source information for translocations. What source was used to get those? (Mike) This came from our group. (Brent) Is there is a place where that is all resting or just added as we go? (Mike) Addressing that next.

### **WAFWA Next Cloud Storage**

- Mike
  - Been using a Google Drive where shared information lives. This includes the translocation dataset. Can jump on and add new information for your agencies as they happen. Been working on moving this to WAFWAs Next Cloud. Disease events data is here as well. Kevin had maps to show at recent meetings and we haven't updated those maps since 2014. Also have harvest trends. (Anne Justice-Allen) Do we have access to the Next Cloud? (Mike) Access was given to all the active working group members but not to others.

### **Historic Wild Sheep Habitat GIS Layer**

- Mike
  - Nevada has an estimate of where BHS were in 1850, know Montana has this too. Would like to have a more fine tuned 1850 map, do other states have any maps with guesses on where sheep were in 1860?
- Tony

- Doug McWhirter has been working on that and should have a pretty extensive map and narrative on that.
- Vern
  - Have also been working on this as well and should hopefully have something soon.

#### **WAFWA Next Cloud (return to topic)**

- Mike
  - Active WSWG members have a WAFWA Next Cloud account, will be sending out the information on how to access that. Similar to Google Drive. Can work on documents together, just like Google Docs and Sheets. Has harvest info, allotment info, habitat info, etc. This is what we'll work on moving forward
- Hollie
  - When the management plan is finished will have a new distribution and habitat map. How should that be updated? (Mike) Send that to Mike to start with, will work on how to do that going forward. Goal is to have a single layer eventually but not there yet.
- Frances
  - As you're working on it, think about version control with some document indicating when it was last updated and by who.

#### **Risk of Contact Modeling**

- Melanie
  - Have had team working for the past 2 years with 2 people from states, 2 from USFS, original developer, Kezia Manlove, Melanie (total of 12). Originally looking at data from GPS vs VHF and frequency of points effects of data. Josh and Kezia have been working on a publication. Looking at how to predict forays for animals without collars or finer scale data. Have funding still for Josh for training and support and developing the new foray estimators. Try to meet once a month. Just Google USGS BHS Risk of Contact tool and it will come up. Eventually want to expand to desert island populations.
- Mike
  - Have money from WAFWA that will get plugged into this effort. Right now, most of the data is coming from Hell's Canyon which is a unique habitat. Want to use the money for collars for sheep in other habitats. Monteith lab has used this in Sweetwater. Also Nebraska.
- Kaitlyn Bohr
  - NE mostly privately owned. Using the tool to highlight the areas for when an advisory committee we can work with landowners in that area. We can run the model and see how wild sheep are using the area so we know which domestic flocks to work with. NE also has different habitat than other western states. 80% of points fall into non-habitat from current habitat map so need updated map for NE.
- Tim
  - From Hell's Canyon for reintroduction, an important thing to consider with the model, you need to consider the migratory behavior of the sheep you are putting in the area. Sheep from migratory sources are going to use the habitat differently than ones from a non-migratory source.

- Don Whitaker
  - o Using it in SE Oregon. On one side of the highway rams are making huge forays but that isn't happening on the other side. Also dealing with disease side on one side but not the other. Could also be risk of contact between subpopulations of sheep as well when dealing with the foray movement. Hoping to have results in a couple of months.
- Mike
  - o Kezia's lab was looking at how strain movements might move. So looking at how exposure to other infected BHS herds as well as domestic sheep contacts. Would you (Don W.) be willing to let Josh look at datasets from Oregon? (Don) Will have to look at data sharing agreements. At state level and BLM are interested in collaborating as well.

### **Wild Sheep Genomics Group**

- Josh Jahner
  - o Working on California BHS genomics project (w/ Clint Epps, Marjorie..., etc.). Goal to develop genetic management strategy. Two main questions: Is divergence between CBH and RMBH is consistent with recent or later differentiation and how much genetic diversity is there between CBH herds. Recent paper by Barbosa 2021, found genetic difference between the subspecies, lower diversity in CBH. Sequenced 1823 CBH and RMBH for project. Results are preliminary at this point but plan to have more finalized results at Jackson meeting in April. A few herds have mixed ancestry suggesting recent hybridization. Ran PCA for evidence of genetic differentiation and hybridization, mostly separating by given classification of CBH and RMBH suggesting strong genetic differences. Wilcoxon rank shows RMBH have much higher genetic diversity, CBH has larger difference in genetic diversity. Suggests there might be some sort of ecologically meaningful difference between subspecies. Plan to look at differences with desert BHS next to see how much different they are relative to another subspecies. Suggestion for management is to refrain from mixing CBH and RMBH, CBH herds with higher variation could be targeted for source herds in future augmentations. Appears BC CBH mostly have mixed ancestry so US low diversity herds may have the purest genetics. Other studies could include looking at ND mixed lineage herds to understand the impact of hybridization more. Currently no funding for this and is just done in participants spare time.
- Frances
  - o Another use of the database could be movements across genotypes, especially states that have both. (Josh) Have been thinking about rare alleles and with the level of data we have we can look at where those rare alleles are and can start looking at where and when movement between herds has occurred.
- Don W.
  - o Do any of the populations included in the analysis with low variability, do you have other data to show if that is impacting performance in those herds? (Clint) That's a next step we'd like to do but have to get data place by place. Looking at dropping this into Oregon survival model next. We can also keep adding to this dataset. Would like to keep working with other states if there's interest. Would like to link this to fitness. (Don) For those states who are wanting to manage our diversity we need to share this information to also inform sharing BHS for augmentation to benefit the genetic diversity. (Clint) We want to start working towards what the best way to share data is and what the best metric is to share. Want to add Mojave and desert sheep to the dataset if we get funding. (Josh) Found examples of

