National Park Service
U.S. Department of the Interior

Bison Conservation in the 21st Century

or

"The Era of Big Conservation Is Not Over"

Glenn Plumb
Chief Wildlife Biologist

Bison Conservation Through Shared Stewardship

Fidelity to law and policy:

Governance & Legal Standing

Public & Private Sectors

Best available science:

Abundance & Distribution, Genetics

Spatial and Temporal Scaled Ecology

Long-term public interest:

Understanding Who Cares About What

Shared Values and Stewardship

Bison Conservation:

What actions have been successful?

What actions have not worked?

What would be needed to increase success?

Conservation of the North American Bison:

What actions have been successful?

What actions have not worked?

What would be needed to increase success?

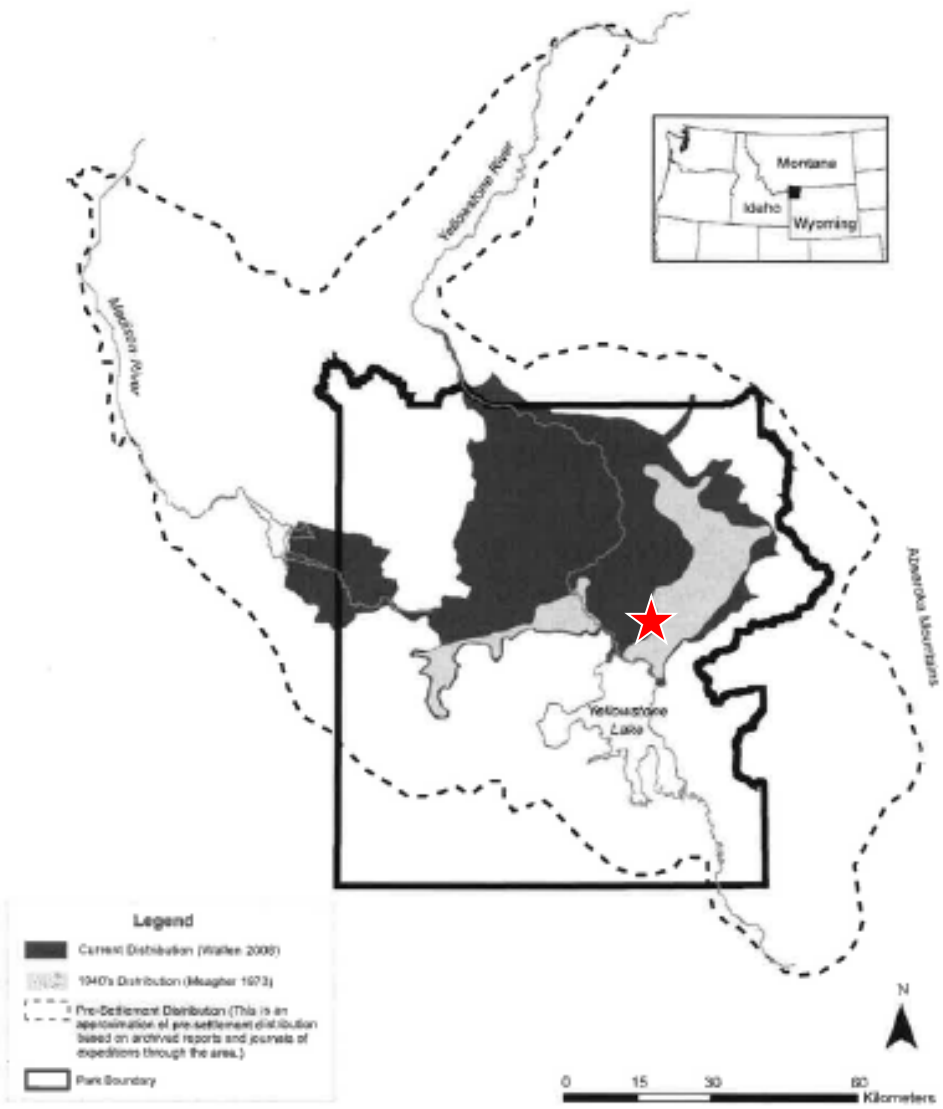
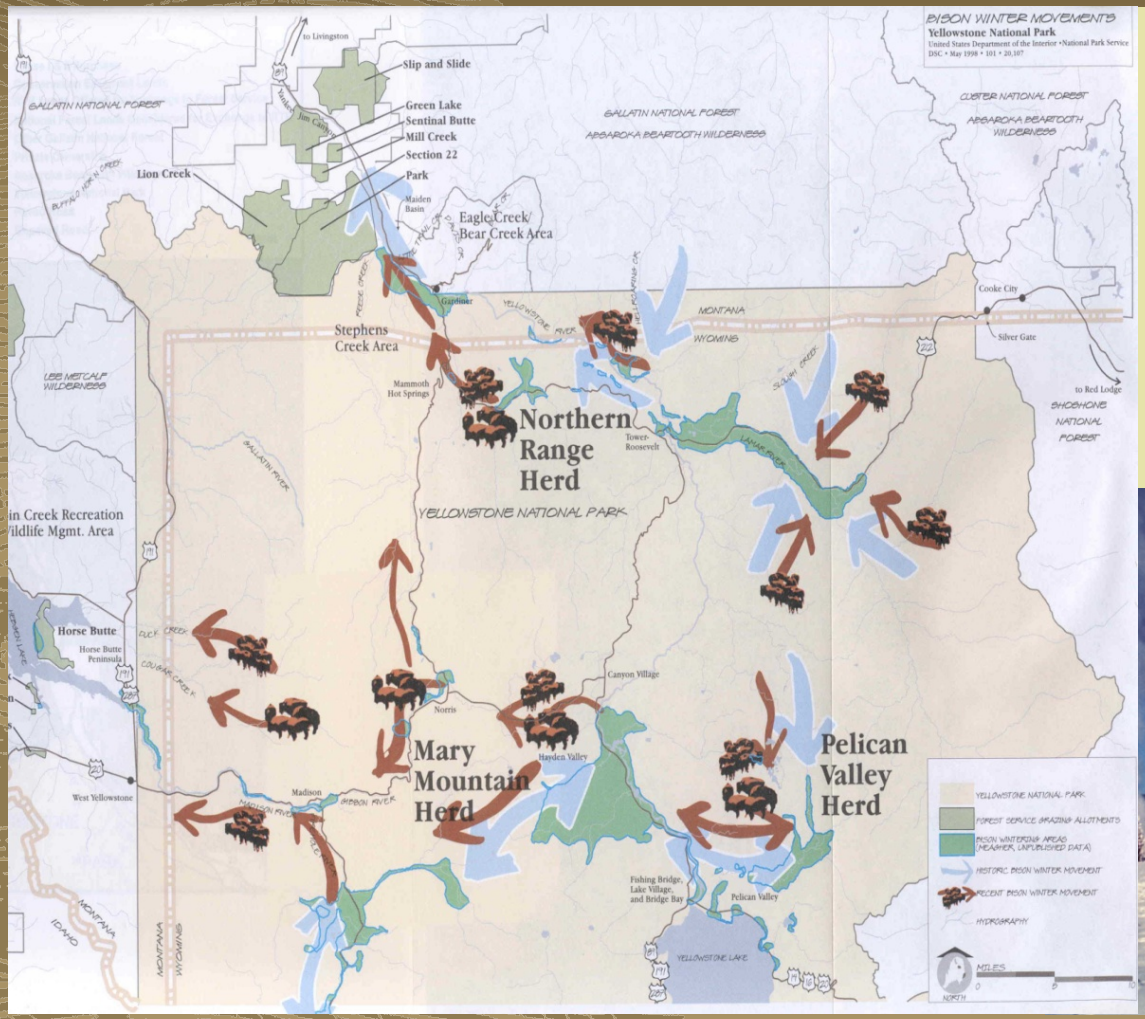


Fig. 1. Map depicting Yellowstone National Park and the pre-settlement, mid-20th century, and current distribution of Yellowstone bison.



