

DENBY S. LLOYD, (AK)  
President

LARRY L. KRUCKENBERG, (WY)  
Secretary

STEPHEN BARTON, (VA)  
Treasurer



JOE MAURIER, (MT)  
First Vice President

PAUL CONRY, (HI))  
Second Vice President

REX AMACK, (NE)  
Third Vice President

522 Notre Dame Court, Cheyenne, Wyoming 82009, 307-638-1470, www.wafwa.org

## WAFWA Wild Sheep Working Group Summary: Winter 2009-2010 Bighorn Sheep Die-offs (3/16/10)

In what can only be described as unprecedented, at least 9 bighorn sheep herds in at least 5 western states have experienced pneumonia-related die-offs during winter 2009-10. Agency responses have ranged from attempted containment via culling of sick BHS to capturing/treating sickly BHS with antibiotics (e.g., Draxxin). Bio-medical samples have been collected/analyzed whenever possible/available. A follow-up workshop is planned at the June 7-11, 2010 Northern Wild Sheep and Goat Council symposium in Hood River, OR, including detailed presentations from involved states, preliminary evaluations of varying response protocols, updates on BHS status and survival, planned future disease sampling, herd/demographic monitoring, and adaptive management strategies.

**Montana:** first discovered 11/15/09, from what was originally thought to be a road-killed BH ♂; later confirmed as having died from pneumonia; 2 more dead BH ♂ found 11/22/09; E Fk. Bitterroot (HD270); Bitterroot NF (~85% USFS lands, balance state/private lands); from population N=200-220, w/in first 30 days, MTFWP removed 75 sickly BHS (+ 3 seemingly healthy BHS); total of 80 BHS culled, over 87-day period; MTFWP captured/tested N=25 BHS in 2007, during transplant; comparative lab results available; 2007 serology showed all 25 BHS - for *B. ovis*, *B. abortus*, bluetongue, anaplasmosis, IBR, BVD I & BVD II, 7/25 BHS (28%) had low titer to BRSV, 24/25 (96%) had low titer to PI<sub>3</sub>; **2007** culture results showed 18/25 (72%) had *Pasteurella trehalosi*; 3/25 (12%) with *Mannheimia haemolytica*; no *Mycoplasma* found on culture; initial **2009** lab results: serology found 5/48 (10.4%) + for BRSV and 42/48 (87.5%) + for PI<sub>3</sub>

2009 Culture Results (E. Fk. Bitterroot)	Lung tissue	% +	Pharyngeal Swabs	% +	Tracheobronchial lymph node	% +	Tonsil	% +
<i>P. multocida</i>	42/75	56%	22/42	52%	28/46	61%	7/19	37%
<i>M. haemolytica</i>	3/75	4%	5/42	12%	1/46	2%		
<i>P. trehalosi</i>	10/75	13%	28/42	67%	10/46	22%	16/19	84%
<i>Mycoplasma</i> culture	12/63	19%	15/42	36%	7/33	21%	5/19	26%
<i>Mycoplasma</i> PCR	39/71	55%	15/22	68%				

- In 2007, *P. trehalosi* most common isolate (72%). Few *M. haemolytica* isolated. *Mycoplasma* and *P. multocida* not isolated.
- In 2009-necropsied animals, *P. trehalosi* still most common isolate from pharyngeal swabs, but *P. multocida* also isolated from over 50% of sheep. *Mycoplasma* isolated from 37% of swabs in 2009.
- *P. multocida* most common isolate from lung and tracheobronchial lymph nodes. *P. trehalosi* most common isolate in upper respiratory samples, followed by *P. multocida*.

Domestic sheep not known to occur within core BHS winter ranges, but occur on fringe of winter range. Two large DS producers w/in 15 miles, + a number of "hobby herds" adjacent to occupied BHS range. With permission of landowner, DS (i.e., hobby farm) were tested ~mid-February 2010; lab results not yet available.

On January 12<sup>th</sup>, residents around Bonner/W Riverside on lower Blackfoot R. (~37% USFS lands, ~25% Plum Creek, 5% state, balance private lands) reported coughing/sick BHS in/near subdivisions; from population N=160-180, MTFWP removed 93 BHS by February 5, 2010. Farm flocks of DS and DG occur in the area; DS used for weed control, as well.

A resident reported a sick BH ♂ in lower Rock Creek (Lolo NF) (78% USFS lands, 1% BLM, 1% state, 20% private); connectivity with lower Blackfoot/Bonner herd is known; MTFWP opted to not intervene or attempt to cull sick BHS in lower Rock Creek, due to their dispersed distribution, rugged terrain, relative inaccessibility; a large DS flock is pastured directly adjacent to the core of the BHS range, with intermingling known to have occurred in the past.

