Captive Breeding and Rearing of the Endangered Greater Sage Grouse at the Calgary Zoo

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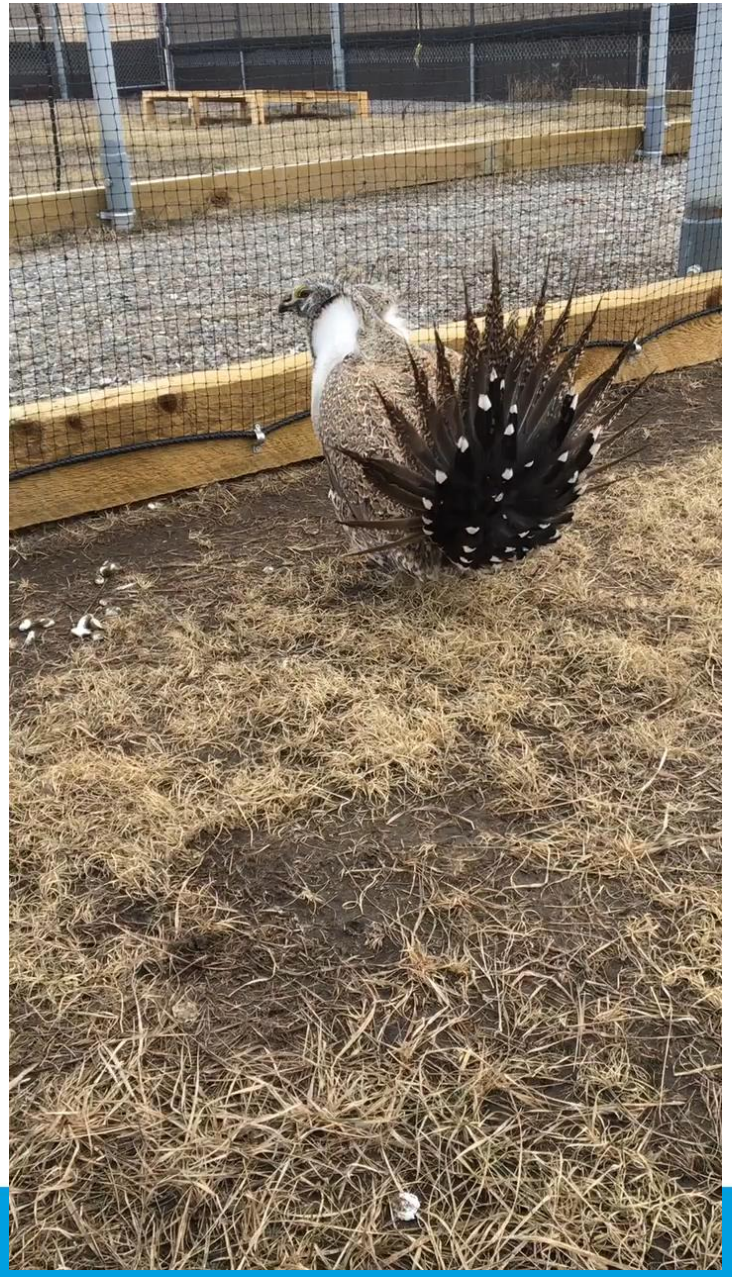
Mary Healy Grant for AZA Avian Leadership Development Recipient

The Greater Sage Grouse

- Largest grouse species in North America
- Recognized for their courtship rituals and lek mating system
- Ground dwelling, nest under sagebrush/grasses
- Females 1.2kg-1.5kg/ Males: 2.3kg-3.0kg