Bison move between winter and summer ranges along major river corridors depending on winter severity

IUCN

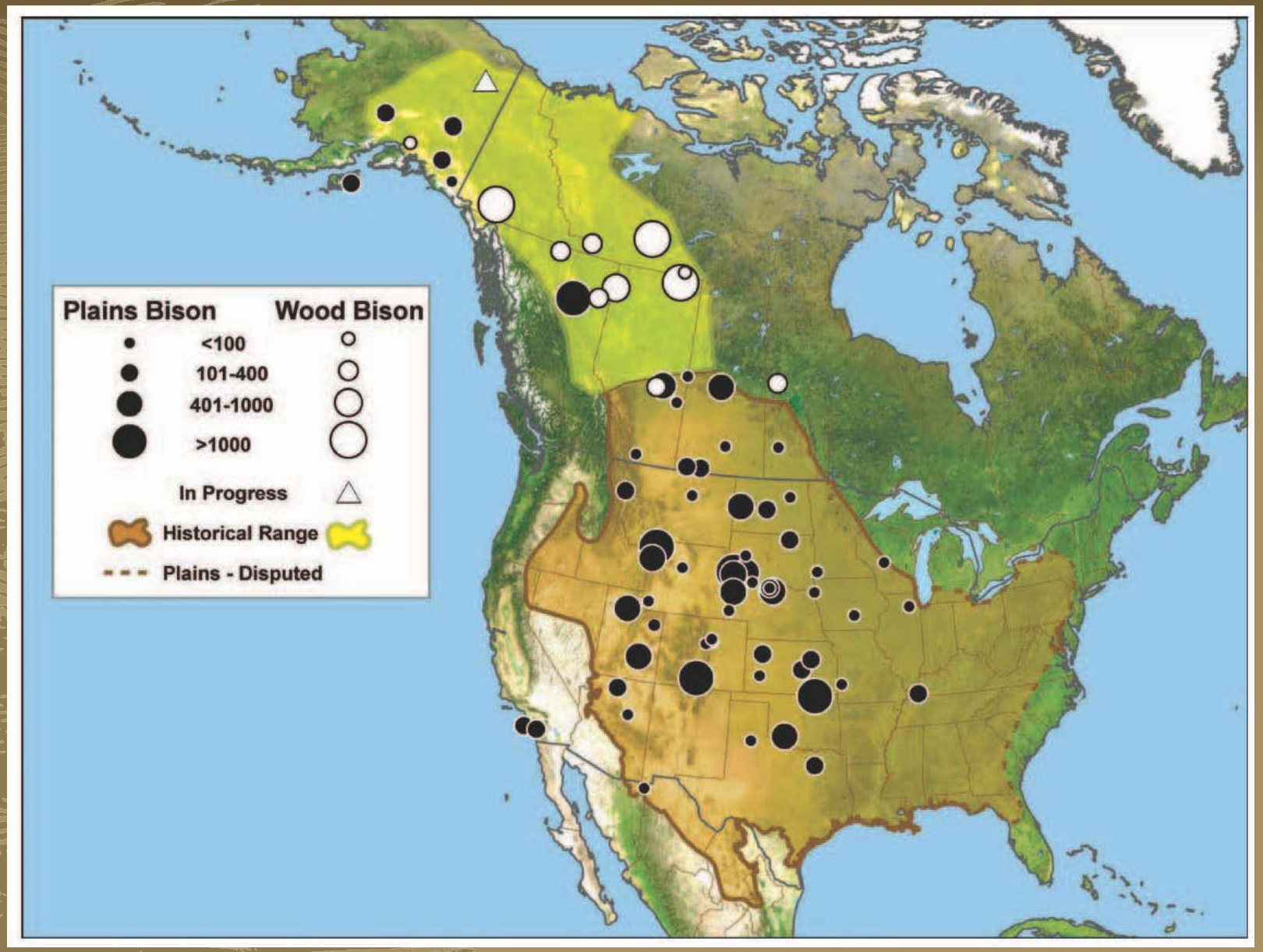
American Bison

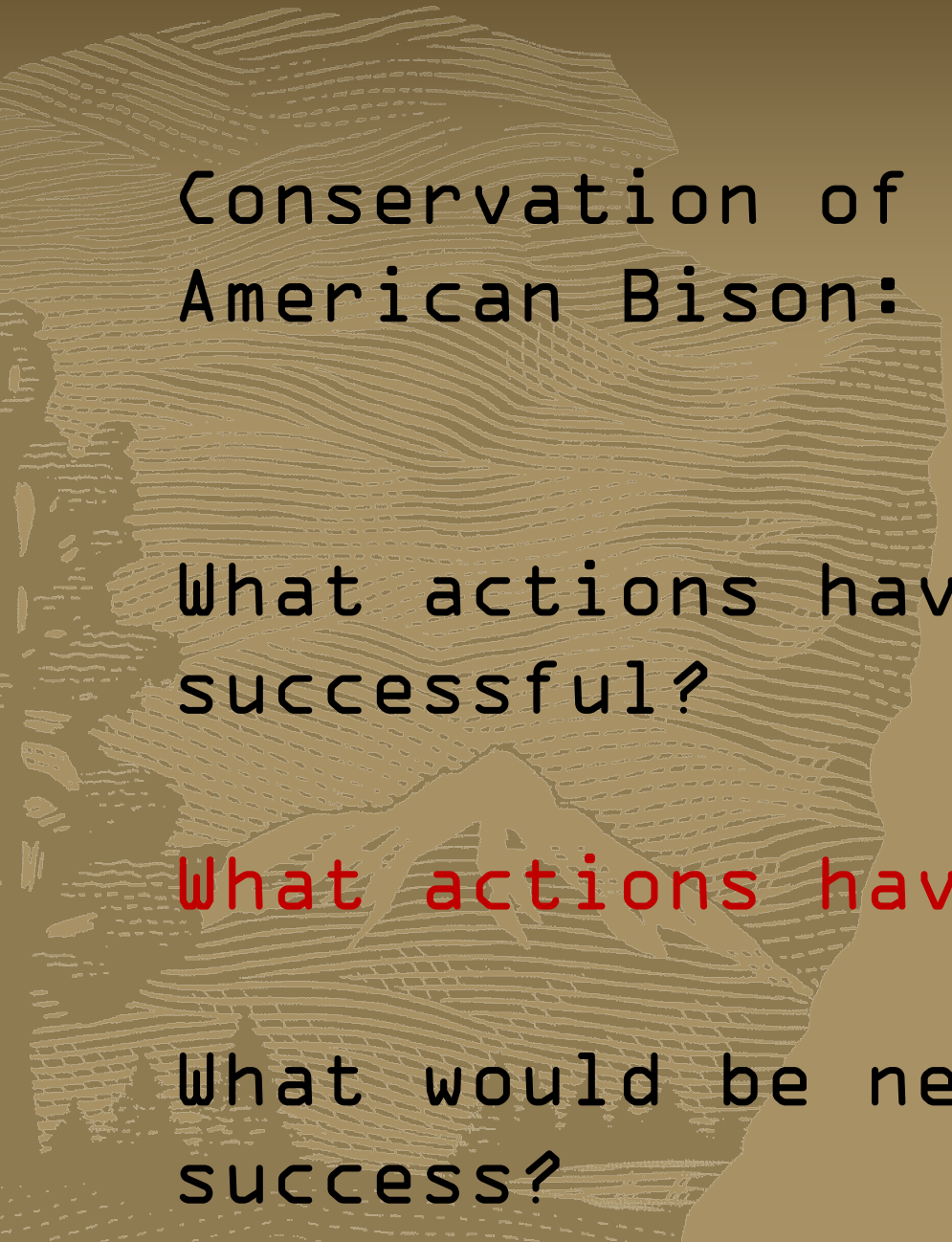
Status Survey and Conservation Guidelines 2010

Edited by C. Cormack Gates, Curtis H. Freese, Peter J.P. Gogan, and Mandy Kotzman

IUCN/SSC American Bison Specialist Group

SSC Species Survival Commission


Plains Bison
Wood Bison
<100
101-400
401-1000
>1000
In Progress
Historical Range
Plains - Disputed



Conservation of the North American Bison:

What actions have been successful?

What actions have not worked?

What would be needed to increase success?

- Body size
- Movement Ecology
- Conservation Genetics
- Legal Status: wildlife or livestock?
- Animal Husbandry Management
- Property Damage
- Health status
- Competition with cattle

Thought Experiment:

What are the consequences of the intense animal husbandry often practiced for conservation bison?

H_w - There is dynamic tension & tradeoff between animal husbandry and conservation of "scaled" bison ecology.

H_n - There is no effect of increasing bison management intensity-complexity on wild bison conservation.

What is the Problem?

H_n – There is no effect of increasing bison management intensity-complexity on wild bison conservation.

Type 1 Error: Reject Hn when it is true?

Type 2 Error: Accept Hn when it is false?

