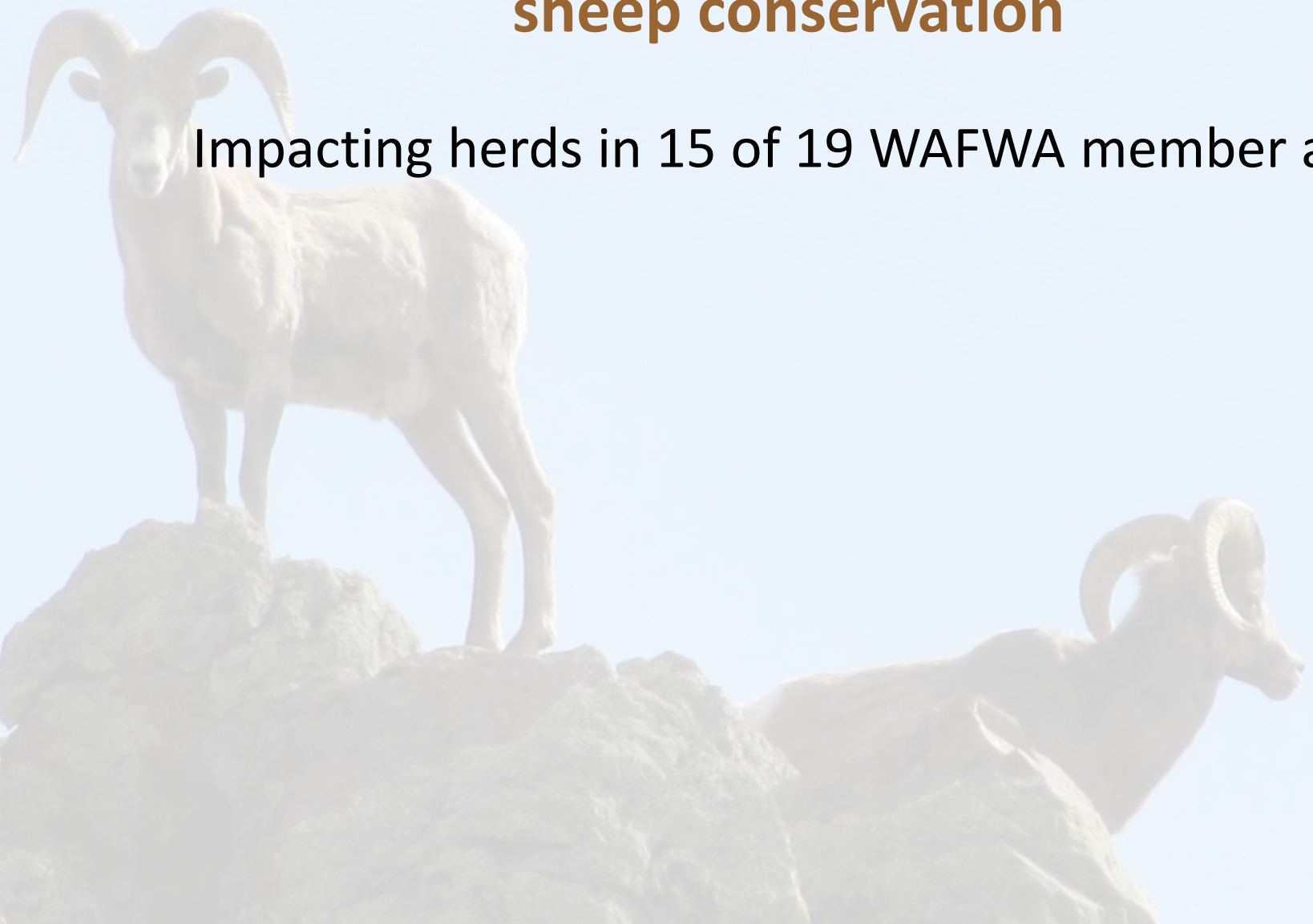
WAFWA / WSWG
Wild Sheep Disease Management Venture

WAFWA
WESTERN ASSOCIATION OF FISH & WILDLIFE AGENCIES

Recognizing that respiratory disease is the main impediment to wild sheep conservation