On January 30<sup>th</sup>, coughing BHS were reported/observed in upper Rock Creek and 2 BHS were collected, with necropsy confirming pneumonia, near Phillipsburg (Deer Lodge NF) (75% USFS lands, 5% BLM, 1% state, 19% private); (N=~340 BHS in herd) connectivity with lower Rock Creek herd is known; MTFWP indicated >25% of these BHS exhibited symptoms of pneumonia; 31 BHS removed by MTFWP, estimated loss of 90%. Culling of sick BHS in the E. Fk. Bitterroot and Bonner populations was carried out in an attempt to contain spread of disease into apparently healthy groups of BHS. Recent observations indicate early success, at least in the East Fork. Culling efforts were not attempted in Lower and Upper Rock Creek, due to difficult terrain; all groups of BHS observed appeared to have been infected.

**Nevada:** coughing BHS first reported by sportsmen 2<sup>nd</sup> week in December 2009 in Ruby Mountains and late December in the E. Humboldt Range (~30 miles apart, but rut-related ram movements between ranges has been documented); BHS distribution primarily occurs on Humboldt-Toiyabe NF lands; BHS winter range occurs on both USFS & BLM lands; as of 3/15/10, 88 known BHS mortalities (70 in E. Humboldts, 18 in S. Rubys); estimated 50% total mortality in Ruby Mtns (N=~160, summer 2009) and 60-80% total mortality in E.

Humboldts (N=~180, summer 2009); 30 BHS were caught/marked in the 2 mountain ranges (5 w/ eartags only in E. Humboldts; 25 [12 in E. Humboldts, 13 in S. Rubys] w/ radiocollars); 18/30 BHS given Draxxin/Banamine/Vit. E, & 12/30 BHS given Banamine/Vit. E.; add'l N=46 BHS were free-darted w/ Draxxin; as of 3/15/10, 4 marked BHS have died (but 2 of 4 deaths may have involved predation), 3 of 4 dead BHS had rec'd Draxxin; 5 other collared BHS suspected (but not confirmed) dead, 2 of those 5 had rec'd Draxxin; animals captured/treated were at various stages of pneumonia, with many in poor body condition, coughing, extreme nasal discharge & sinusitis; a few had a moderate body condition but with extremely compromised lung capacity (on necropsy); all live BHS captured (N=30) tested PCR + for *Mycoplasma ovipneumoniae*; 4 skulls from heavily-scavenged carcasses tested PCR + for *Mycoplasma ovipneumoniae* (cultures taken from ear drum or sinus cavity; waiting results from other sampled carcasses; from fresh mortalities sampled to date, all are PCR + for *Mycoplasma*; *B. trehalosi* cultured from majority of pharyngeal and lung samples; *P. Trehalosi* & *Mannheimia haemolytica* also cultured, but to a much lower %age; heart, lung, liver, spleen, trachea samples all collected, + heads collected/being analyzed for sinusitis (when available, liver and blood have been submitted for Se and trace minerals); vegetative/soil samples also being collected/analyzed from primary winter ranges, to analyze forage quality and Se/trace minerals; no active DS grazing allotments in the E. Humboldts; hobby DS/DG flocks on private lands at the base of the mountains; DS were used adjacent to the USFS boundary the past 2 summers for fuels management; several reports from sportsmen, BHS tagholders, and permittees that DS were observed beyond the private land boundary in known summer BHS use areas in late summer 2009; ~2,000 meat goats grazed the southern end of E. Humboldts on high-elevation private lands in 2006; straying was documented, and known contact with at least a single BH ♂ occurred in 2007 (♂ euthanized and full necropsy performed); ~19 cattle died in early summer 2009 in proximity to a water tank in core of the E. Humboldt die-off area; BH ♂ were observed using this water tank, with dead cattle around it; w/in Ruby Mtns., an active DS summer grazing allotment has existed since before the first reintroduction of BHS; there has been overlap between DS and BHS distribution with potential for interaction; previous BHS dieoff occurred in 1995-96 (~80% BHS mortality); plans are to capture BHS that originated in the E. Humboldts but were translocated to another mtn range in January 2006 (at time of capture, BHS cultured negative for *Mycoplasma*), to test whether they are PCR negative for *Mycoplasma ovipneumoniae*; NDoW has also identified a small, isolated BHS group in E. Humboldts that are apparently unaffected by pneumonia; NDoW will be capturing/sampling/collaring this group of BHS, to monitor movements and survival as they mix with other BHS later in spring/summer 2010.