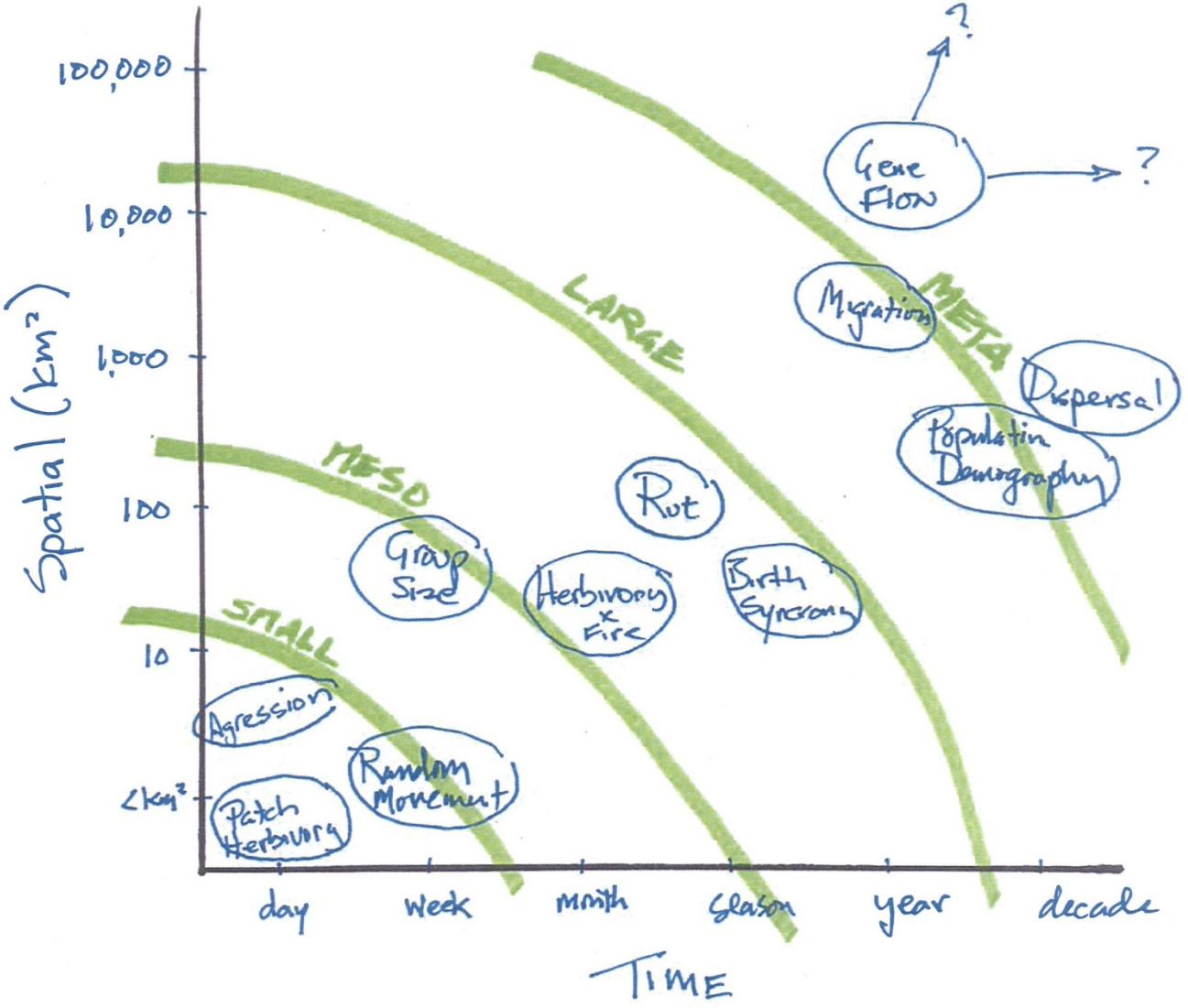
Thought Experiment Approach

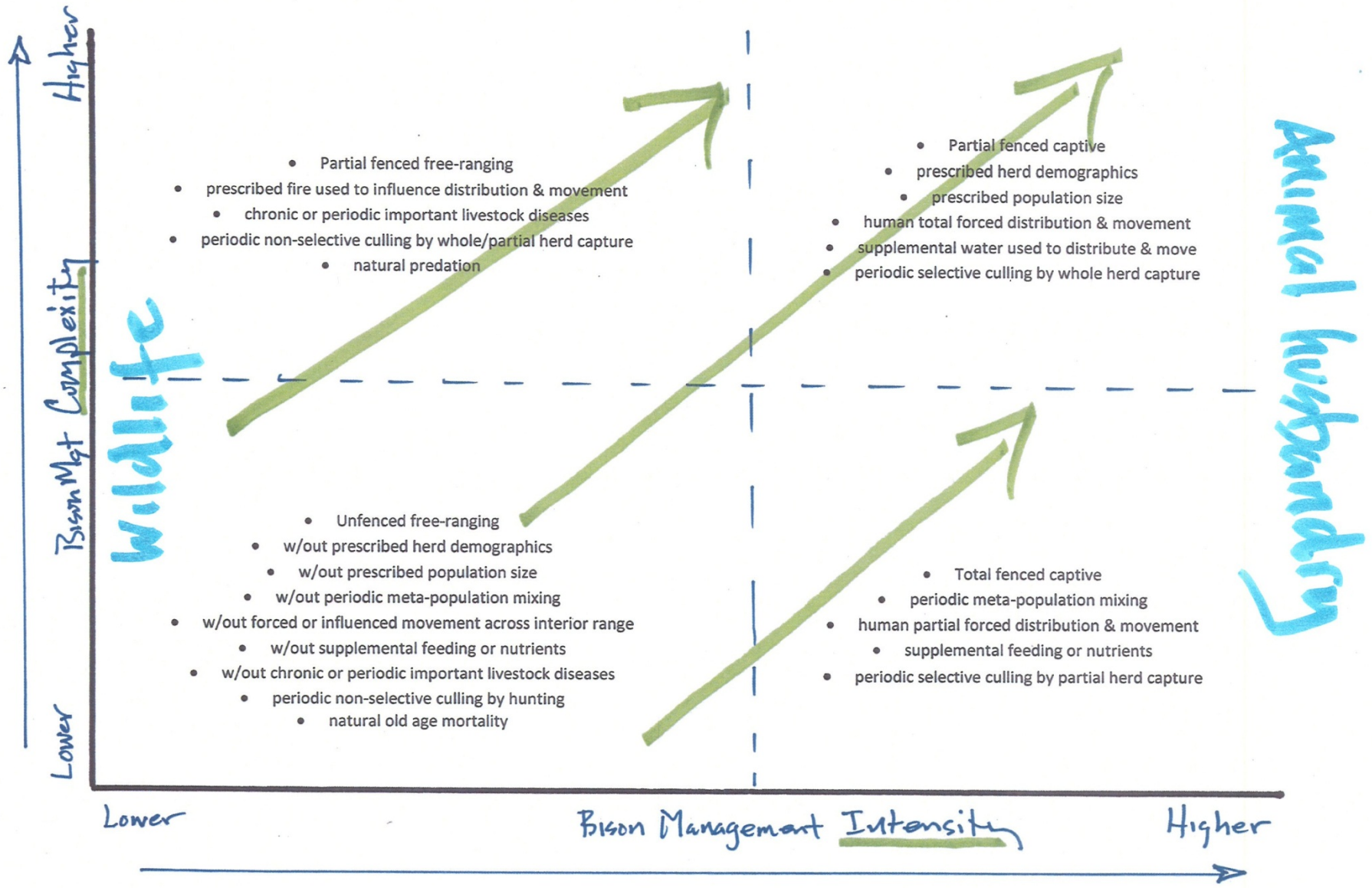
Scaled Bison Ecology

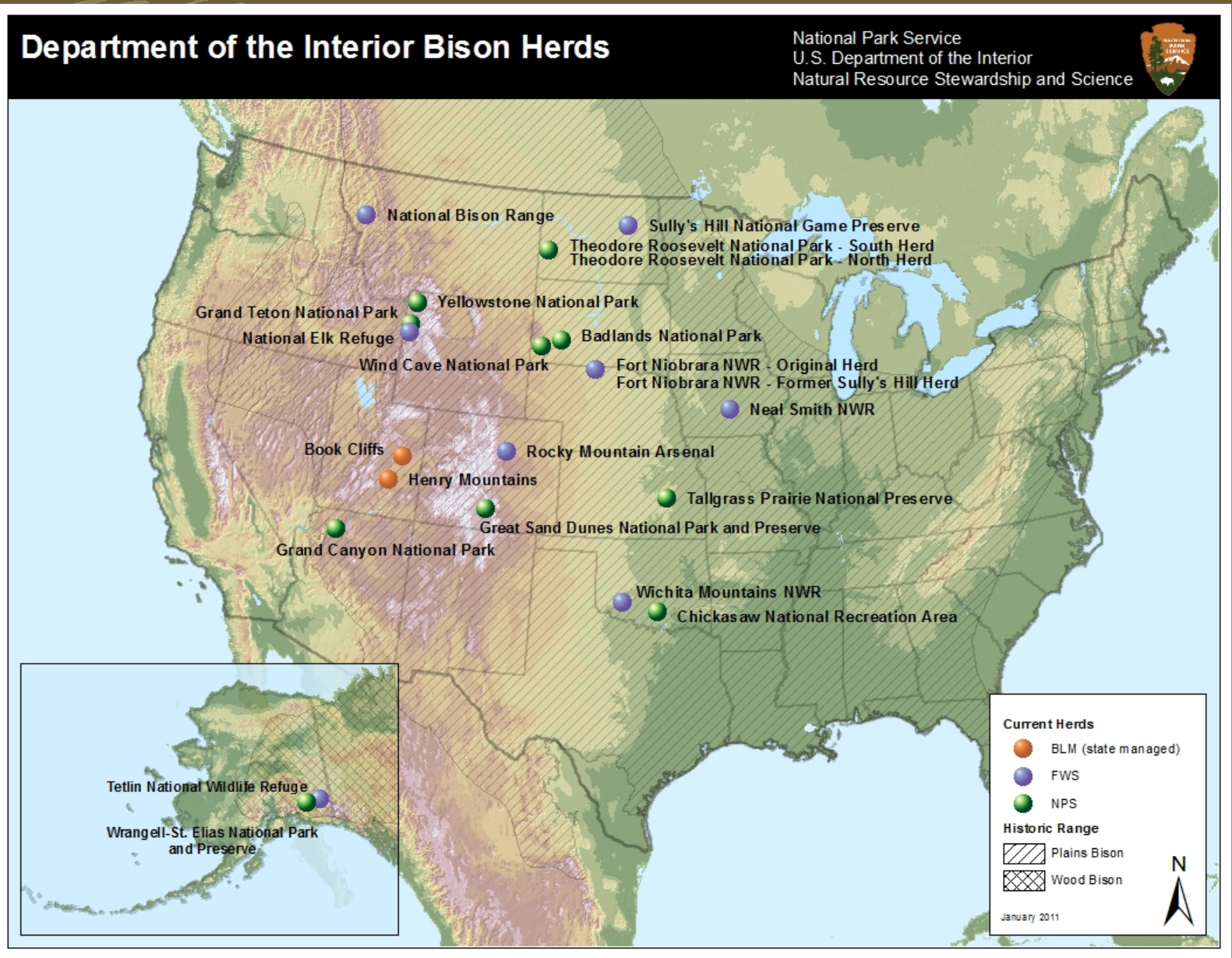
Scaled Bison Management

Key elements and trends

Considerations


100,000
10,000
1,000
100
10
<1km²
Spatial (km²)
SMALL
MESO
LARGE
META
Aggression
Patch Herbivory
Random Movement
Group Size
Herbivory + Fire
Rut
Birth Synchrony
Migration
Gene Flow
?
?
Dispersal
Population Demography
day
week
month
season
year
decade
TIME