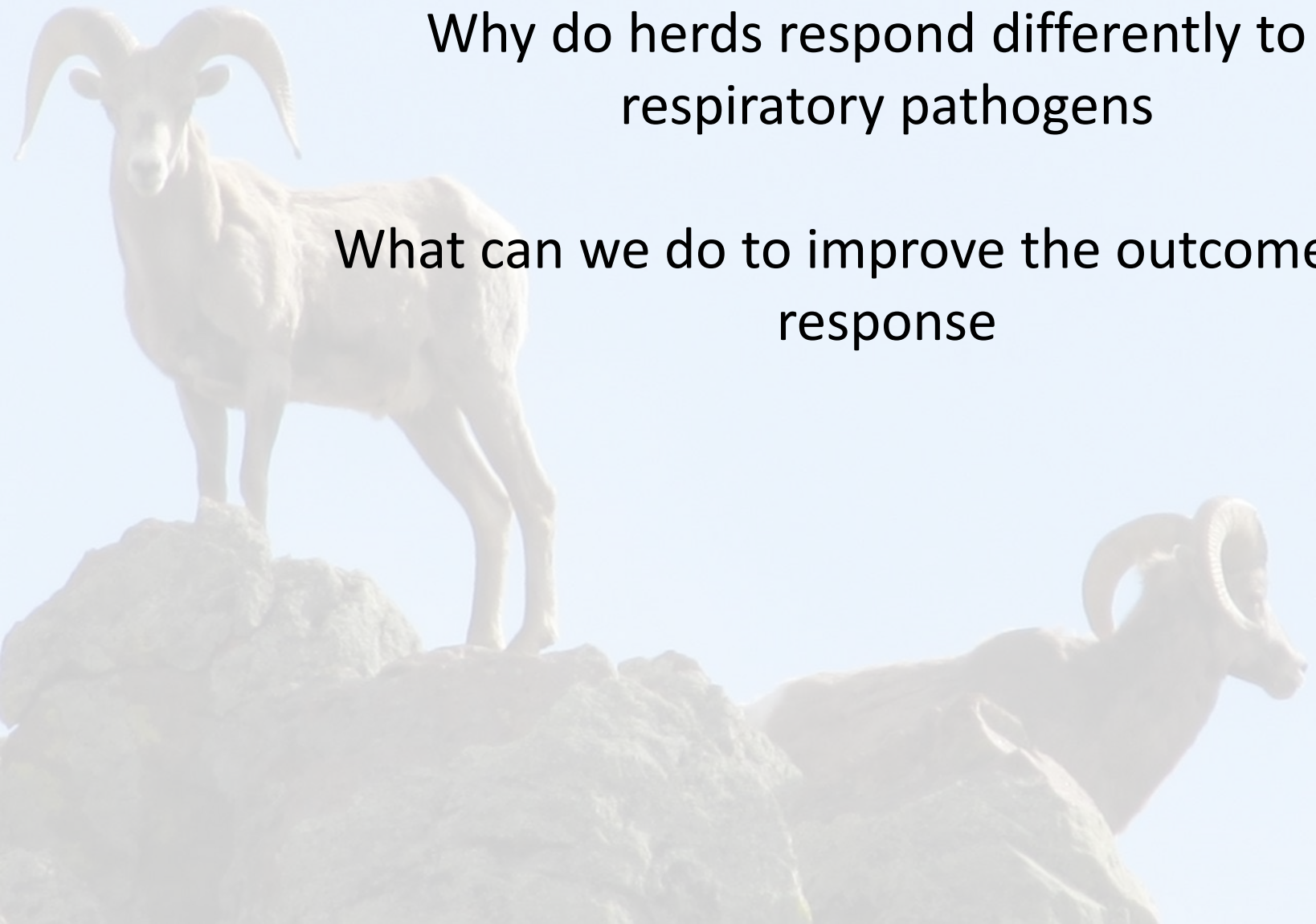
Impacting herds in 15 of 19 WAFWA member agencies



At the 2014, NWSGC in Ft. Collins, CO we asked the questions

Why do herds respond differently to key respiratory pathogens

What can we do to improve the outcome of that response



A Steering Committee was formed

Clay Brewer (WAFWA, WSWG Chair)
Rich Harris (WA)
Emily Almberg (MT)
Helen Schwantje (BC)
Mike Cox(NV)
Rusty Robinson (UT)
Mike Miller (CO)
Peregrine Wolff (NV)

Subject matter experts were consulted

Tom Besser (WA)
Frances Cassirer (ID)
Bob Garrett (MT)

