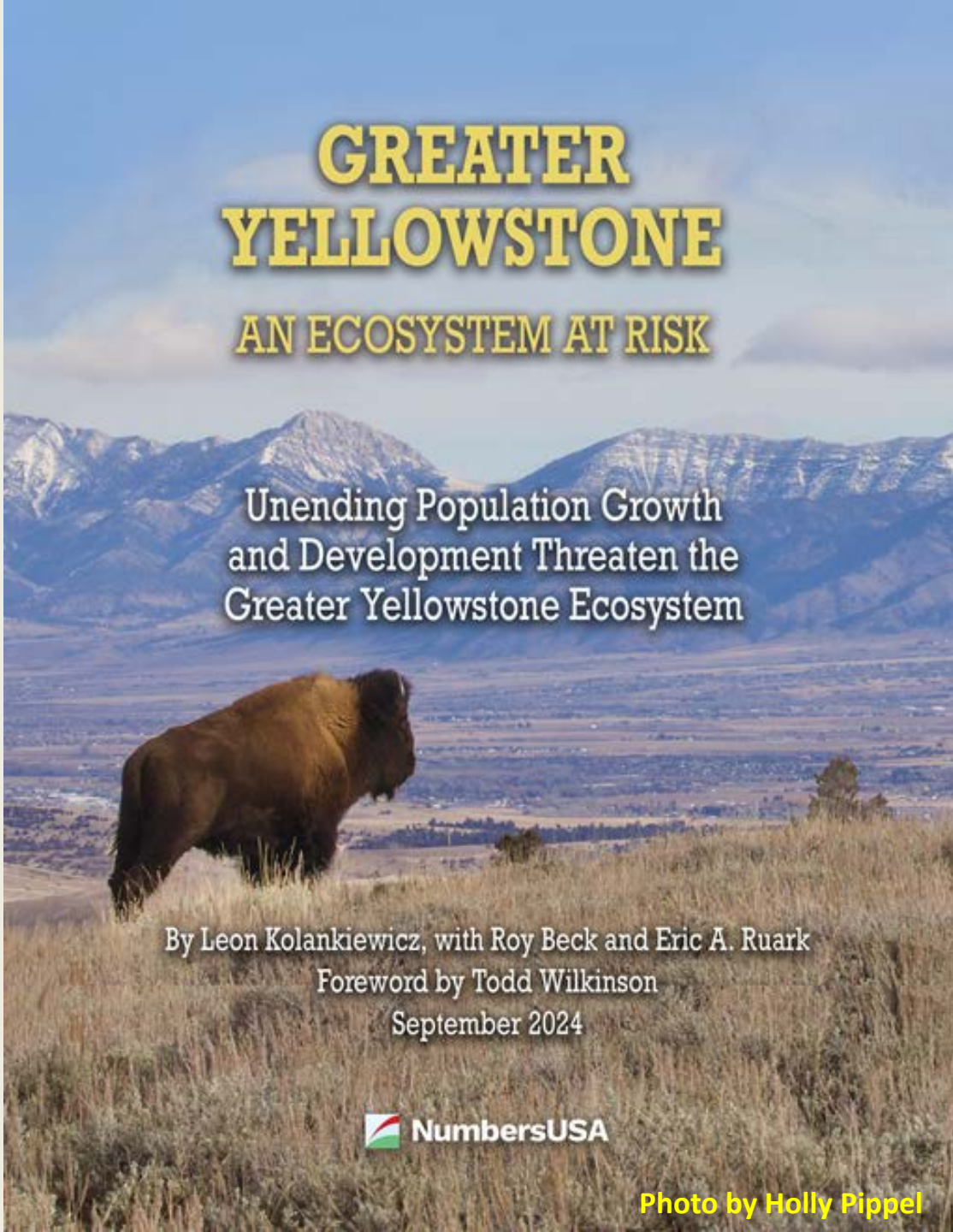
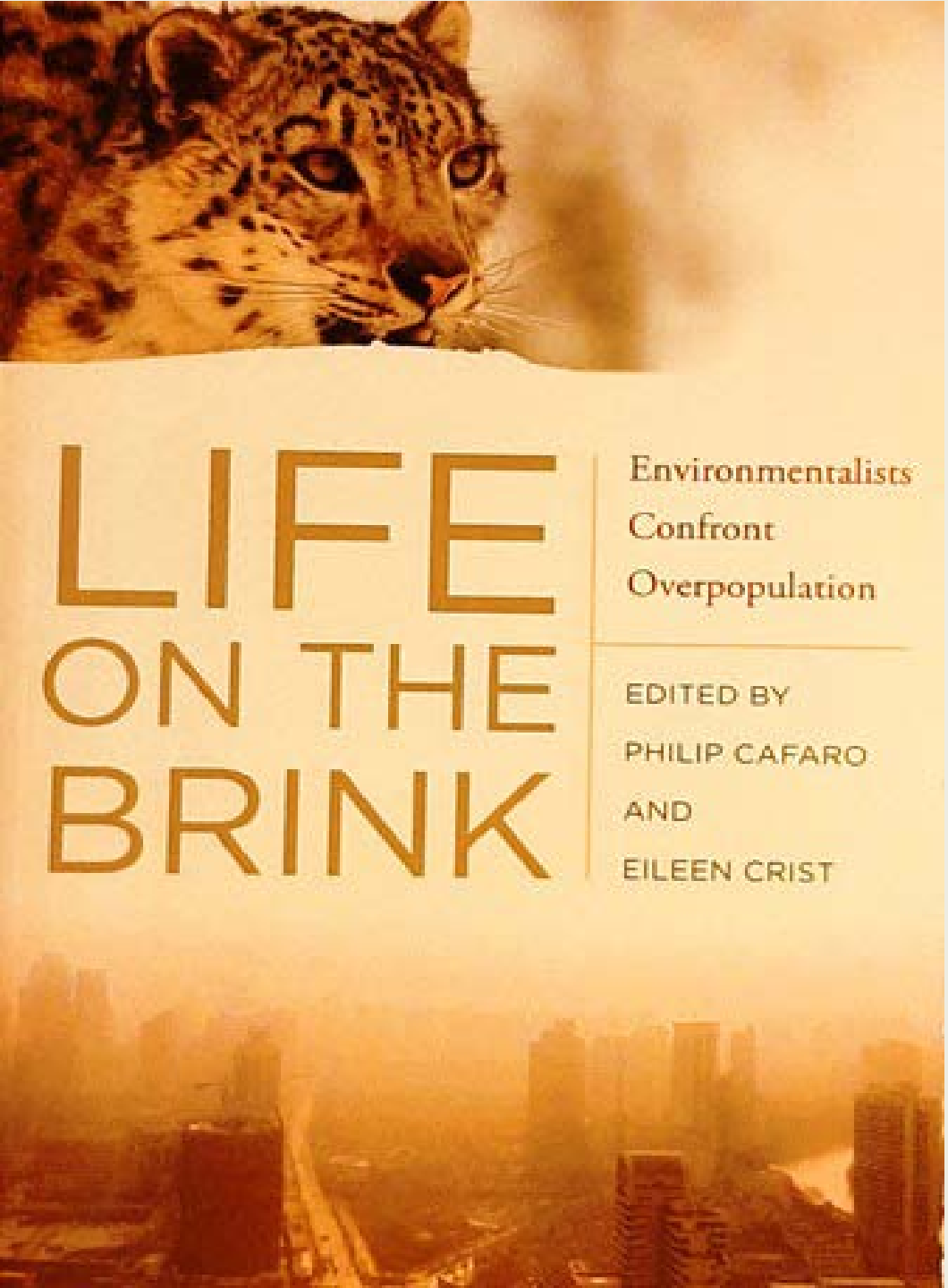
Drivers of Sprawl and Habitat Loss in the Greater Yellowstone Ecosystem

