U.S. Department of the Interior Bison Conservation Science Initiative

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Species of Common Conservation Concern:
Continental Scale Bison Conservation

XXI Meeting of Trilateral Committee for Wildlife & Ecosystem Conservation & Management
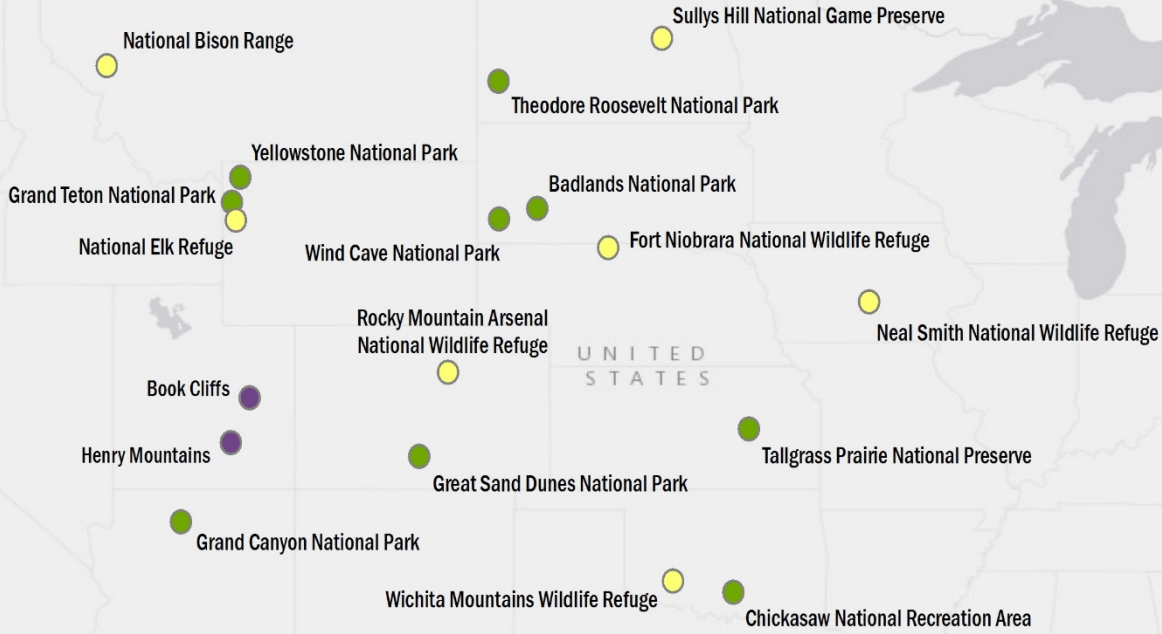Ottawa, Canada May 19, 2016

WCS – NPS Task Agreement

Bison Conservation Science
Initiative Partners

19 DOI Bison Herds

Wrangell-St. Elias National Park

CANADA

UNITED STATES

Sullys Hill National Game Preserve

National Bison Range

Theodore Roosevelt National Park

Yellowstone National Park

Badlands National Park

Grand Teton National Park

National Elk Refuge

Wind Cave National Park

Fort Niobrara National Wildlife Refuge

Rocky Mountain Arsenal
National Wildlife Refuge

UNITED
STATES

Neal Smith National Wildlife Refuge

Book Cliffs

Henry Mountains

Great Sand Dunes National Park

Tallgrass Prairie National Preserve

Grand Canyon National Park

Wichita Mountains Wildlife Refuge

Chickasaw National Recreation Area

Gulf of

Legend
- ○ **Fish & Wildlife Service**
- ● **National Park Service**
- ● **Burea of Land Management**

DOI Bison Portfolio

Agency	# Herds	Approx. # Bison	Approx. Area (ac)
National Park Service	10	9,740	2,897,180
US Fish and Wildlife Service	7	2,340	468,240
Bureau of Land Management	2	775	1,700,000
Total	*19*	*12,055*	*4,705,420*