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Project Inception

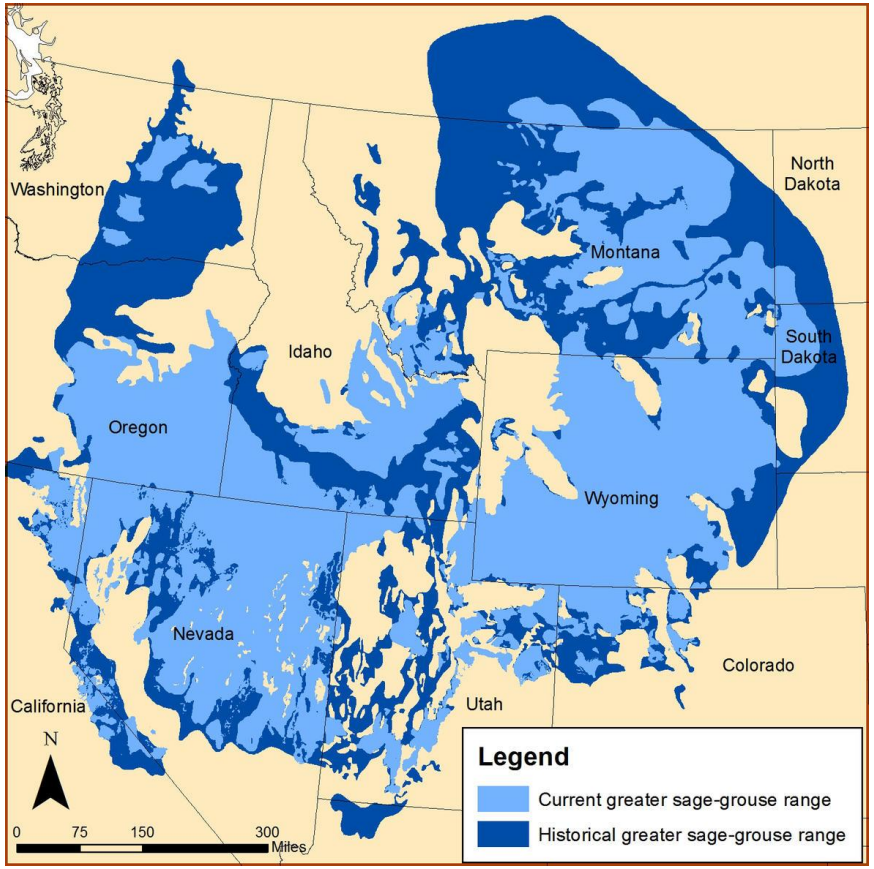
Photo from: usgs.gov

The Greater Sage grouse one of Canada's most endangered bird species:

- > 150 individuals estimated in 2012
- 98% population decline since 1988
- Occupying ~ 7% of their historical Canadian range

Emergency Order for the Protection of the Greater Sage grouse issued in 2013 under Canada's Species at Risk Act

In 2014, Calgary Zoo, in partnership with federal and provincial governments, began a ten-year captive breeding and rearing initiative



Phase 1: Captive Flock Establishment

	Eggs Collected	Eggs Hatched	Surviving to 2017 Breeding season
2014	13	13	1

13 wild eggs collected from Alberta

- A single egg and clutch of 12
- From nests of incubating hens
- Development of ~1 week

- 9 of 13 died in the first month
- Impaction & infections

Phase 1: Captive Flock Establishment

	Eggs Collected	Eggs Hatched	Surviving to 2017 Breeding season
2014	13	13	1
2015	5	5	2
Totals	18	18	3

5 wild eggs collected from Alberta

- 4 from nest of a flushed hen
- Single abandoned egg

Phase 1: Captive Flock Establishment

	Eggs Collected	Eggs Hatched	Surviving to 2017 Breeding season
2014	13	13	1
2015	5	5	2
2016	**33**	**28**	**12**
Totals	51	46	15

- 33 wild eggs collected
  - 23 from Grasslands National Park, SK
  - 10 from Montana hens
    - Laid during translocation "Rescued Eggs"

Phase 1: Captive Flock Establishment

Above: Grassland National Park eggs
Left: Montana translocated egg

Phase 1: Proof of Concept

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2015	5	5	2
2016	33	28	12
Totals	**51**	**46**	**15**

Pre-2017 Breeding Season

- Captive flock = 15 individuals (7.8)
  - 3 adults, 12 yearlings
- April 2017: Captive breeding 2-day workshop held at the Calgary Zoo