By Leon Kolankiewicz
Scientific Director
NumbersUSA

GYE Science Conference
4 September 2024

This presentation summarizes the key findings of a new study which I co-authored on the key drivers of urban sprawl on private lands in the 20-county Greater Yellowstone Ecosystem





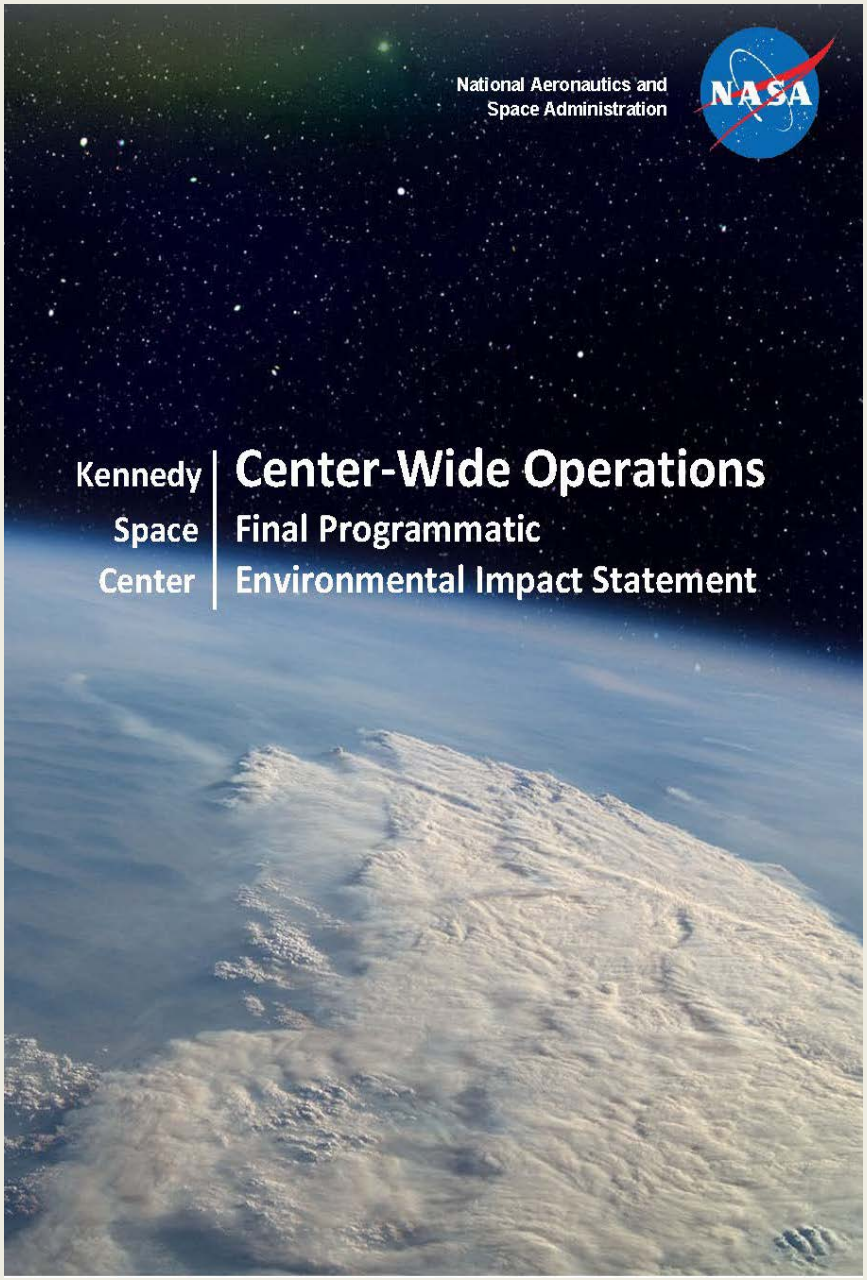
University of Georgia Press, 2012

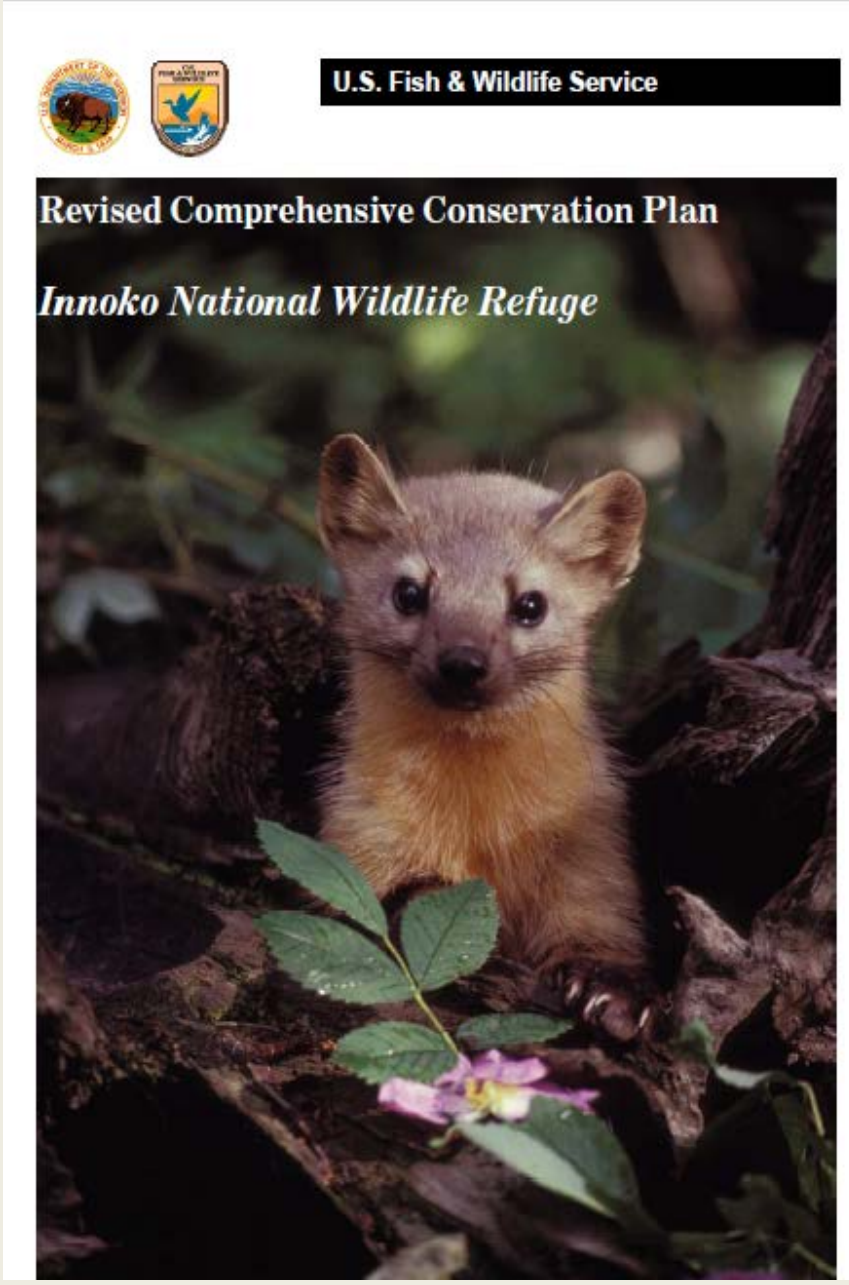