NV also had a disease event of desert BHS in Clan Alpine Range (population ~250); during fall, hunters reported coughing BHS; NDoW follow-up didn't find high evidence of coughing BHS, and BHS body conditions were considered fairly good; NDoW examined 1 sick and 2 hunter-killed BHS; mild pneumonia documented; *B. trehalosi* was cultured, but no *Mycoplasma* was recovered by PCR

Washington: discovered early December 2009; both sides Yakima R. Canyon, ~260 BHS in 2 herds; ~90% of BHS in N Umtanum sub-herd on W side of river documented coughing, ~25% of BHS in S Umtanum sub-herd on W side of river documented coughing; on E side of river, <10% of BHS observed coughing; ~1/3 of all BHS observed coughing; WADFW intensively monitoring these BHS; by mid-February, ~20 BHS carcasses had been documented; late February 2010 decision by WADFW to have F&W staff & USDA/Wildlife Services cull sickest BHS, to minimize chance of spread to BHS meta-population to the NE; by mid-March 2010, nearly 40 BHS have been culled and another 10 BHS carcasses were documented. Lab results have been received on 27 submitted sheep. Mycoplasmal pneumonia has been diagnosed as the cause of the epizootic, and in most cases is accompanied by severe sinusitis and/or otitis media. *Mycoplasma ovipneumoniae* has been detected via PCR from all affected sheep. Interestingly, a novel species of *Moraxella* has been isolated from the lungs of 60-80% of the affected sheep. The significance, if any, of the *Moraxella* isolations is unknown at this time, but WSU researchers are actively investigating it. In addition to *Moraxella*, *Pasteurellaceae* have been isolated from the lungs of 40-75% (in descending order of prevalence: *P. trehalosi*, *P. multocida*, and *M. haemolytica*), and *Arcanobacterium pyogenes* has been isolated from the lungs of 25-60%. Most submitted sheep have titers to BRSV (generally  $\leq 1:128$ ), and all have titers to PI3 (generally  $\geq 1:512$ ); there is no documentation of contact with DS, but northern end of Yakima R. Canyon has 4-H DS present, while southern end of canyon has DS farm flocks present; Yakima R. area is home to more than 1/2 of WA's 1,500 BHS; no dead or sick BHS have been found outside Umtanum and Selah Butte herds

Utah: discovered mid-February 2010; Goslin Unit, N slope Uinta Mountains, Uinta NF; 40-60 BHS present; many BHS, in multiple groups, observed coughing; UTDWR collected N=26 BHS; attempting to eliminate all 40-60 head, to prevent possible spread to nearby Bare Top Unit; lab results (20 BHS sampled) found *Pasteurella* (sent out for typing) and *Mycoplasma* in all sampled BHS; no known contact with DS

Wyoming: discovered early March 2010; lower Gros Ventre drainage, Bridger-Teton NF; 50-60 BHS present; 4-6 BHS (5-7%) showing visible signs of pneumonia (e.g., extended coughing, runny nose), although most animals had minor cough (1X/4 hours) and "wet noses"; 2 ♂ lambs collected/necropsied March 9-10; body condition scores (on a 1-5 scale, 5 being optimal), 1 ♂ lamb ~4, 1 ♂ lamb ~2; early stages of pneumonia; 15-20% consolidation in lower lobes of lung, 80-85% normal lung appearance; dispersal to spring ranges anticipated soon; no known contact with DS; lab results confirm *Arcanobacterium pyogenes*, but no *Pasteurella* or *Mannheimia*; samples sent to WADDL for *Mycoplasma* PCR testing; no further intervention/actions planned, at present

South Dakota: in early March 2010, newspaper articles indicated a pneumonia outbreak/die-off was ongoing in Custer State Park; in fact, pneumonia occurred **5 years ago**, killing ~75% of the CSP BHS herd; there are currently ~30 BHS alive in CSP; adult BHS continue to produce lambs, but few lambs are surviving; prior to the pneumonia die-off ~5 years ago, SDGFP knew of 2 young BH ♂ and 3 BH ♀ that wandered outside CSP, and mixed with DS on private land; with landowner permission, SDGFP personnel killed 1 BH ♀ that was in with DS, but the landowner decided against allowing SDGFP to cull the other 4 BHS; it is not known conclusively if those 4 BHS survived and/or returned to CSP; lab results from dead or culled BHS indicated pneumonia; *Mycoplasma* and *Pasteurella* documented.