DOI Bison Portfolio

Herd Name	State	Managing Agency	Fenced or Ranging	Approx. Herd Size	Approx. Area Size (ac)
Book Cliffs	UT	BLM / UT DWR	Ranging	450	1,400,000
Henry Mountains				325	300,000
Fort Niobrara National Wildlife Refuge	NE	FWS	Fenced	350	17,000
National Bison Range	MT	FWS	Fenced	380	19,000
Neal Smith National Wildlife Refuge	IA	FWS	Fenced	70	700
Rocky Mtn. Arsenal National Wildlife Refuge	CO	FWS	Fenced	75	12,000
Sullys Hill National Game Preserve	ND	FWS	Fenced	25	540
Wichita Mountains National Wildlife Refuge	OK	FWS	Fenced	640	59,000
Grand Teton Nat'l Park / Nat'l Elk Refuge	WY	NPS / FWS	Ranging	800	360,000
Badlands National Park	SD	NPS	Fenced	650	64,000
Chickasaw National Recreation Area	OK	NPS	Fenced	10	80
Grand Canyon National Park / House Rock	AZ	NPS / AZ G&F	Ranging	300	23,000
Tallgrass Prairie National Preserve	KS	NPS	Fenced	20	1,100
Theodore Roosevelt National Park	ND	NPS	Fenced	500	71,000
Wind Cave National Park	SD	NPS	Fenced	450	28,000
Wrangell-St. Elias National Park and Preserve	AK	NPS / AK F&G	Ranging	110	100,000
Yellowstone National Park	MT WY	NPS	Ranging	4,900	2,200,000
Great Sand Dunes Nat'l Park and Preserve	CO	TNC / NPS	Fenced	2,000	50,000

DOI Bison Science Initiative Goals

- ▶ Build Collaborative Science & Stewardship Team

- ▶ Establish standardized baseline herd genetic/demographic data for population viability analyses and modeling

- ▶ Identify key bison conservation threats, opportunities & meta-population management approaches

- ▶ Develop collaborative management strategies

- ▶ Develop adaptive management evaluation methods

- ▶ Communications and Outreach / Human Dimensions

2016 Objectives

► **Engage collaborators, science collaboration group; refine key science and management questions**

► **Population Viability Analyses (PVA)**

  ► Collect genetic & demographic data to parameterize models

  ► Model individual herd viabilities under current management

  ► Model potential management scenarios including meta-population strategies

► **Collaboratively assess potential conservation and shared stewardship opportunities, contingency scenarios**

Population Viability Analyses

▶ Builds on IUCN Red List Assessment PVA Process

Vortex Simulation Modeling

Models population dynamics as discrete sequential events that occur according to defined probabilities.

Simulates effects of:

▶ **Life history traits, genetics**

▶ **Specific threats/management**

▶ **Stochastic processes**

  ▶ Demographic stochasticity

  ▶ Environmental variation

  ▶ Catastrophes / Disease

  ▶ Genetic drift and inbreeding

on the future of a population.