CHAPTER 6

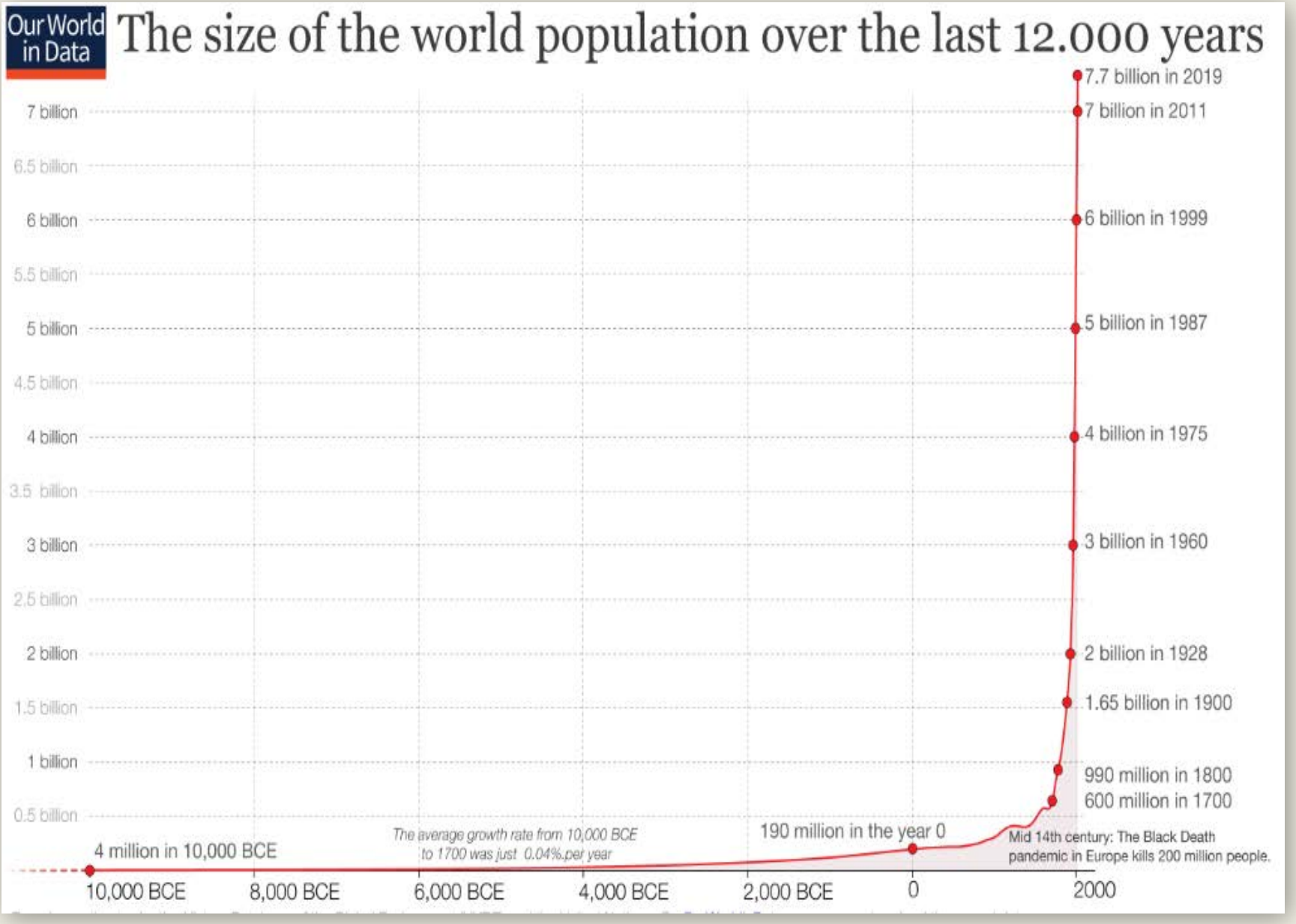
Overpopulation versus Biodiversity

How a Plethora of People Produces a Paucity of Wildlife

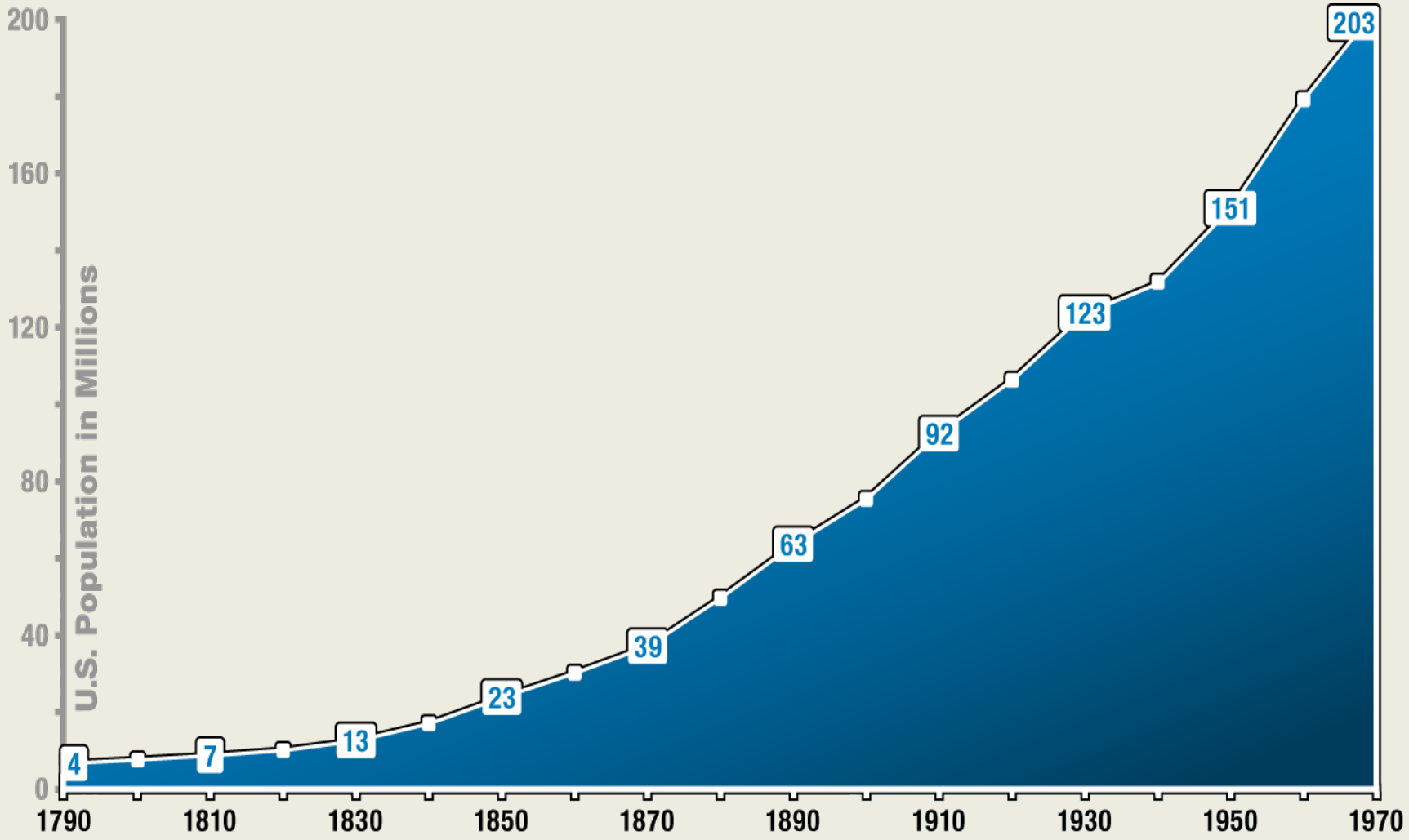
LEON KOLANKIEWICZ

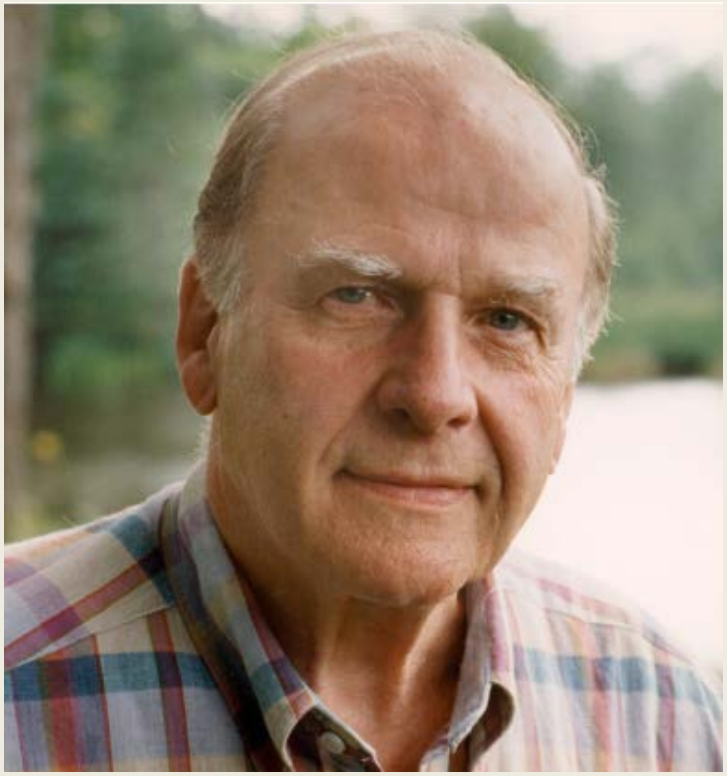

National Aeronautics and
Space Administration
NASA
Kennedy
Space
Center
Center-Wide Operations
Final Programmatic
Environmental Impact Statement


U.S. Fish & Wildlife Service
Revised Comprehensive Conservation Plan
Innoko National Wildlife Refuge


Our World in Data
The size of the world population over the last 12.000 years
7.7 billion in 2019
7 billion in 2011
6 billion in 1999
5 billion in 1987
4 billion in 1975
3 billion in 1960
2 billion in 1928
1.65 billion in 1900
990 million in 1800
600 million in 1700
7 billion
6.5 billion
6 billion
5.5 billion
5 billion
4.5 billion
4 billion
3.5 billion
3 billion
2.5 billion
2 billion
1.5 billion
1 billion
0.5 billion
4 million in 10,000 BCE
The average growth rate from 10,000 BCE to 1700 was just 0.04% per year
190 million in the year 0
Mid 14th century: The Black Death pandemic in Europe kills 200 million people.
10,000 BCE
8,000 BCE
6,000 BCE
4,000 BCE
2,000 BCE
0
2000