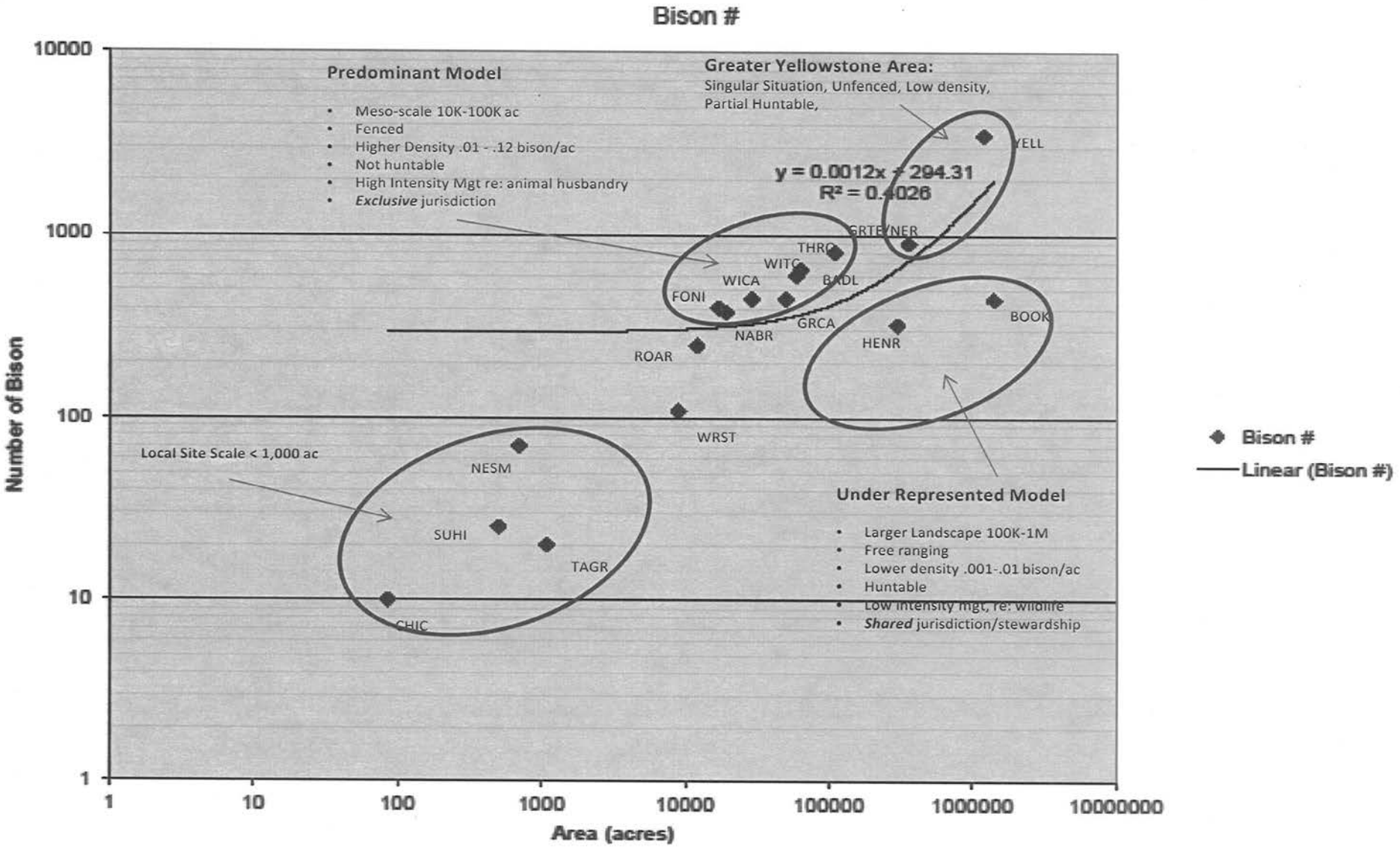

Higher
Bison Mgt Complexity
Lower
Wildlife
Animal husbandry
• Partial fenced free-ranging
• prescribed fire used to influence distribution & movement
• chronic or periodic important livestock diseases
• periodic non-selective culling by whole/partial herd capture
• natural predation
• Partial fenced captive
• prescribed herd demographics
• prescribed population size
• human total forced distribution & movement
• supplemental water used to distribute & move
• periodic selective culling by whole herd capture
• Unfenced free-ranging
• w/out prescribed herd demographics
• w/out prescribed population size
• w/out periodic meta-population mixing
• w/out forced or influenced movement across interior range
• w/out supplemental feeding or nutrients
• w/out chronic or periodic important livestock diseases
• periodic non-selective culling by hunting
• natural old age mortality
• Total fenced captive
• periodic meta-population mixing
• human partial forced distribution & movement
• supplemental feeding or nutrients
• periodic selective culling by partial herd capture
Lower
Bison Management Intensity
Higher


Department of the Interior Bison Herds
National Park Service
U.S. Department of the Interior
Natural Resource Stewardship and Science
National Bison Range
Sully's Hill National Game Preserve
Theodore Roosevelt National Park - South Herd
Theodore Roosevelt National Park - North Herd
Yellowstone National Park
Grand Teton National Park
National Elk Refuge
Badlands National Park
Wind Cave National Park
Fort Niobrara NWR - Original Herd
Fort Niobrara NWR - Former Sully's Hill Herd
Neal Smith NWR
Book Cliffs
Rocky Mountain Arsenal
Henry Mountains
Tallgrass Prairie National Preserve
Great Sand Dunes National Park and Preserve
Grand Canyon National Park
Wichita Mountains NWR
Chickasaw National Recreation Area
Tetlin National Wildlife Refuge
Wrangell-St. Elias National Park and Preserve
Current Herds
BLM (state managed)
FWS
NPS
Historic Range
Plains Bison
Wood Bison
N
January 2011

US Department of Interior
11 Fenced & 6 Free-Ranging Herds

Unit	State	Agency	Fenced or Free-Ranging	Approximate Herd Size	Approximate Area Size (ac)[1]
Badlands National Park	SD	NPS	Fenced	650	64,000
Book Cliffs	UT	BLM	Free-Ranging	450	1,400,000
Chickasaw National Recreation Area	OK	NPS	Fenced	10	80
Fort Niobrara National Wildlife Refuge	NE	FWS	Fenced	350	17,000
Grand Canyon National Park	AZ	NPS	Free-Ranging	550	23,000
Grand Teton National Park/ National Elk Refuge	WY	NPS, FWS	Free-Ranging	900	360,000
Henry Mountains	UT	BLM	Free-Ranging	325	300,000
National Bison Range	MT	FWS	Fenced	380	19,000
Neal Smith National Wildlife Refuge	IA	FWS	Fenced	70	700
Rocky Mountain Arsenal National Wildlife Refuge	CO	FWS	Fenced	75	12,000
Sullys Hill National Game Preserve	ND	FWS	Fenced	25	540
Tallgrass Prairie National Preserve	KS	NPS	Fenced	20	1100
Theodore Roosevelt National Park	ND	NPS	Fenced	500	71,000
Wichita Mountains National Wildlife Refuge	OK	FWS	Fenced	640	59,000
Wind Cave National Park	SD	NPS	Fenced	450	28,000
Wrangell-St. Elias National Park and Preserve	AK	NPS	Free-Ranging	110	100,000
Yellowstone National Park	WY	NPS	Free-Ranging	4600	2,200,000

1 – free-ranging herds occur on DOI and adjacent lands


Bison #
Predominant Model
Meso-scale 10K-100K ac
Fenced
Higher Density .01 - .12 bison/ac
Not huntable
High Intensity Mgt re: animal husbandry
Exclusive jurisdiction
Greater Yellowstone Area:
Singular Situation, Unfenced, Low density, Partial Huntable,
y = 0.0012x + 294.31
R² = 0.4026
YELL
GRTE
NER
THRO
WITC
WICA
BADL
FONI
GRCA
NABR
ROAR
HENR
BOOK
WRST
Local Site Scale < 1,000 ac
NESM
SUHI
TAGR
CHIC
Under Represented Model
Larger Landscape 100K-1M
Free ranging
Lower density .001-.01 bison/ac
Huntable
Low intensity mgt, re: wildlife
Shared jurisdiction/stewardship
Number of Bison
10000
1000
100
10
1
1
10
100
1000
10000
100000
1000000
10000000
Area (acres)
Bison #
Linear (Bison #)

Considerations

Bison ecology is scaled in time and space

Bison management is scaled in complexity and intensity

Bison ecology x management trends as gradient between wildlife and animal husbandry

There are trade offs between density and large landscape ecology on fixed landscapes

Higher bison density on fixed landscapes trends towards animal husbandry

Rejecting H_N is probably warranted

Accepting H_w suggests lower management complexity-intensity derived from lower density across larger landscapes better trends towards conservation of bison ecologies across scales

For recovery of the North American Bison:

What actions have been successful?