Phase 1: Proof of Concept

Breeding season 2017 setup strategies

- Pairs - 8 individuals total,
  - 1.1 per pen, together 24/7
- “Female choice lek” - 7 individuals
  - Introductions via keeper shifting

E06 1.1 Bilbo & Galadriel	E07 2.0 Billings & Dillon
E05 1.1 Aragorn & Shelby	E08 0.2 Rosie & Eowyn
E04 1.1 Leonardo & Nellie	E09 1.0 Raphael
E03 1.1 Frodo & Laurel	E10 0.2 Arwen & Ori
E02 “Visual Barrier”	E11 “Male holding”
E01 “Male holding”	E12 “Male Holding”

Egg Production

- All 8 hens established nests/laid eggs
- 85 eggs laid between April 21 - June 1
- 78 eggs found in nest sites
  - 8 nests established and eventually incubated by a hen (1 each)
  - 2 nest sites had an egg laid, then abandoned
- 7 eggs were “dumped”
- Clutch sizes: 7 - 16 eggs

Egg Management

- Nest eggs collected in two stages:
  1) First 3-5 eggs replaced with dummies and moved into incubator

  2) All eggs (real & dummy) removed after onset of hen incubation

  - First stage = insurance policy
  - Second stage = double clutch?

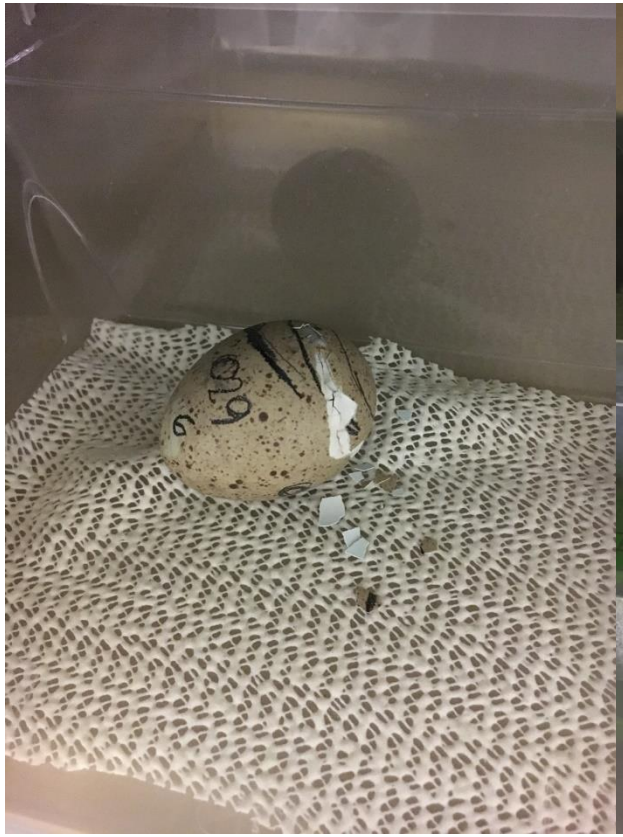
- Dumped eggs collected upon discovery

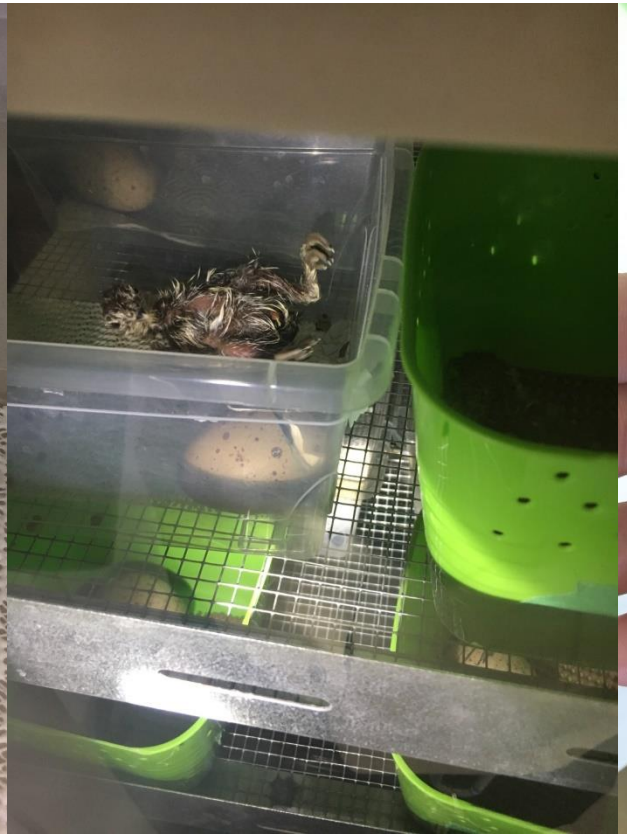
Artificial Incubation

- Majority of eggs artificially incubated
  37.5°C, 58%
- High hatchability (60/62 viable eggs)
- Average 27 day incubation period
- Eggs managed by humidity
  48%, 52%, 58%, 68%
  11-15% weight loss
- Candling & weighing typically 2X/week
- RCom & Grumbach incubators

Hatching

Eggs placed in individual containers in hatchers
Once dry chicks processed:
weighed, banded, umbilicus and toe check





First chick from egg produced in captivity at the Calgary Zoo

“TABER”

May 20th, 2017

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Chicks: Brooders & Stackers

Moved to brooders after processing for 12–36 hours