U.S. Population 1790 – 1970





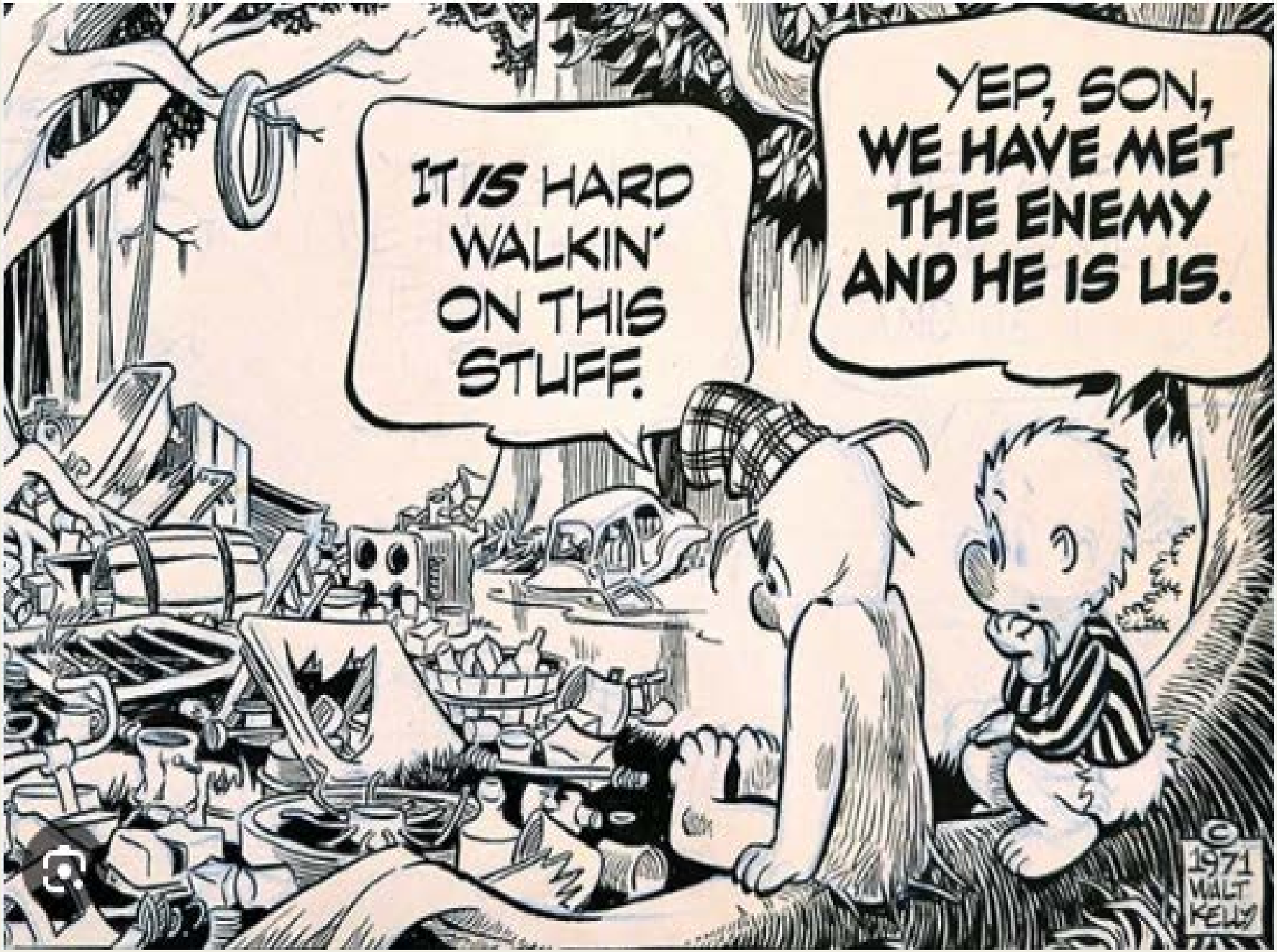
U.S. Senator Gaylord Nelson

(D-WI), 1916-2005, Founder or "Father" of Earth Day in 1970

"Gaylord Nelson Warns About Overpopulation"
-- Wisconsin Public Radio, October 12, 2002

"Founder of Earth Day Warns of Overpopulation"
-- Idaho Mountain Express, June 11-17, 2003

"The [overpopulation] cause had long animated him…"