What actions have not worked?

What would be needed to increase success?

Bison Conservation Through Shared Stewardship

Fidelity to law and policy:

Governance & Legal Standing

Public & Private Sectors

Best available science:

Abundance & Distribution, Genetics

Spatial and Temporal Scaled Ecology

Long-term public interest:

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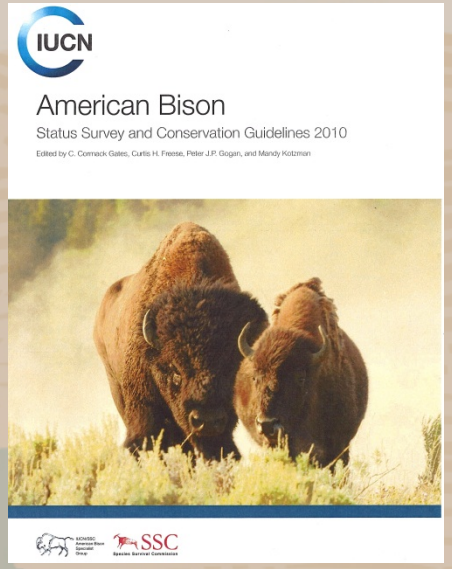
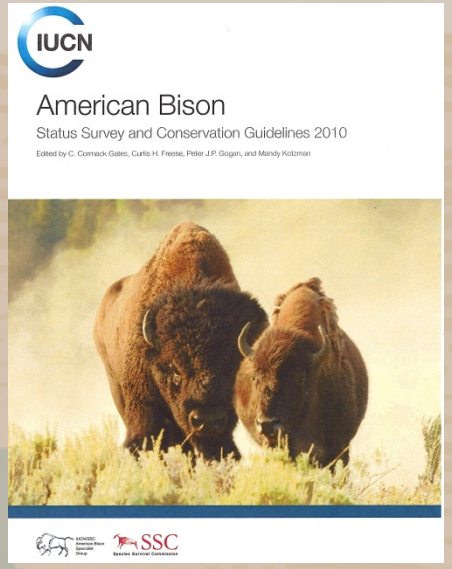


PACE Bisonte.
Bison reintroduction to historic range
in Northern Mexico

SEMARNAT
Comisión Nacional de Áreas Naturales Protegidas
Chihuahua
The Nature Conservancy
Protecting nature. Preserving life.
Casa abierta al tiempo
UNIVERSIDAD AUTÓNOMA METROPOLITANA
Unidad Lerma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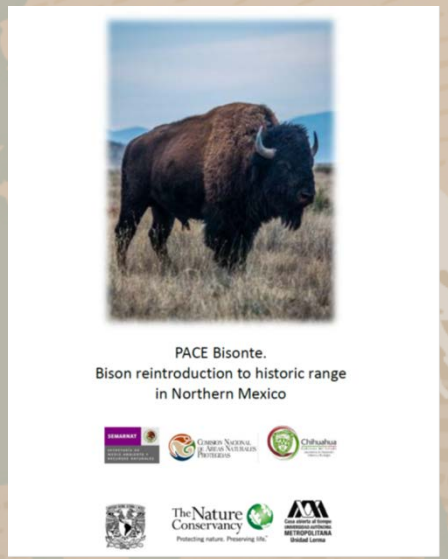
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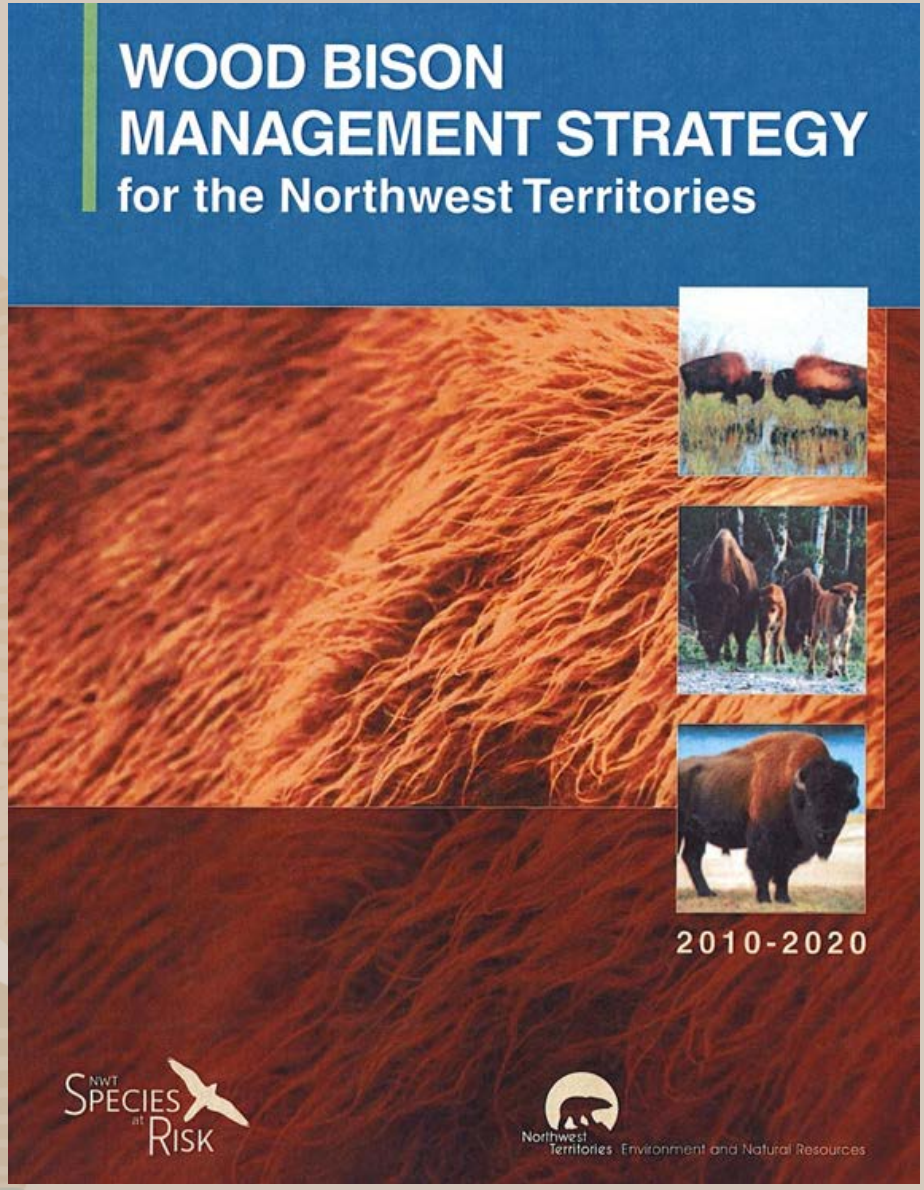
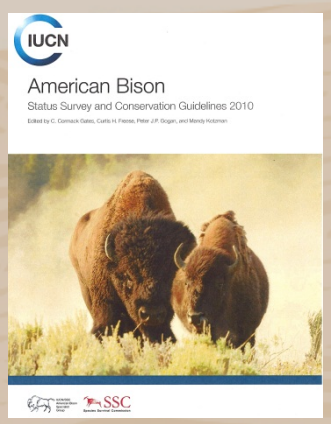
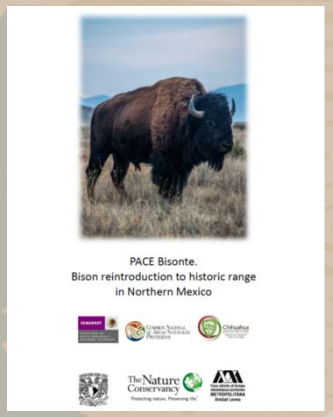
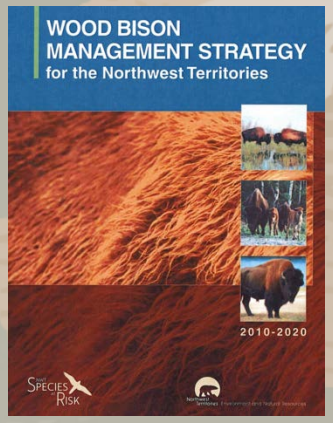

WOOD BISON
MANAGEMENT STRATEGY
for the Northwest Territories
2010-2020
NWT Species at Risk
Northwest Territories Environment and Natural Resources