Then moved into stackers until 10-14 days old

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Chicks: Tent Pens

- Moved to tent pens starting at 10 days old
- Inside but outside – pen in large tent, roof but open sides
- Heat lamps still provided
- Pens mosquito netting
- Moved into outdoor pens after second West Nile vaccination (~ 4 weeks old)

Snyder-Wilson Greater Sage Grouse Pavilion

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Hen Incubated & Reared Chicks

- Trialed with two hens
- First hen incubated 5 of her 8 eggs
  - All successfully hatched
  - All survived under her care
  - Separated in September
- Second hen given back 3 eggs
  - Initially pulled/artificially incubated
  - Successfully hatched with hen
  - Chicks pulled from hen – problems with chick proofing pen

Phase 1: Proof of Concept

	Eggs Collected	Eggs Produced	Eggs Hatched
2014	13	0	13
2015	5	0	5
2016	33	0	28
2017	**0**	**85**	**68**
Totals	51	85	114

- 85 eggs produced in captivity
  - 70 viable
  - 15 infertile/underdeveloped
- 68 eggs hatched
  - 60 artificially incubated/hatched
  - 8 incubated/hatched under hen

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Captive Care Challenges

Captive Care Challenges

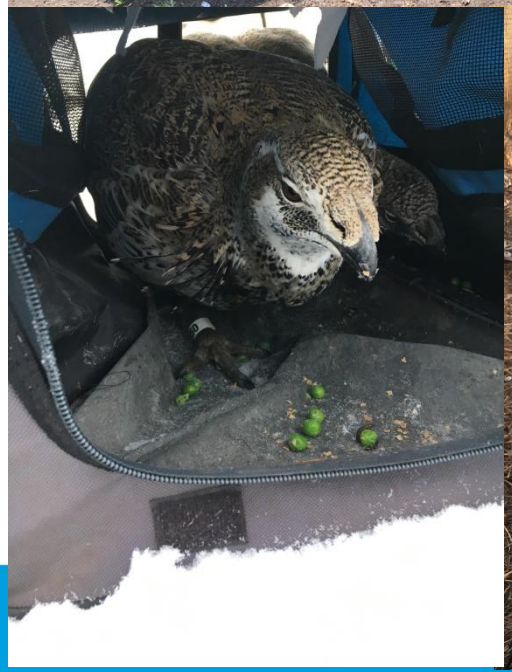
Challenges	Husbandry Response	Resolved? Improvement?
Developmental issues (Malposition, Crooked toes, heart issues)	• Assisted hatching • Toe taping • Continued data collection	• Successful toe corrections & malposition hatches
Yolk Sac infections	• Umbilicus Swabs • Preventative medication • Early eating	• Still observed but improvement
“Swollen Head” Syndrome	• Treatment at earliest detection?	• Unresolved, cause & care unknown
Impaction	• Greens finely chopped, deveined, clipped • Grit always available	• Successful, • 0 cases in 2017