-- The Making of the Modern Environmental Movement, 2023

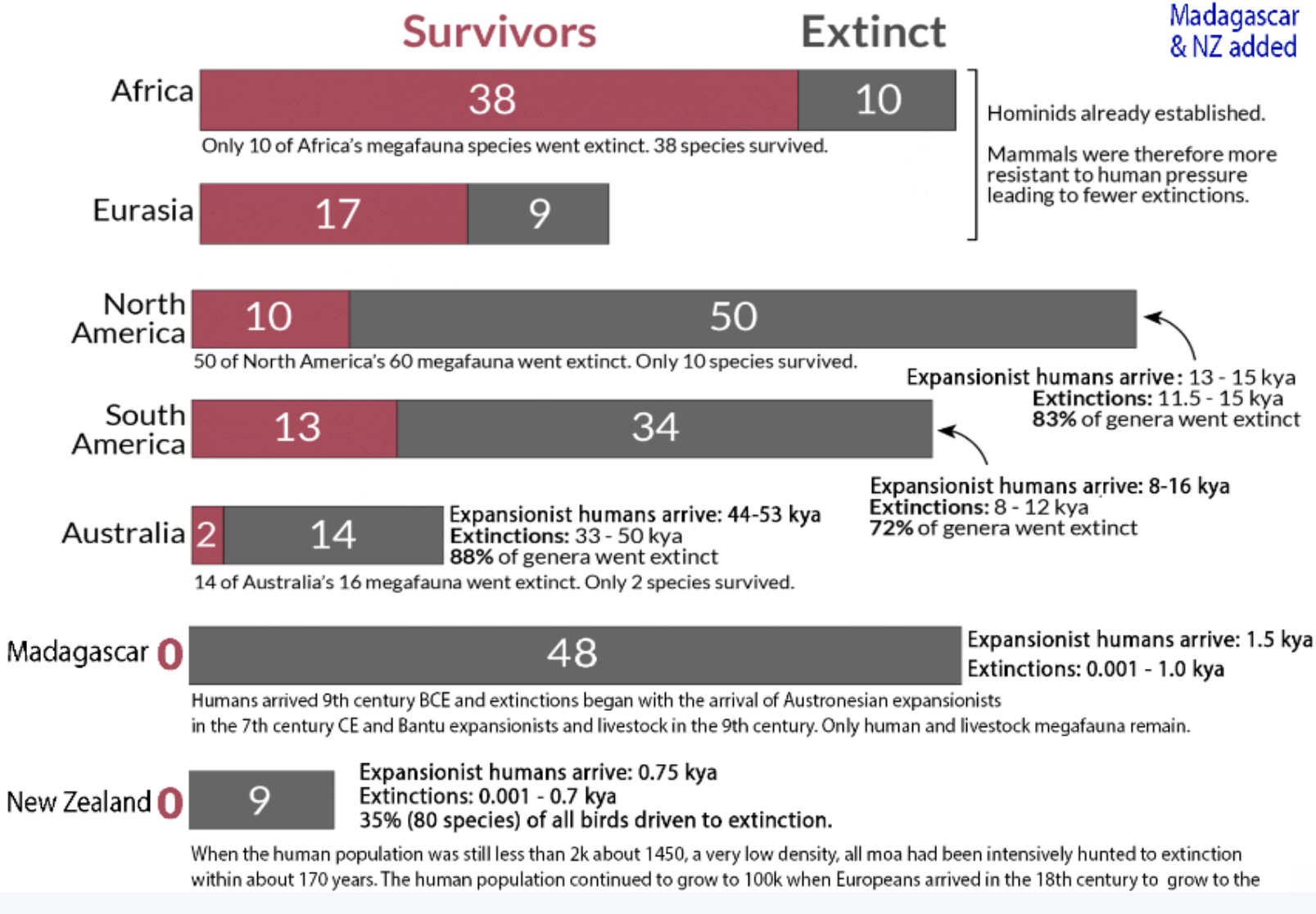

IT IS HARD WALKIN' ON THIS STUFF.
YEP, SON, WE HAVE MET THE ENEMY AND HE IS US.
© 1971 WALT KELLY

Megafauna losses at the Quaternary Extinction

The Quaternary extinction event (52,000 years BC to 9,000 years BC) killed >178 species of the world's largest mammals. Humans were the primary driver of these extinctions.