West Wide Disease Management Venture Was born

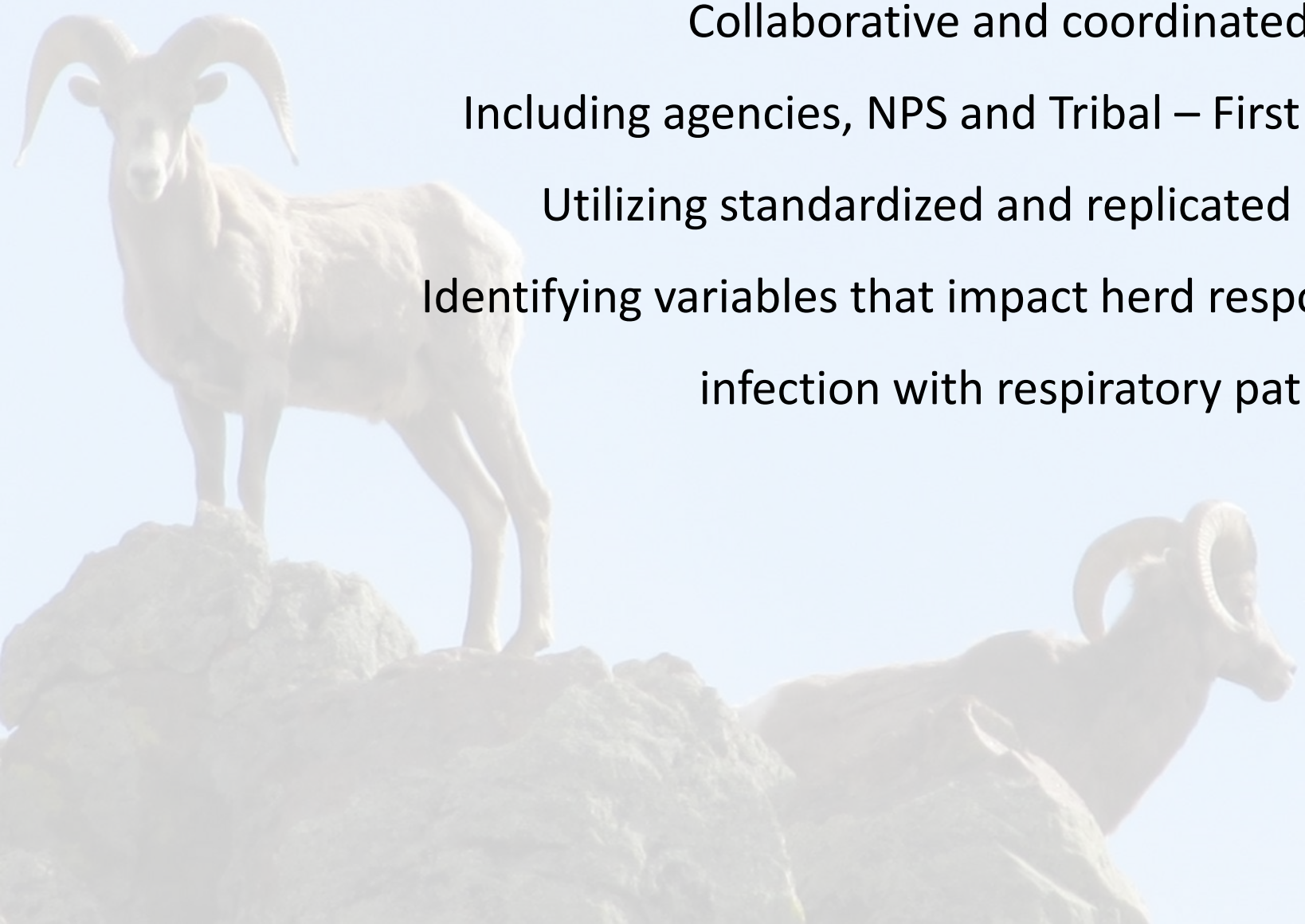
Disease Management Venture

Collaborative and coordinated effort

Including agencies, NPS and Tribal – First Nation

Utilizing standardized and replicated studies

Identifying variables that impact herd response to infection with respiratory pathogens



Disease Management Venture

Develop + validate adaptive management actions

Improve population performance in herds, negatively impacted by respiratory disease

Enhanced Monitoring

Standardized, multi-year monitoring of herd performance

Population estimate
Lamb survival and recruitment
Adult survival
Sub-herd structure

Pathogen presence
Nutritional status
Genetic structure

Enhanced Monitoring

Eight categories of herds

risk of exposure to *pathogens (low and high)*

Known status of pathogens (including emerging pathogens)

response following the introduction of *pathogens*

long term herd performance (poor to good)