Vortex 10

A stochastic simulation of the extinction process

Version 10.0.0.4
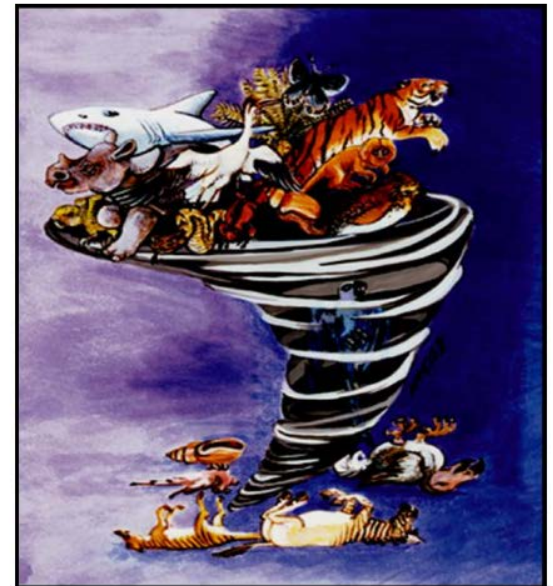
Vortex Model Outputs
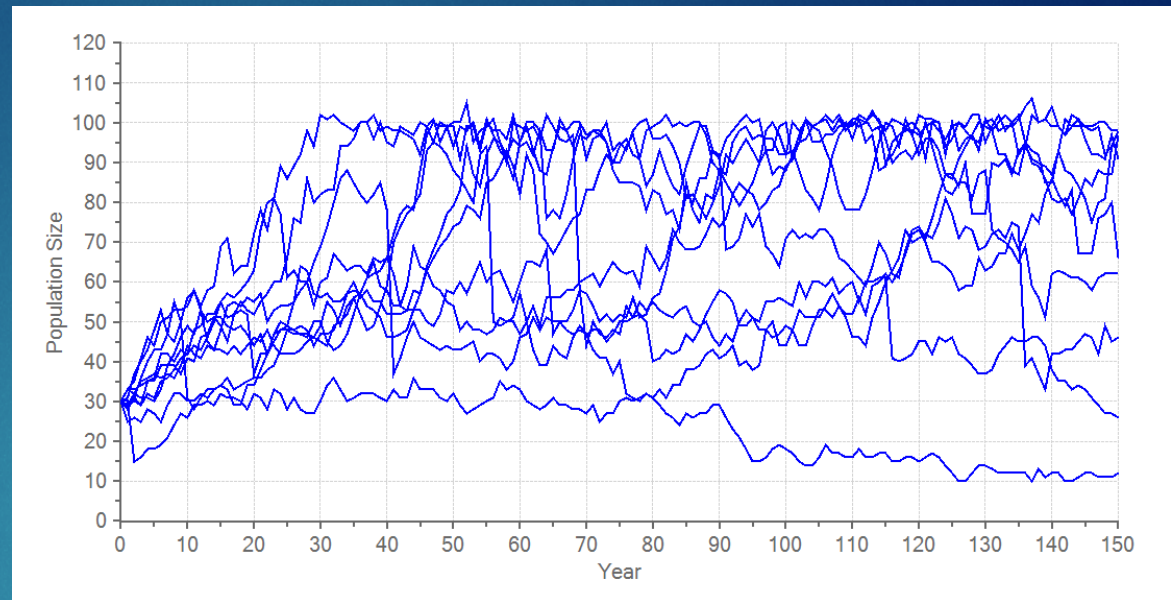
Distribution of outcomes across large number of runs (iterations) – mean and SD

- ▶ Population size

- ▶ Trend (population growth or decline) – stochastic r

- ▶ Probability of and time to extinction

- ▶ Loss of genetic variation (heterozygosity, # alleles, # lethal alleles, mean inbreeding, genetic distance)

Vortex Inputs: Population characteristics

- Individual or multiple populations

- Movement among populations

- Options for removal (e.g., harvest, cull)

- Catastrophes (e.g., disease outbreak)

- Vital rates and EV can be population-specific

- Carrying capacity and future trends in K

Vortex Inputs: Demographic rates

- Mating system
- Reproductive lifespan
- Age- and sex-specific fecundity and mortality rates
- Maximum longevity

- Options for density-dependence effects
- Environmental variation in rates
- Options for individual characteristics that can affect demographic rates