RMBH and DBH hybridization but not any others. (Don) Are you looking at using this to look back at the old morphometrics paper? (Clint) Thinks there's still worth in morphometrics, would be interesting to apply this to that work.

- Mike
  - o Working on rewriting management plan in NV. In past have grabbed BHS from all over. Trying to blur lines to promote DBH in NV. What is the guess of how far south CBH actually went historically? Historically NV only had DBH statewide. RMBH aren't doing well and CBH are stable to declining; won't improve with climate change. (Kevin) In early 2000s when CBH were brought to Big Horn Mountains in Wyoming, sheep were brought to an area they weren't ecologically matched well, not sure it was a genetic thing. (Don) Not seeing that this will change how OR manages the subspecies they have. (Frances) ID in same situation as NV. Had desert sheep, now have CBH at NV border. Probably not changing things now. If CBH diversity is lower, could move DBH into CBH to increase diversity.
- Clint
  - o Has been a struggle to find funding because costs go up funding research outside of that state.

### **Capture and Handling Guidelines**

- Mike
  - o Have nearly complete chapters, thanks to all leads on those. Collaring and Marking, Translocations and Release, and Basecamp Operations are what's left. Mike will do his best to help with finishing these final chapters. Next big step will be getting these chapters to link together. There's a lot of shared info between chapters. Lots of things will be reiterated. Planning to have links to send people to appropriate chapters. (Anne Justice-Allen) Can also use appendices for shared information. (Mike) Probably won't come to complete agreement on what should be suggested, strongly recommended, and what's a requirement. Do think that cleaning of equipment should be a requirement. Mike is sold on summer captures but not going to work for all places/situations so probably can't be a requirement.
  - o Wanted to discuss minimum distance to domestic sheep for release of translocated sheep. Need to take into account terrain, roads, rivers, etc. Is this something we need to discuss and promote more? (Anne Justice-Allen) Distance is a risk analysis that needs to be considered so it can't be a specific requirement. Need to consider size of domestic operation and how it's managed. (Katie C.) Having this issue that wording in Wyoming, would suggest using mechanism of separation rather than distance. (Anne Justice Allen) use potential of commingling rather than risk of contact.
  - o Need to also include consideration when releasing rams vs. ewes. (Kevin) CO had experience where they moved mature rams that moved back to where they were sourced from. (Mike) Are there still states struggling with ram ratios and wanting to move them versus using harvest. Believe we need to stop moving groups of rams without ewes.
  - o What about collars? We don't need collars on animals forever, especially once they stop working. Anyone in the habit of using releases on collars. (Julie – CO) Recommendation is to use drop-off collars. (Riley – UT) Mixed bag but trying to improve on that.
  - o Plan to start getting these chapter out for review. Hope all can contribute for visual aids, including photos and videos.
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- Brent Lonner
  - o MT is similar to UT. With rams, if you move a mature ram, also stirs up public with concern that ram is no longer available for harvest. The other issue is the more ewes we pull out of an area will skew ram ratios that need to be dealt with. Trying to work on what is considered a safe release distance, currently working under 14km rule.

**Review West-wide Trends in License/Tags, Harvest, Demand, Population Estimates**

- Will be discussed during Professionals meeting in the afternoon.

**Future of the WSWG Chair Position and parting words**

- Mike
  - o Have people who are interested in the chair position reach out.
  - o Been an honor to be the chair
  - o Thanks to former chair Clay Brewer who is retiring

**Upcoming Wild Sheep related events and meetings:**

- Northern Wild Sheep & Goat Council 23rd Biennial Symposium, April 4-7, 2022, Jackson Hole, WY
- Wild Sheep Foundation's Thinhorn Sheep Summit III, May 3-5, 2022, Whitehorse, Yukon

Adjourn (12:04PM)