Enhanced Monitoring Process

sub-species basis, replicate herds

3 to 5 years

centralized data base

Analysis of data herd response

performance variables

predictive variables

model probability of *M. ovi* elimination

Adaptive Management Actions

hasten elimination of pathogens

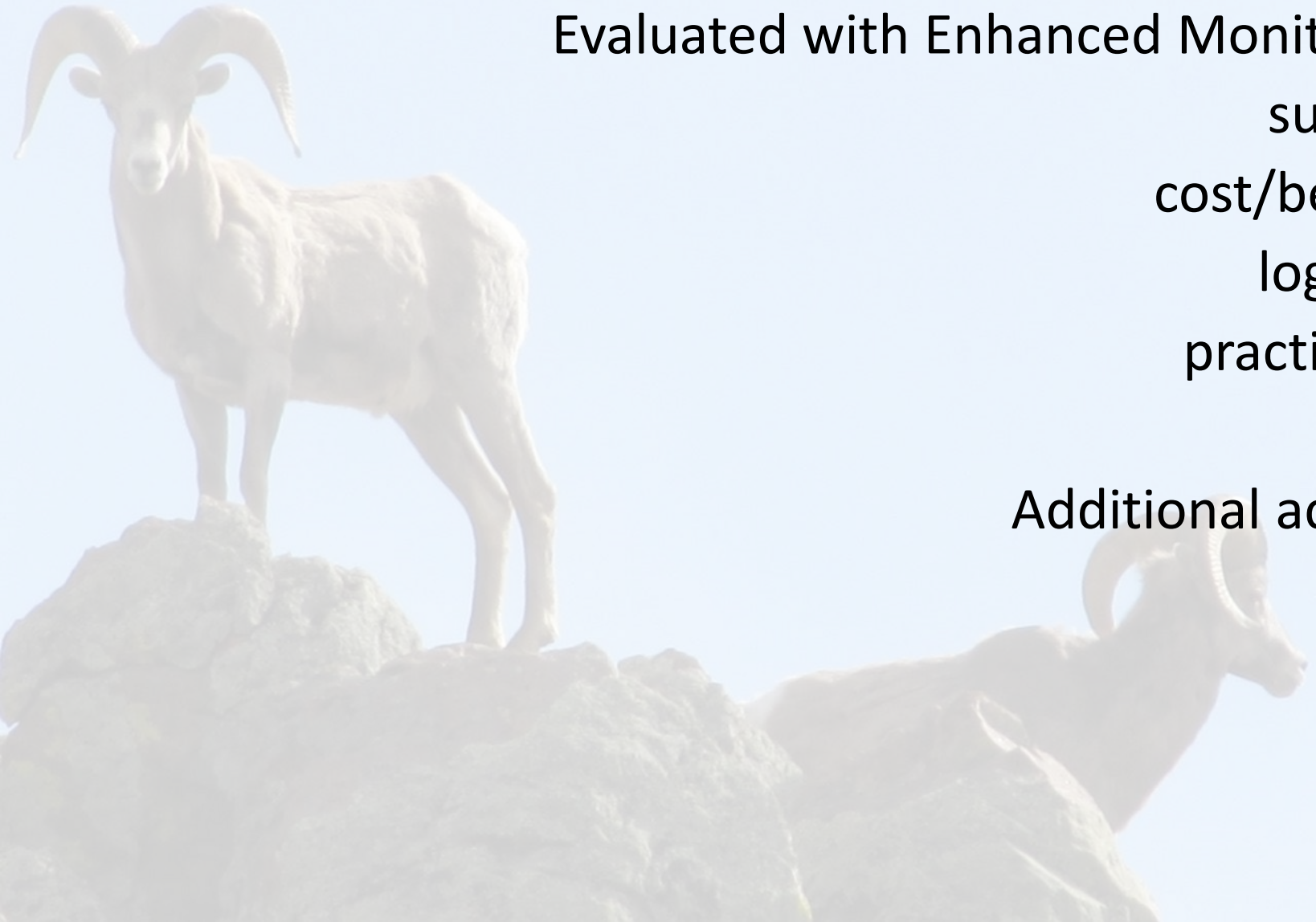
prevent the spread of the pathogen

improve herd performance

+/- evidence of M. ovi infection

evaluate risk of combining animals from herds infected with identical strains of *M. ovi*.