2015 Red List Workshop: Herd-Specific Inputs

Current Project Status

Herding herd managers and biologists

► **Collecting herd demographic information**

► **Collecting genetic data and genetic samples**

  ► Genetic analyses at UC Davis Veterinary Genetics Lab

  ► Archiving samples at American Natural History Museum

► **Summer workshop:**

  ► Assess/adjust PVA model parameterization & preliminary outputs

  ► Collaboratively discuss potential management scenarios

► **Fall: Model management scenarios**
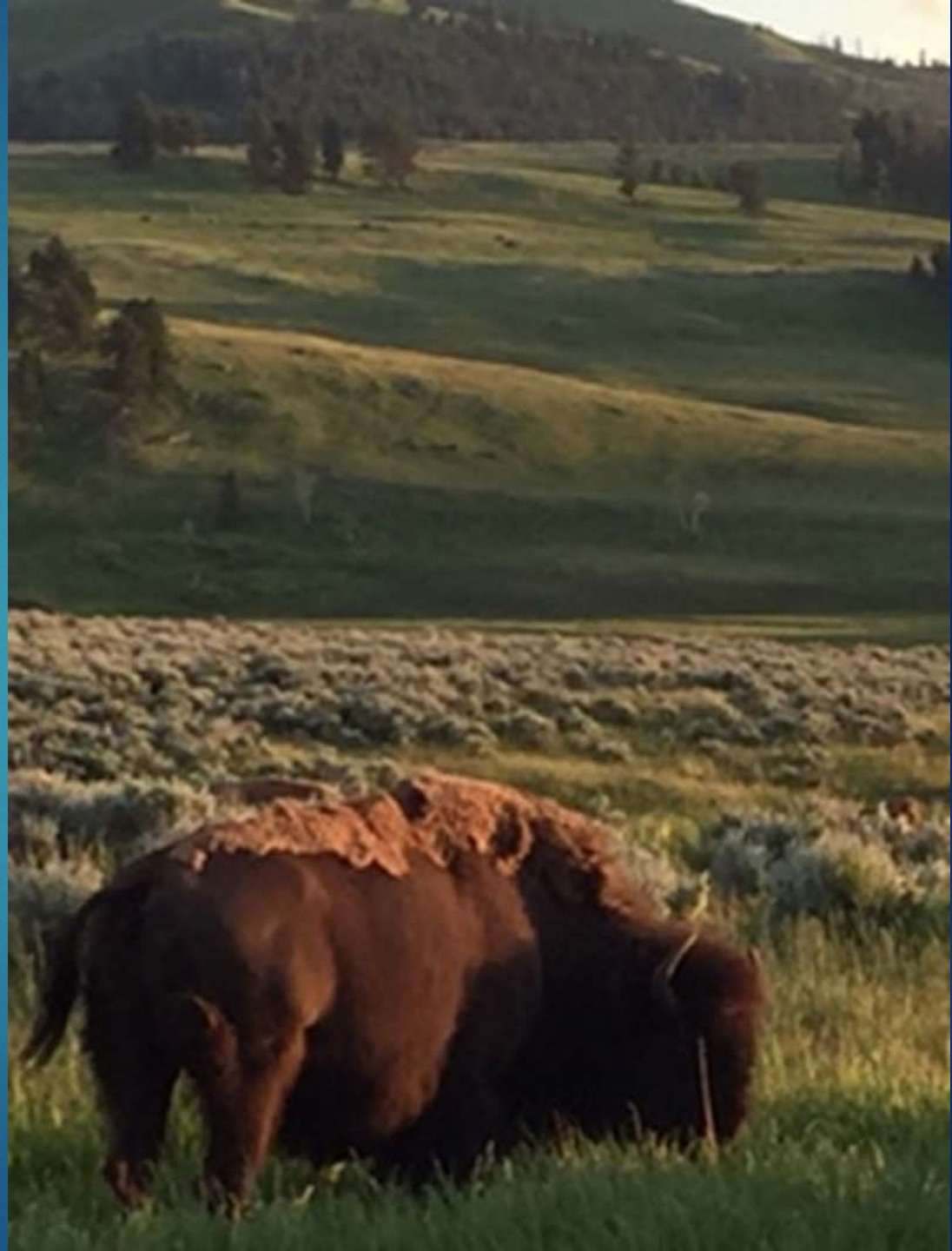
Next steps?

Meta-database development

Human Dimensions

Communications & Outreach

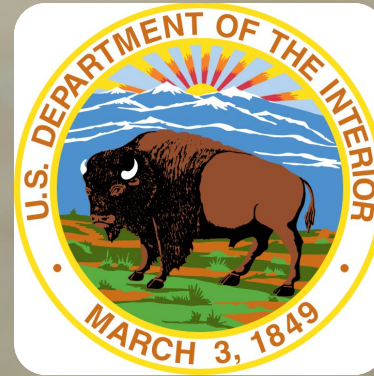SCALE UP ecological restoration collaborations

Application beyond DOI?

Opportunity to assess continental-wide species conservation strategies and opportunities?

Questions?

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