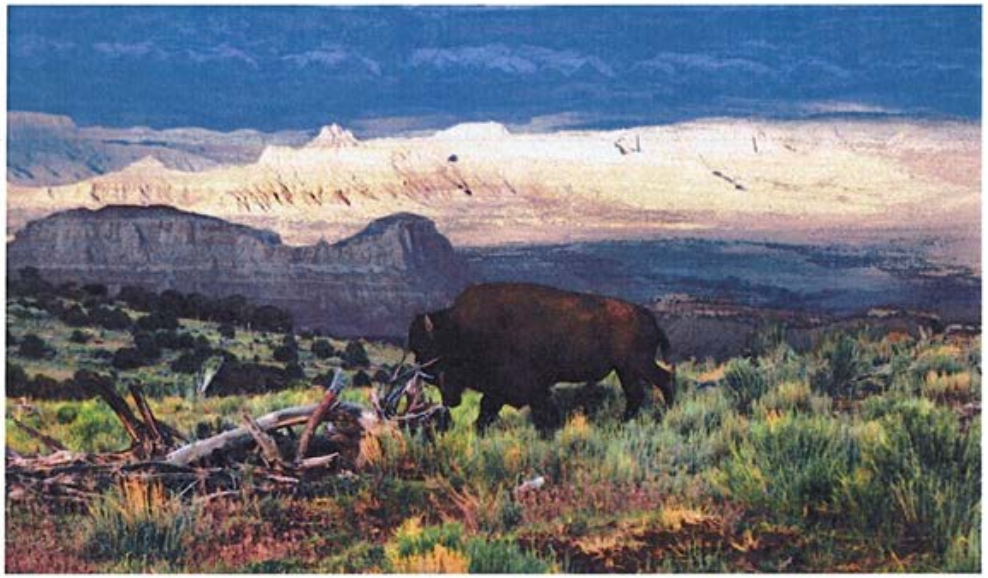
National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science

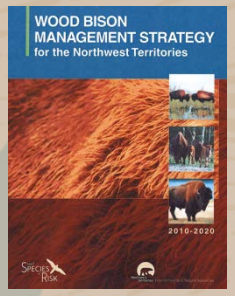
DOI Bison Report

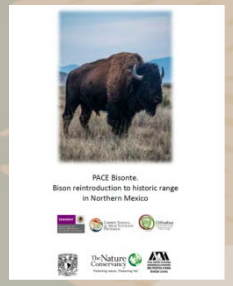
Looking Forward

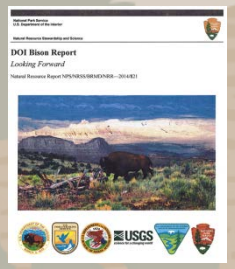
Natural Resource Report NPS/NRSS/BRMD/NRR—2014/821



U.S. Department of the Interior — March 3, 1849
U.S. Fish & Wildlife Service
U.S. Department of the Interior — 1824 — Bureau of Indian Affairs
USGS science for a changing world
U.S. Department of the Interior — Bureau of Land Management
National Park Service







Banff
National Park

Reintroduction Plan: Plains Bison in Banff National Park

March 2015

Parks Canada Parcs Canada

Canada

Expanding the Camp

- Northern Buffalo Treaty
  - 11 Northern Tribes-U.S. and Canada
  - Conservation and Culture

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Long-term public interest:

Understanding Who Cares About What

Shared Values and Stewardship

Essay

The Ecological Future of the North American Bison: Conceiving Long-Term, Large-Scale Conservation of Wildlife

ERIC W. SANDERSON,[a,*] KENT H. REDFORD,[a] BILL WEBER,[a] KEITH AUNE,[b] DICK BALDES,[c] JOEL BERGER,[a,†] DAVE CARTER,[d] CHARLES CURTIN,[e] JAMES DERR,[f] STEVE DOBROTT,[g] EVA FEARN,[a] CRAIG FLEENER,[b] STEVE FORREST,[i] CRAIG GERLACH,[j] C. CORMACK GATES,[k] JOHN E. GROSS,[l] PETER GOGAN,[m] SHAUN GRASSEL,[n] JODI A. HILTY,[a] MARV JENSEN,[o] KYRAN KUNKEL,[i] DUANE LAMMERS,[p] RURIK LIST,[q] KAREN MINKOWSKI,[a] TOM OLSON,[r] CHRIS PAGUE,[s] PAUL B. ROBERTSON,[s] AND BOB STEPHENSON[t]

**email esanderson@wcs.org*
†Current address: Organismal Biology and Ecology, University of Montana, Missoula, MT 59812, U.S.A.
Paper submitted February 11, 2007; revised manuscript accepted August 21, 2007.

Conservation Biology, Volume 22, No. 2, 252–266

DOI: 10.1111/j.1523-1739.2008.00899.x

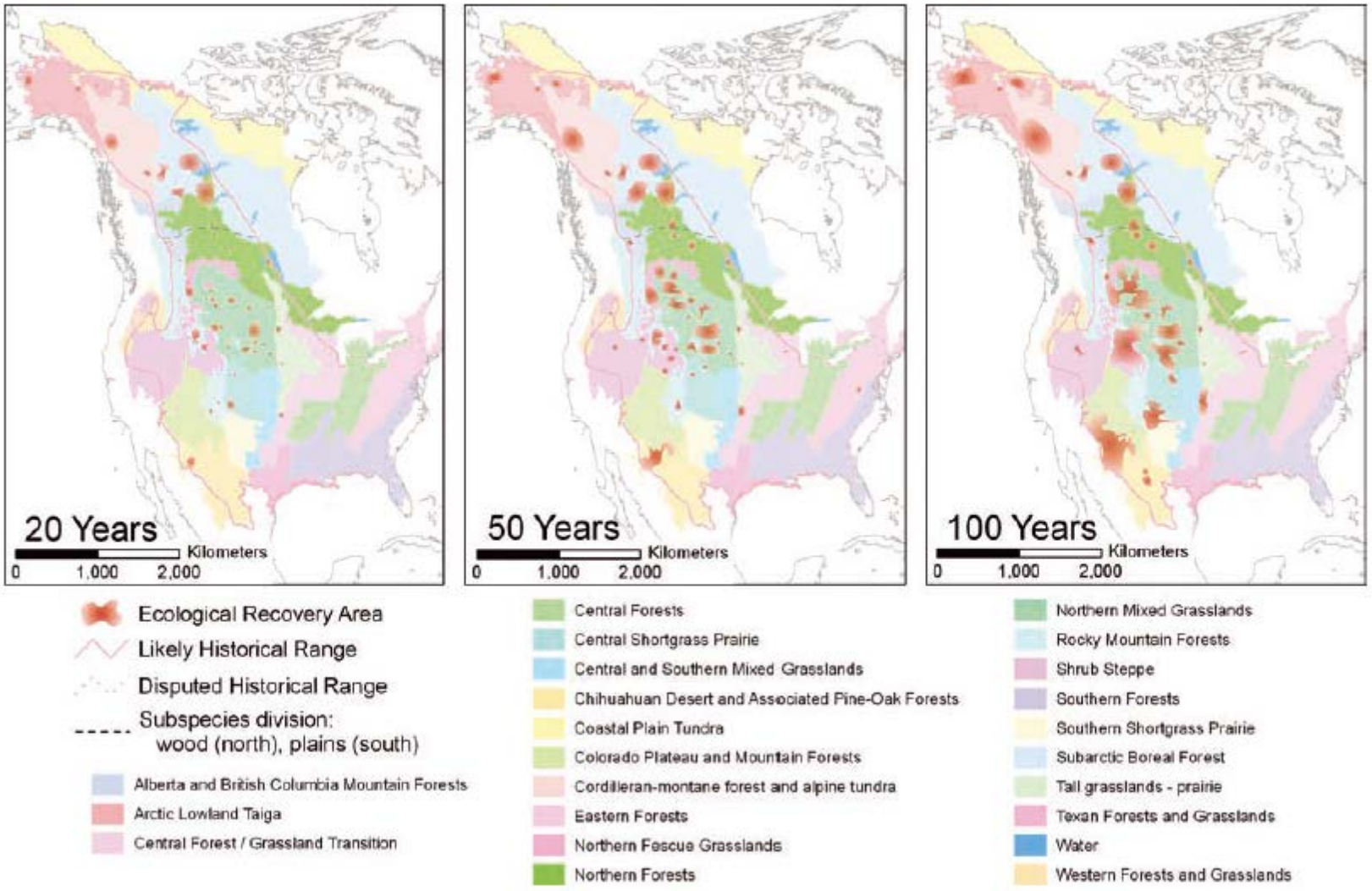


Figure 2. Distribution of potential recovery zones over the next 100 years for the North American bison. Major habitat types are indicated by colored areas in the background.

A 21st Century Bison Meta-Population

NPS funded Research 2015-2018

Updated Genetics for all DOI Bison Herds

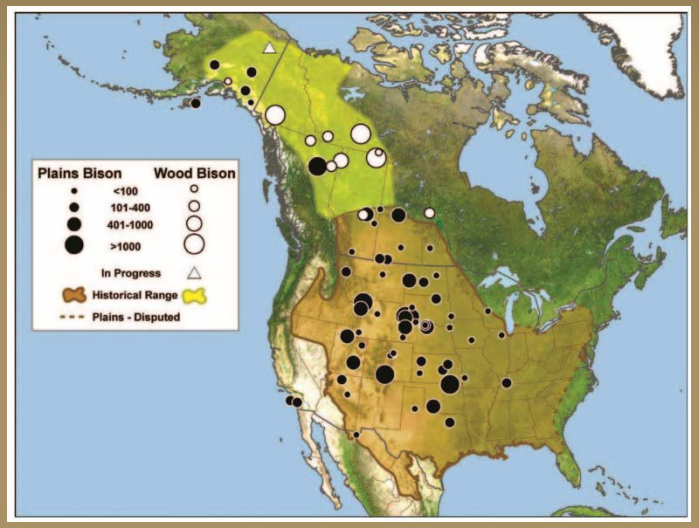
Population Viability Model for each herd

Meta-population Models

Include IUCN Red List Assessment

Include Canada and Mexico bison herds

A new scientific paradigm for continental conservation that combines law/policy with best available science with a vision for shared long-term public interest and values



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Who Cares ? – Constituencies ?