Adaptive Management Actions



Evaluated with Enhanced Monitoring

success

cost/benefit

logistics

practicality

Additional actions

Proposed Adaptive Management Action
Selective Test and Cull

Reduce or eliminate *M. ovi* shedders

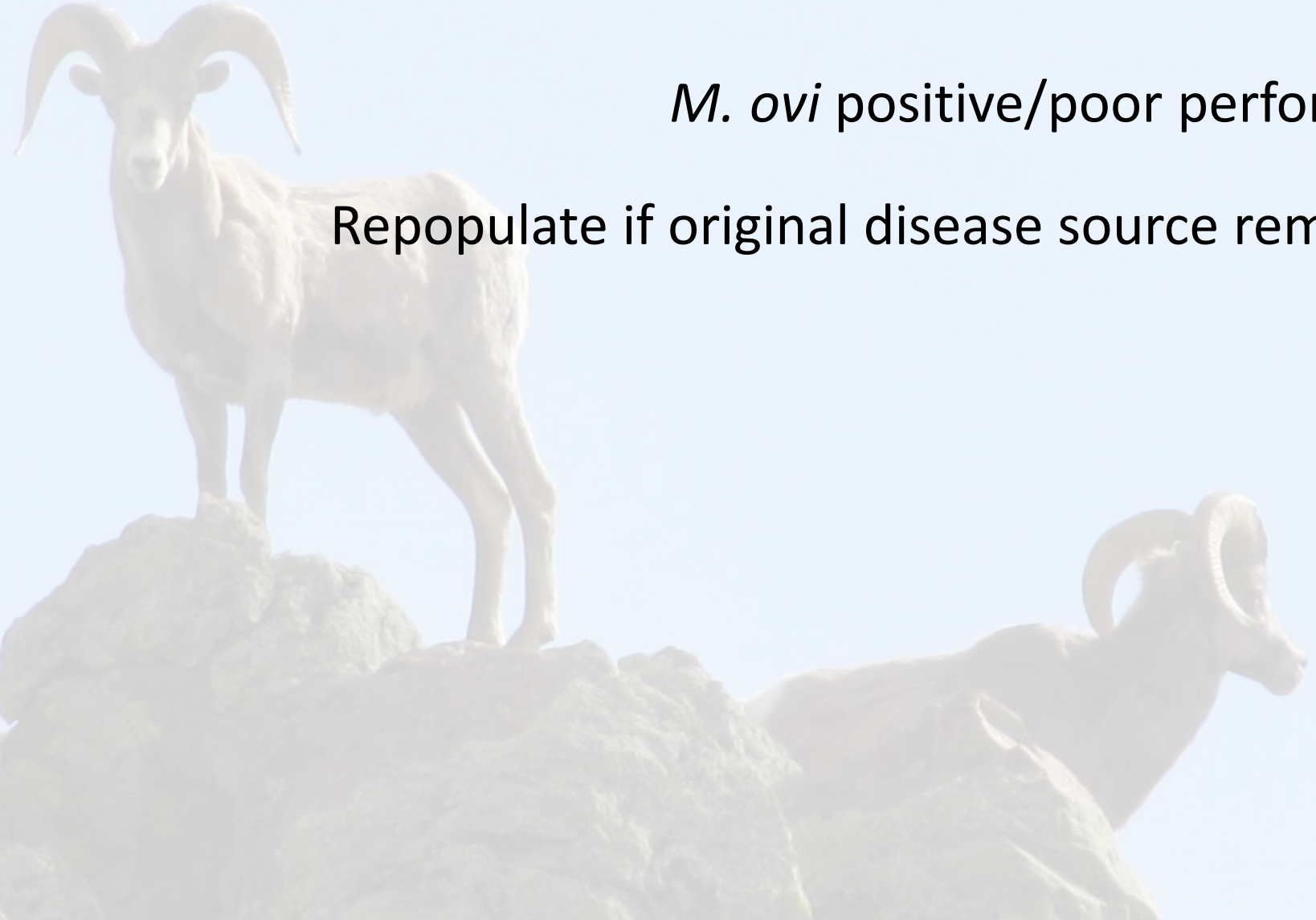
prevent *M. ovi* infection of lambs

improve lamb survival

Proposed Adaptive Management Action
Depopulation

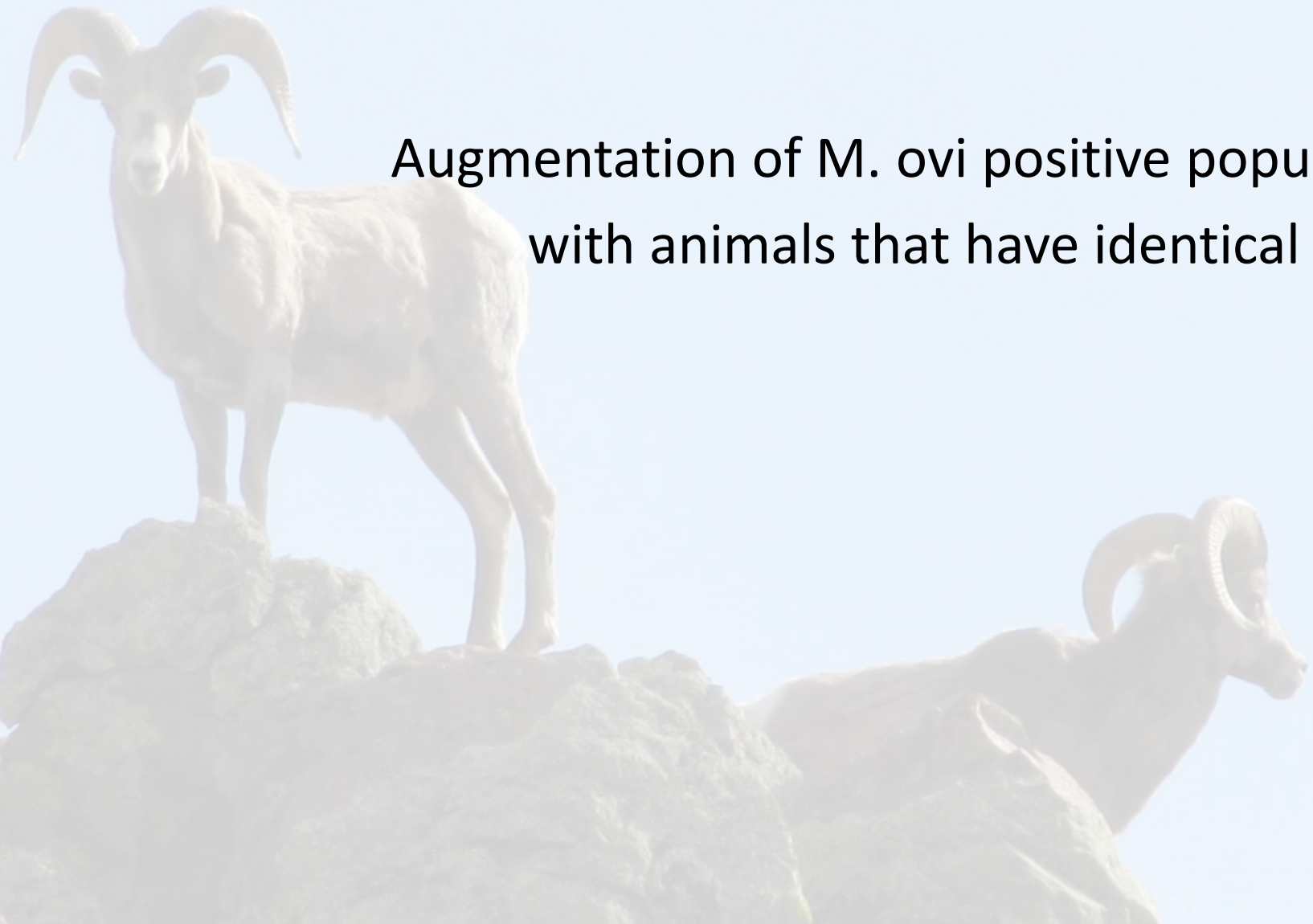
M. ovi positive/poor performing

Repopulate if original disease source removed



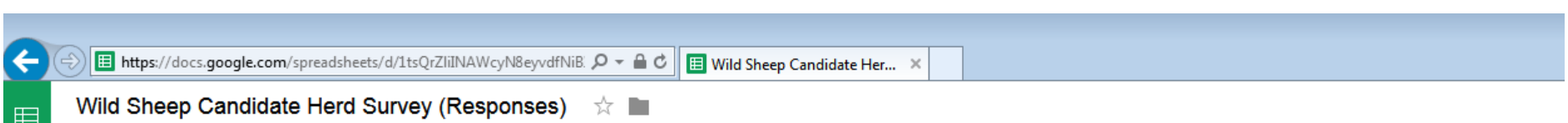
Proposed Adaptive Management Action
Combining animals with exact strains

Augmentation of M. ovi positive population with animals that have identical strain