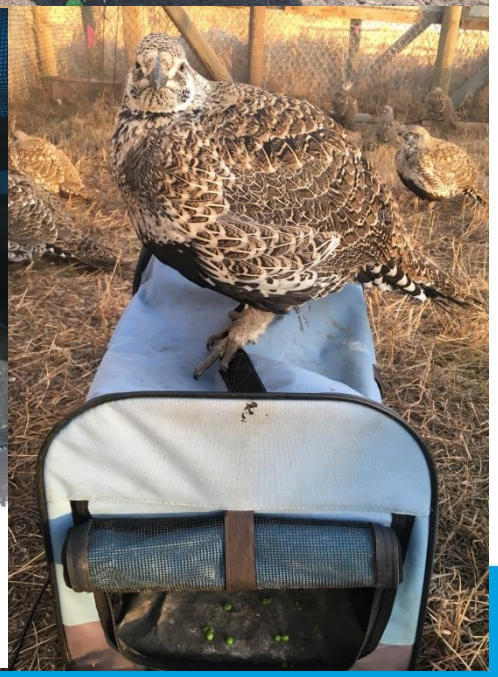
Captive Care Challenges

Challenges	Husbandry Response	Resolved? Improvement?
Bacterial & Fungal infections	• Routine pen disinfecting • group size vs pen size • Medical treatment	• Beginnings of treatment success
Flushing or Trauma related injuries & deaths	• Wing clipping • Crate training • Surgical repair • Mesh/soft surface pens	• Improved capture & enclosures • Successful rehabilitation
Aggression Males towards other males/keepers	• Separation of adult males • PPE • Crate/Playpens	• No significant injuries or deaths
**Invisible/Hidden Illness	• Crate training	• Improving

Crate Training

- Daily crate training allows for:
  - individual assessment
  - frequent weighing
  - Habituation
- Training 100% voluntary
- Reward = mealworms & peas
- Daily tracking





Diet & Nutrition

- Offered year round:
  - Pheasant pellet (Breeder: March-June)
  - Mealworms
  - Romaine Lettuce
  - Green peas
  - **Big Sage – Kamloops, BC**
  - Cucumber & Superworms (enrichment)

- Additional seasonal items
  - Spring mix greens
  - Dandelion
  - Yarrow
  - Naturally occurring grasses/forbes

- Currently undertaking year long diet study

- Winter: Heat mats slow freezing

Project Summary: 2014-2017

Year	Wild eggs	Captive eggs	Hatched	Alive
2014	13	0	13	1
2015	5	0	5	2
2016	33	0	28	11
2017	0	85	68	44
Totals	**51**	**85**	**114**	**58**

- 136 eggs total, 121 viable = **94% hatchability**
- 58 individuals surviving to 2018 = **51% total survivability**
- 85 eggs in first production year = **60% more** than total number of eggs taken from the wild in the first 3 years combined

Transitioning to Phase 2: 2018 Release

- Captive flock established ✓
- Captive breeding & rearing success ✓

- Animal Care objectives:
  - Increase egg production
  - Manage release candidates
  - Continued improvement on captive care challenges

- Conservation Research objectives:
  - Establish and trial release strategies

A special thanks to our colleagues, donors, supporting foundations, government and corporate partners

Environment Canada / Environnement Canada

Alberta Environment and Parks

Saskatchewan Ministry of Environment

Parks Canada / Parcs Canada

Hannah Bailey, Houston Zoo
Holly Haefele, Fossil Rim Wildlife Center
Janet Johnson, Fossil Rim Wildlife Center
Lief Wiechman, Sage Grouse Ecologist
Dan Snyder, Grouse Park
Liz Koutsos, Animal Nutritionist
Shawn Pedersen, Woodland Park Zoo

Crescent Point

Snyder-Wilson Family
Greater Sage-Grouse Pavilion