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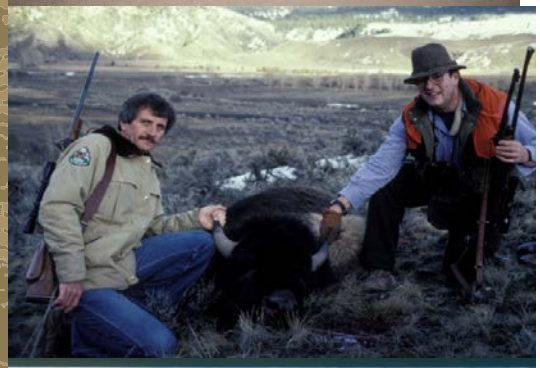

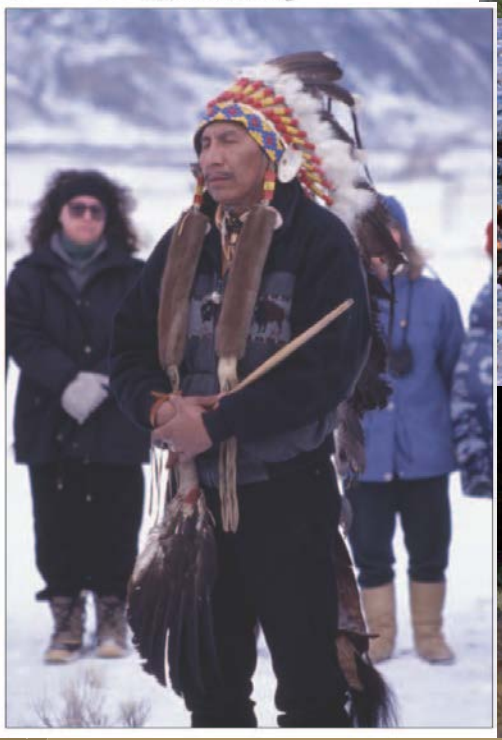

Shared Values

Shared Values

- A foundation for decision making & action especially in times of uncertainty

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- Systems thinking utilizing understanding of interactions and relationships and the context of the environment

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- Systems thinking utilizing understanding of interactions and relationships and the context of the environment

- Celebration of:

Shared Values

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- Celebration of:

History

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- Celebration of:

  History

  Heroes

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History

Heroes

Stories

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History

Heroes

Stories

Values

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History

Heroes

Stories

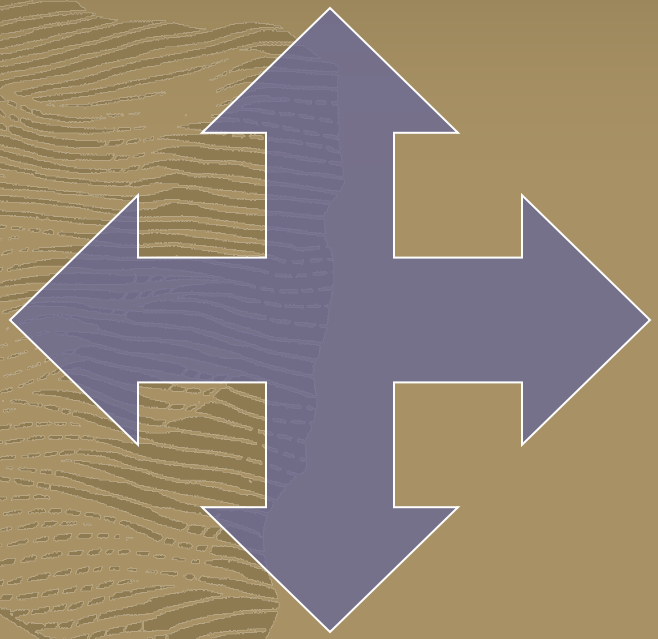
Values

Ritual & Ceremony

Shared Values

Protection

~ Preservation of Natural Resources



Shared Values

Protection

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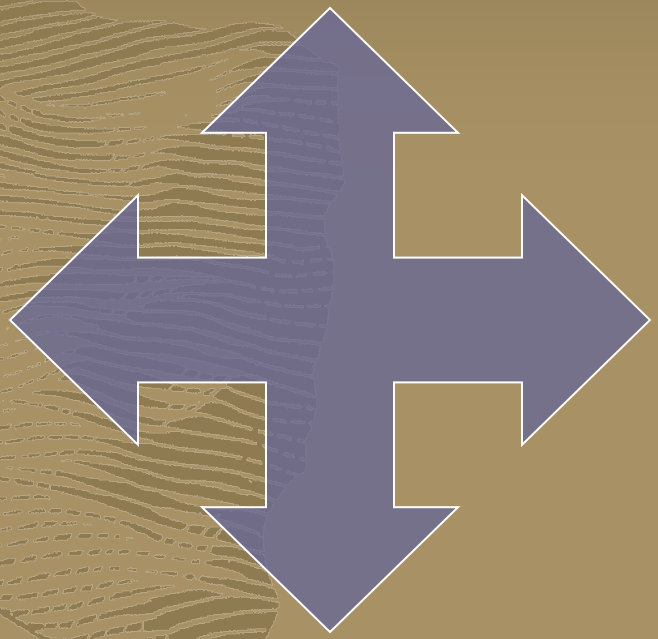


Efficiency

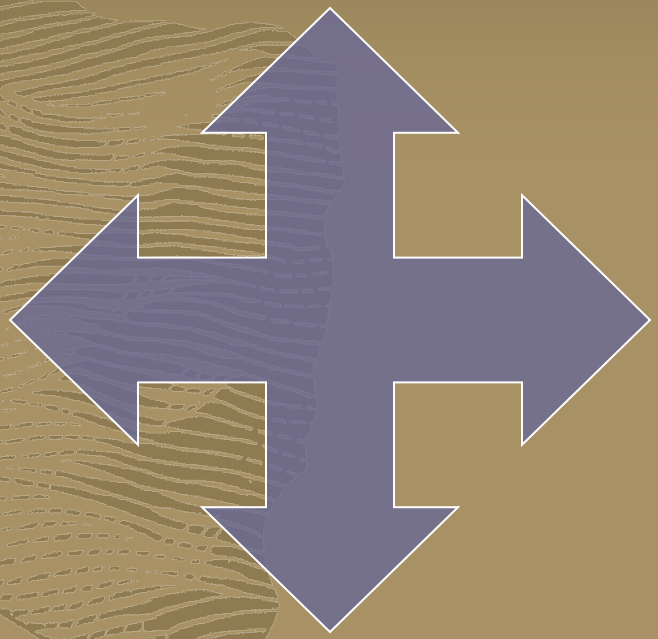
Standards
Budget
Planning
Implementation

Rules-based

Shared Values

Protection

~ Preservation of Natural Resources



Efficiency

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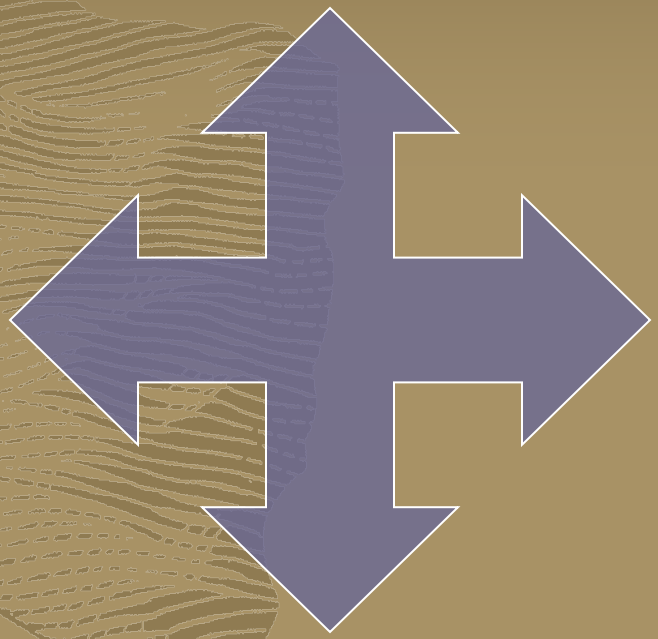
Sharing

Access Capacity Education

Shared Values

Protection

~ Preservation of Natural Resources



Community

Quality of Life
Values
Partnerships

Relationships

Efficiency

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Budget
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Implementation