Google Survey/Inventory of Candidate Herds from all Jurisdictions for DMV

- Jurisdiction contact Information
- Herd Information – name, location, subspecies, native/reintroduced
- Herd Category (8 total categories)
- Consider Herd for Adaptive Mgmt Action
- Previous Demographic Data – pop estimate, lamb ratios, survival rates
- M. ovi. – sampling rate, ELISA and PCR tests, sample banking
- Pasteurellaceae - sampling rate, culture results, sample banking
- Screening for other Respiratory pathogens
- Genetic sampling
- Nutritional Status/Body Condition Scores
- Knowledge of Sub-herd Spatial Structure
- Herd Accessibility for monitoring and sampling
- Funding Needed for Future Monitoring



Wild Sheep Candidate Herd Survey (Responses)

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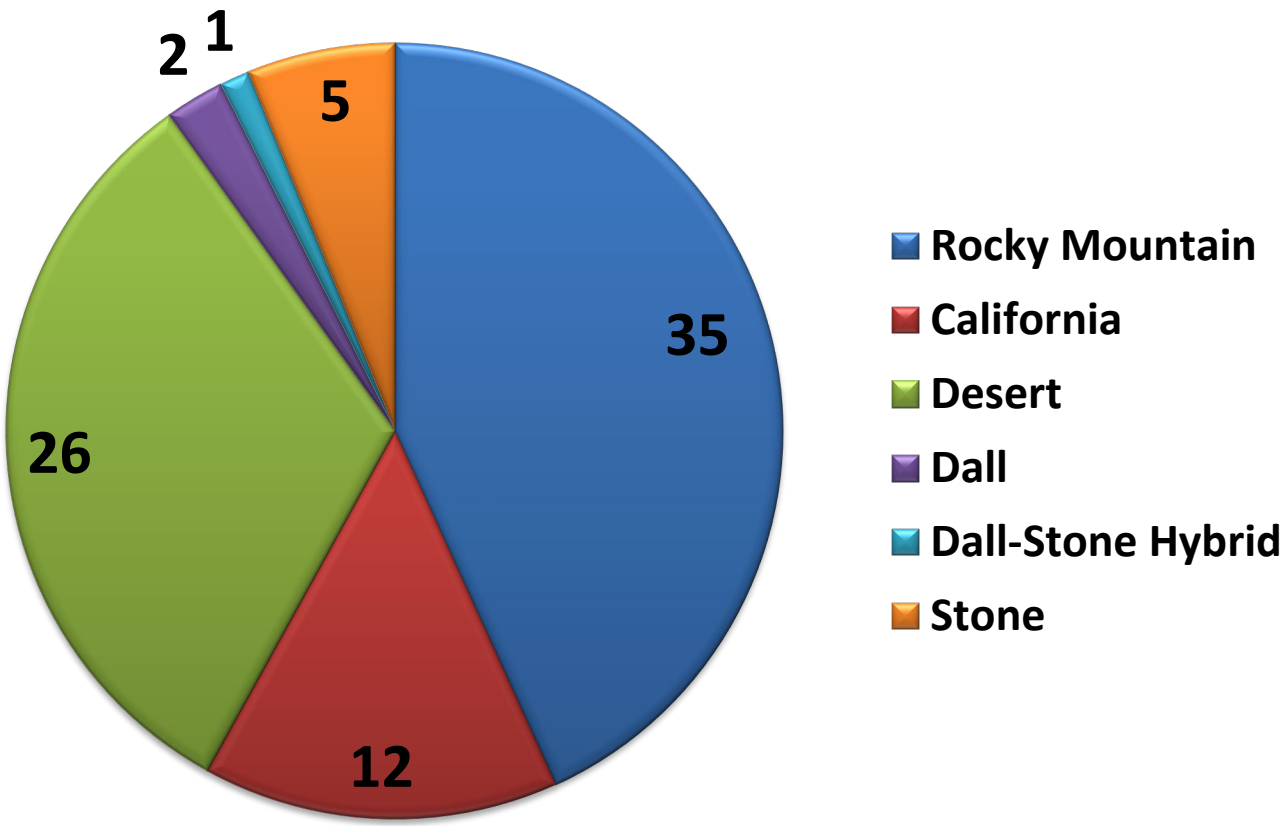
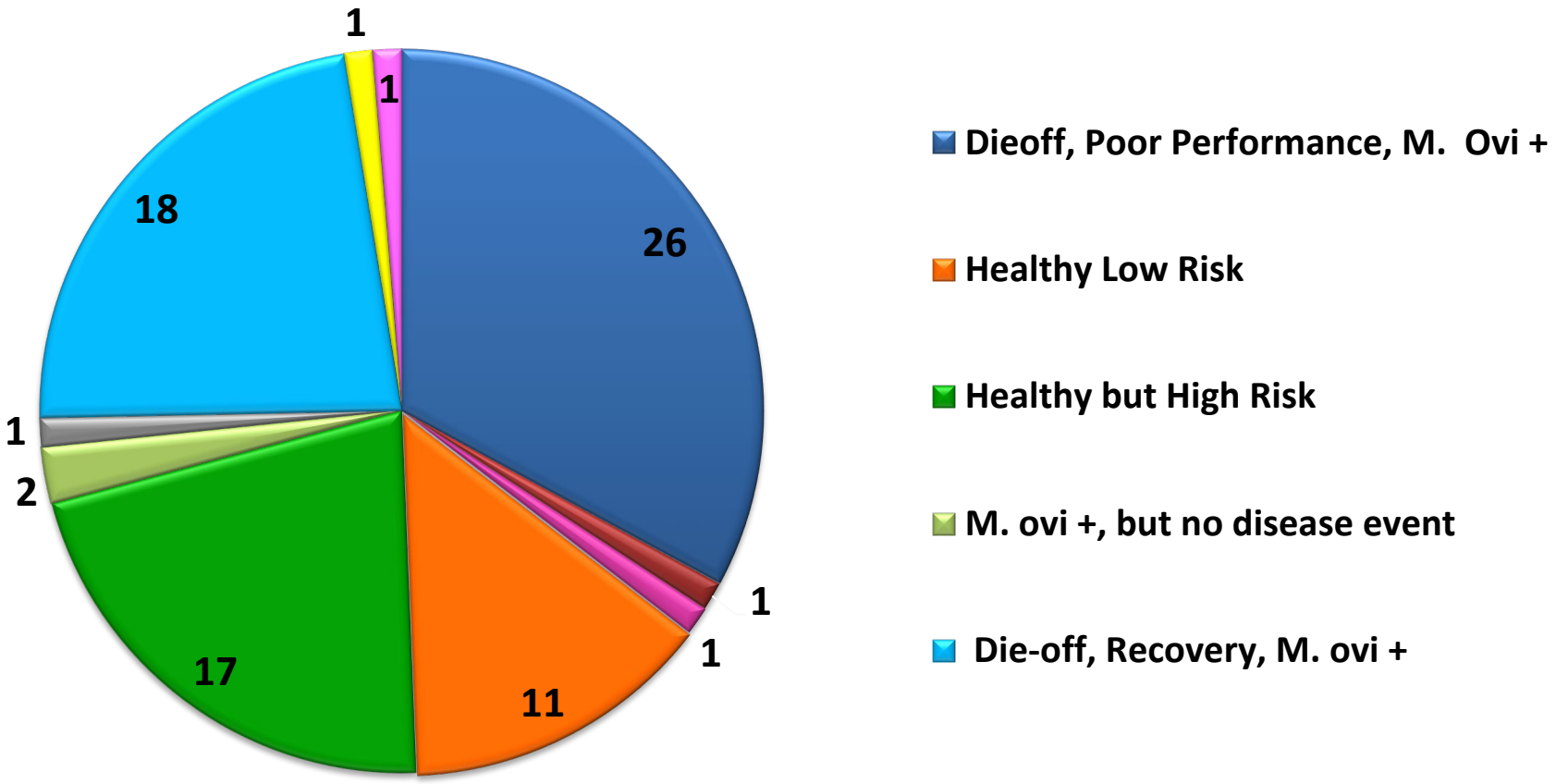
	A	B	C	D	E	F	G	H	I
1	Timestamp	Completed by:	Agency:	Jurisdiction	1. Herd location (S	2. Herd name:	3. Subspecies:	4. Herd source:	5. Year of Initial Reintrodu
53	5/31/2016 9:11:59	Rusty Robinson	UDWR	State	UT	San Juan, North	Desert	Reintroduced	1998
54	5/31/2016 9:36:15	Rusty Robinson	UDWR	State	UT	San Rafael, Dirty Devil	Desert	Reintroduced	1991
55	5/31/2016 9:48:00	Rusty Robinson	UDWR	State	UT	San Rafael, South	Desert	Reintroduced	1983
56	5/31/2016 9:52:32	Rusty Robinson	UDWR	State	UT	Stansbury Mtns.	California	Reintroduced	2005
57	6/7/2016 13:18:50	Amber Munig/Anne Justic	AZGFD	State	AZ	Black Mountains (souther	Desert	Native	never augmented
58	6/7/2016 13:24:08	Amber Munig/Anne Justic	AZGFD	State	AZ	Kanab Creek	Desert	Native	2015
59	6/7/2016 13:28:09	Amber Munig/Anne Justic	AZGFD	State	AZ	Catalina Mountains	Desert	Reintroduced	2015
60	6/7/2016 13:31:52	Amber Munig/Anne Justic	AZGFD	State	AZ	Kofa Mountains	Desert	Native	never
61	6/7/2016 13:37:22	Amber Munig/Anne Justic	AZGFD	State	AZ	Silver Bell Mountains	Desert	Native	never
62	6/7/2016 13:52:16	Amber Munig/Anne Justic	AZGFD	State	AZ	Morenci/Eagle Creek	Rocky Mountain	Reintroduced	2005
63	6/9/2016 14:37:06	Eric Rominger	NMDGF	State	NM	Pecos	Rocky Mountain	Reintroduced	1965
64	6/9/2016 14:41:28	Eric Rominger	NMDGF	State	NM	Wheeler Peak	Rocky Mountain	Reintroduced	1993
65	6/9/2016 14:57:35	Eric Rominger	NMDGF	State	NM	Fra Cristobal	Desert	Reintroduced	1995
66	6/9/2016 15:01:28	Eric Rominger	NMDGF	State	NM	Red Rock	Desert	Reintroduced	1972
67	7/18/2016 11:35:54	Troy Hegel	Yukon Dept of Environme	Territory	Yukon	Ogilvie	Dall	Native	n/a
68	7/18/2016 11:21:48	Troy Hegel	Yukon Dept of Environme	Territory	Yukon	Pilot Mountain	Dall	Native	n/a
69	9/8/2016 13:55:04	Hollie Miyasaki	IDFG	State	ID	Owyhee River	California	Reintroduced	1963
70	9/9/2016 15:36:47	janene colby	CA. Dept. Fish and Wildli	State	Southern CA	Peninsular	Desert	Native	
71	7/21/16	Bill Jex	BC FLNRO	Province	British Columbia	Atlin, MU 6-25	Dall-Stone Hybrid	Native	
72	7/21/16	Bill Jex	BC FLNRO	Province	British Columbia	Cassiar	Stone	Native	
73	7/21/16	Mike Bridger	BC FLNRO	Province	British Columbia	Williston	Stone	Native	
74	7/21/16	Mike Bridger	BC FLNRO	Province	British Columbia	Sulphur/8 Mile Creek	Stone	Native	
75	7/21/16	Bill Jex	BC FLNRO	Province	British Columbia	Mt. Frank Roy/Mt. Montei	Stone	Native	
76	7/21/16	Mike Klaczek	BC FLNRO	Province	British Columbia	Russel Range	Stone	Native	
77	7/21/16	Irene Teske/ Jeremy Ayo	BC FLNRO	Province	British Columbia	Bull River	Rocky Mountain	Native	
78	7/21/16	Irene Teske	BC FLNRO	Province	British Columbia	Radium / Stoddart	Rocky Mountain	Native	
79	7/21/16	Irene Teske	BC FLNRO	Province	British Columbia	Columbia Lake East	Rocky Mountain	Native	
80	7/21/16	Irene Teske	BC FLNRO	Province	British Columbia	Phillips Creek	Rocky Mountain	Native	
81	7/21/16	Andrew Walker and Aaro	BC FLNRO	Province	British Columbia	South Okanagan	California	Native	2009
82	7/21/16	Patrick Dielman	BC FLNRO	Province	British Columbia	Junction Sheep Range	California	Native	
83	7/21/16	Patrick Dielman	BC FLNRO	Province	British Columbia	Churn Creek- Camelsfoot	California	Native	
84	7/21/16	Gerad Hales	BC FLNRO	Province	British Columbia	Chasm	California	Native	