Rules-based

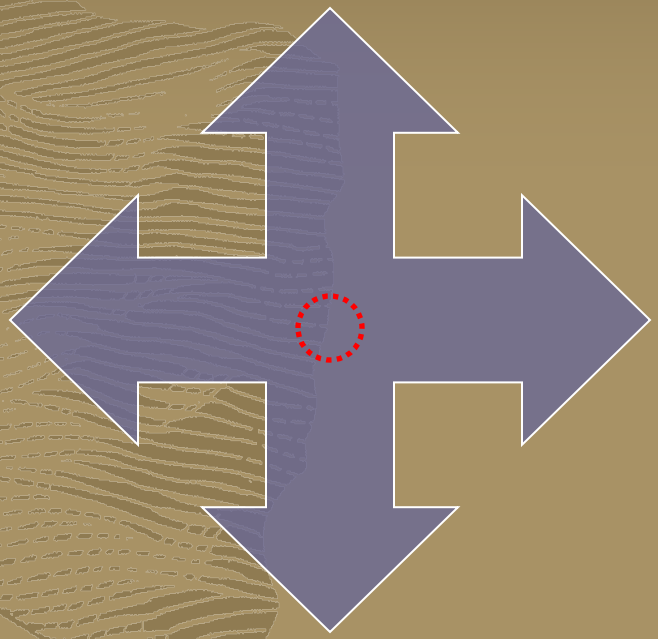
Sharing

Access Capacity Education

Shared Values

Protection

~ Preservation of Natural Resources



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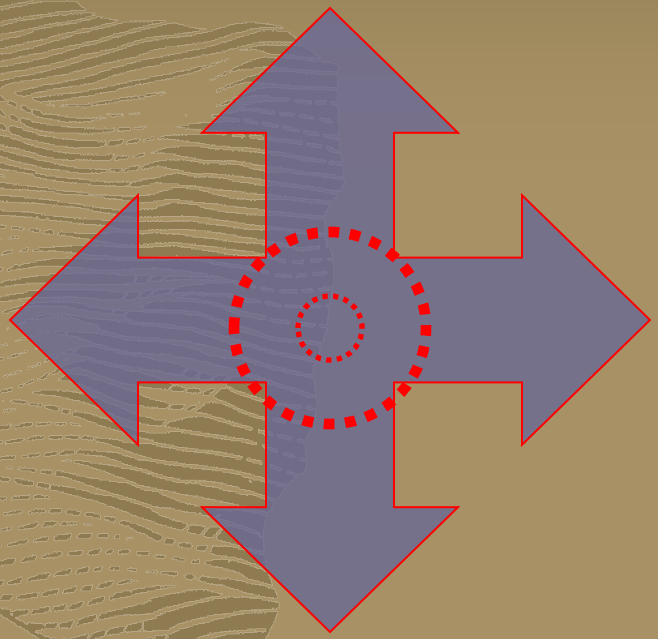

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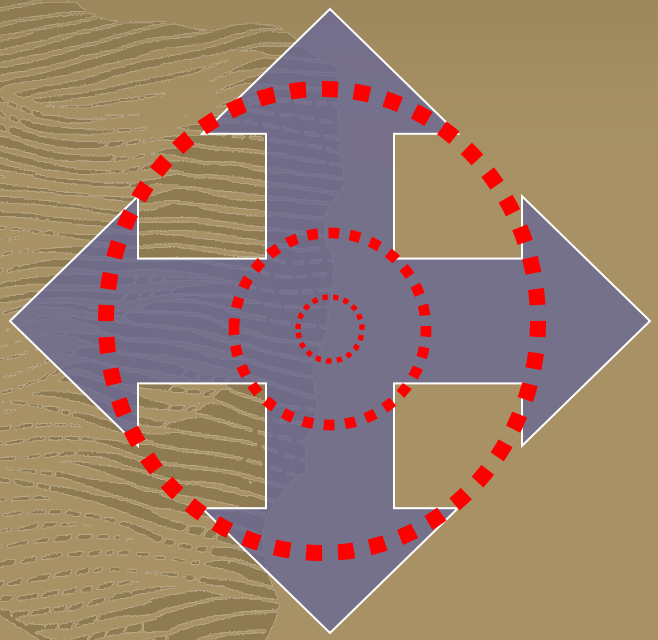
Protection

~ Preservation of Natural Resources



Community

Quality of Life
Values
Partnerships

Relationships

Efficiency

Standards
Budget
Planning
Implementation

Rules-based

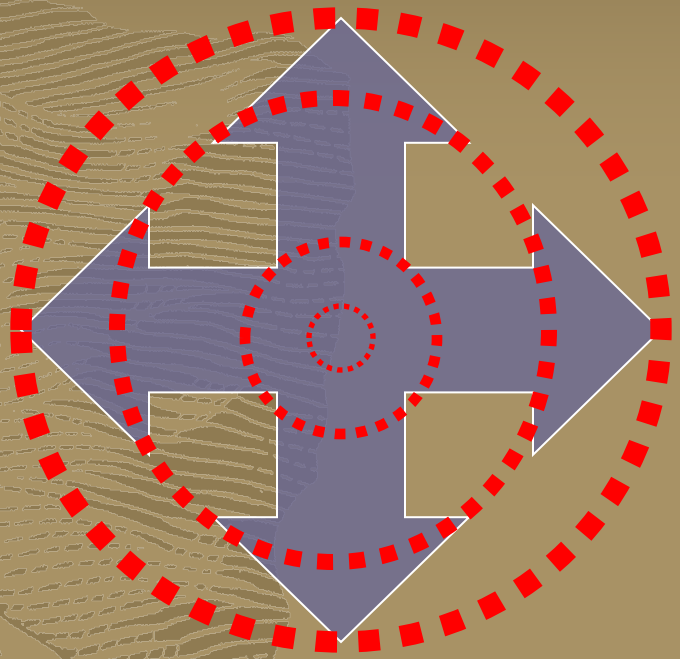
Sharing

Access Capacity Education

Shared Values

Protection

~ Preservation of Natural Resources



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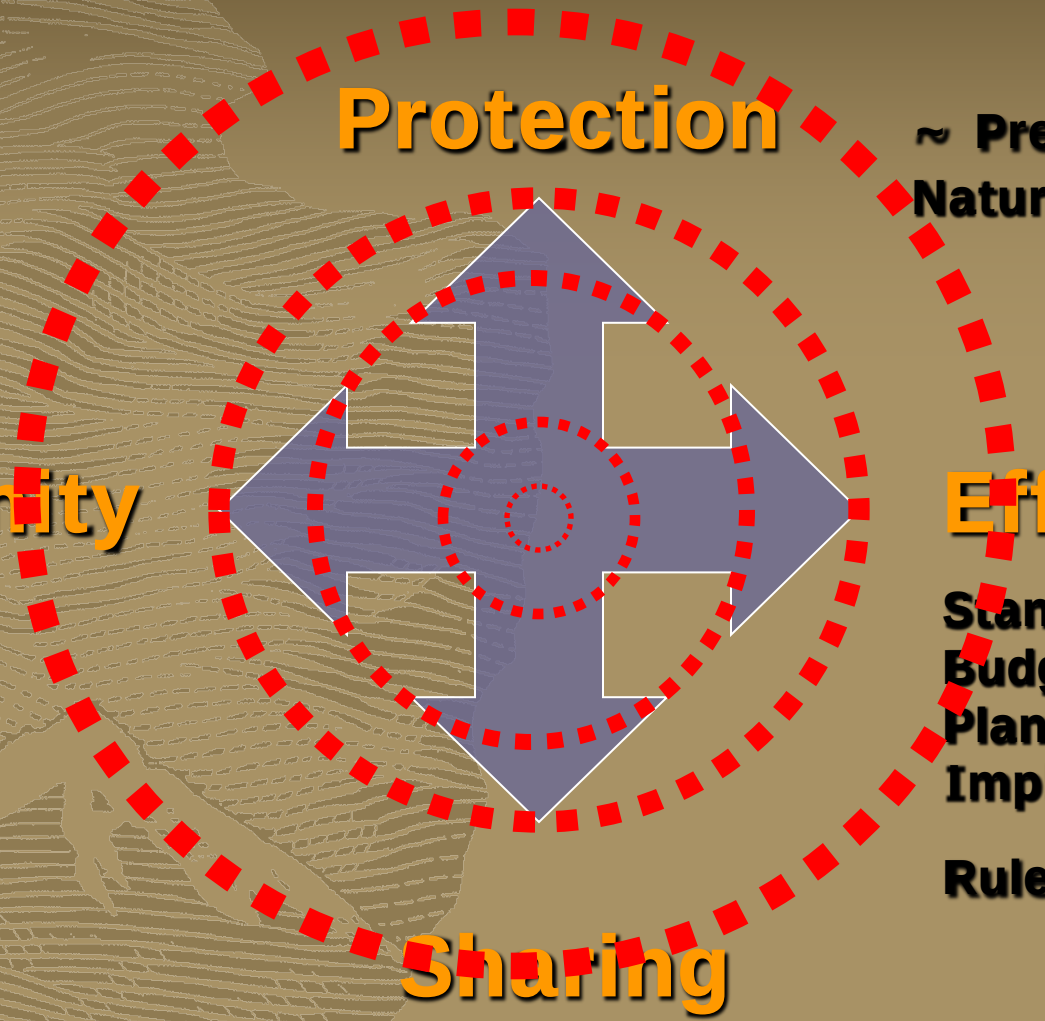

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Bison Conservation Through *Shared* Stewardship

Fidelity to law and policy:

Governance & Legal Standing
Public & Private Sectors

Best available science:

Abundance & Distribution, Genetics
Spatial and Temporal Scaled Ecology

Long-term public interest:

Understanding Who Cares About What
Shared Values and Stewardship