Records by Subspecies

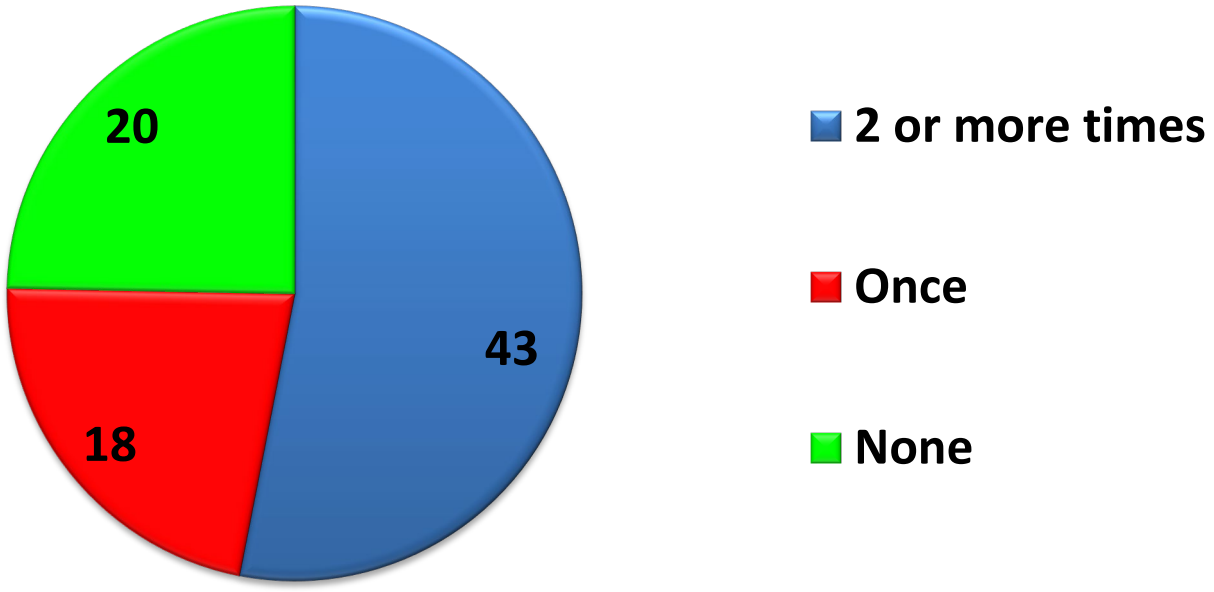


84 herds total

Records by Herd Category



Tested for M. ovi with PCR



Example of Stone Sheep Candidate Herd Entry

- Bill Jex, BC Ministry of Forests, Lands and Natural Resources
- Mt. Frank/Mt. Monteith
- Stone Sheep, Native and Augmented
- Supposedly healthy herd at high risk of disease transmission
- 28 sheep augmented from 1990-1993; 1992–1994
- reports of wild rams breeding domestic ewes; By 1996 , 9 of 10 collared sheep died; 1996 observed only 6 sheep left
- Consider for Test and Cull Action
- No pathogen sampling conducted
- Good knowledge of sub-herd spatial structure
- Moderate accessibility
- > $20,000 needed for annual monitoring