Our World in Data

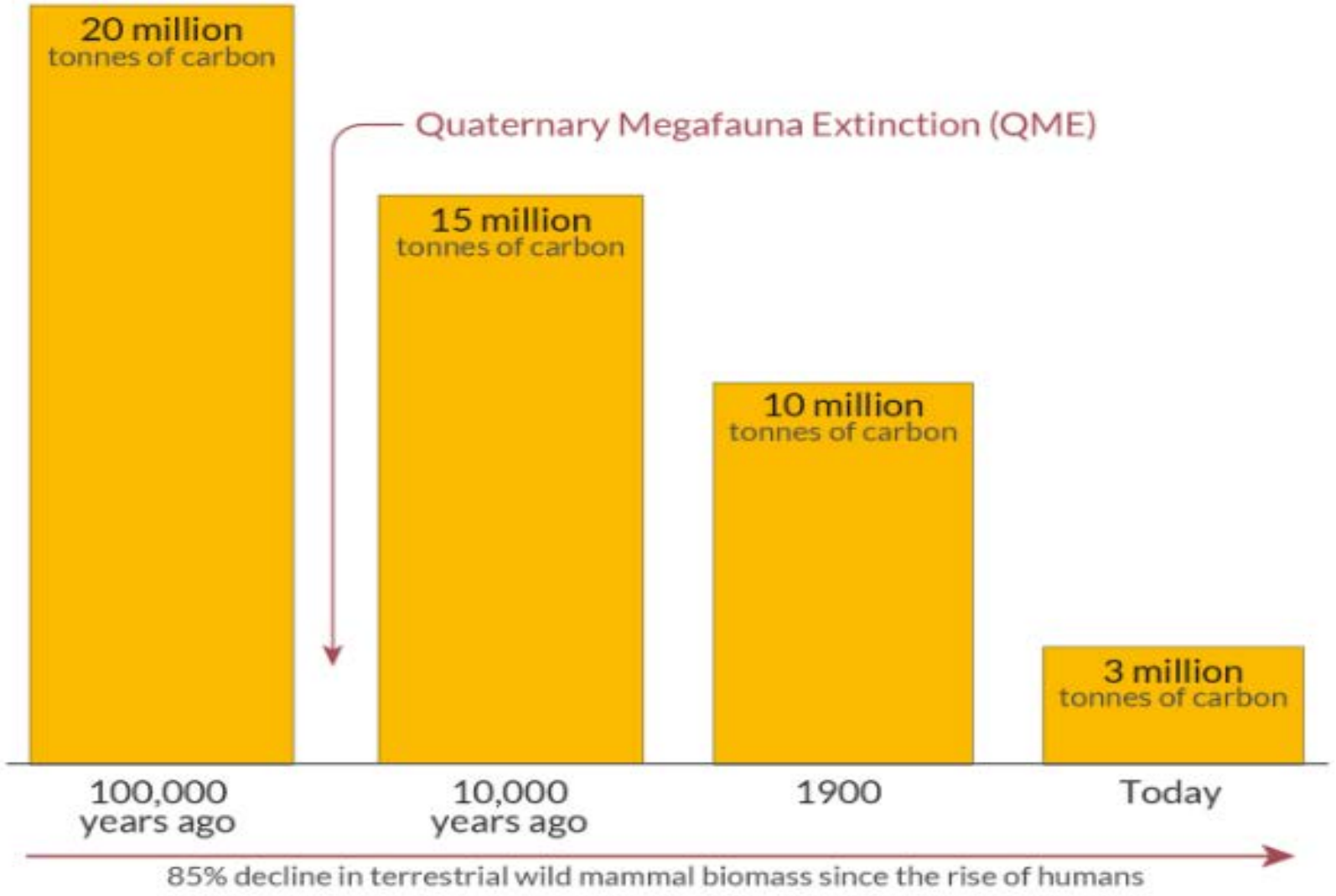
MODIFIED Madagascar & NZ added



The long-run decline of the world's wild mammals

Estimates of the total biomass the world's wild land mammals.
Biomass provides a proxy for the richness of the mammal kingdom.

Our World in Data



Weight of vertebrate land animals

population matters

10,000 YEARS AGO

99% Wild Animals

1% Humans

TODAY

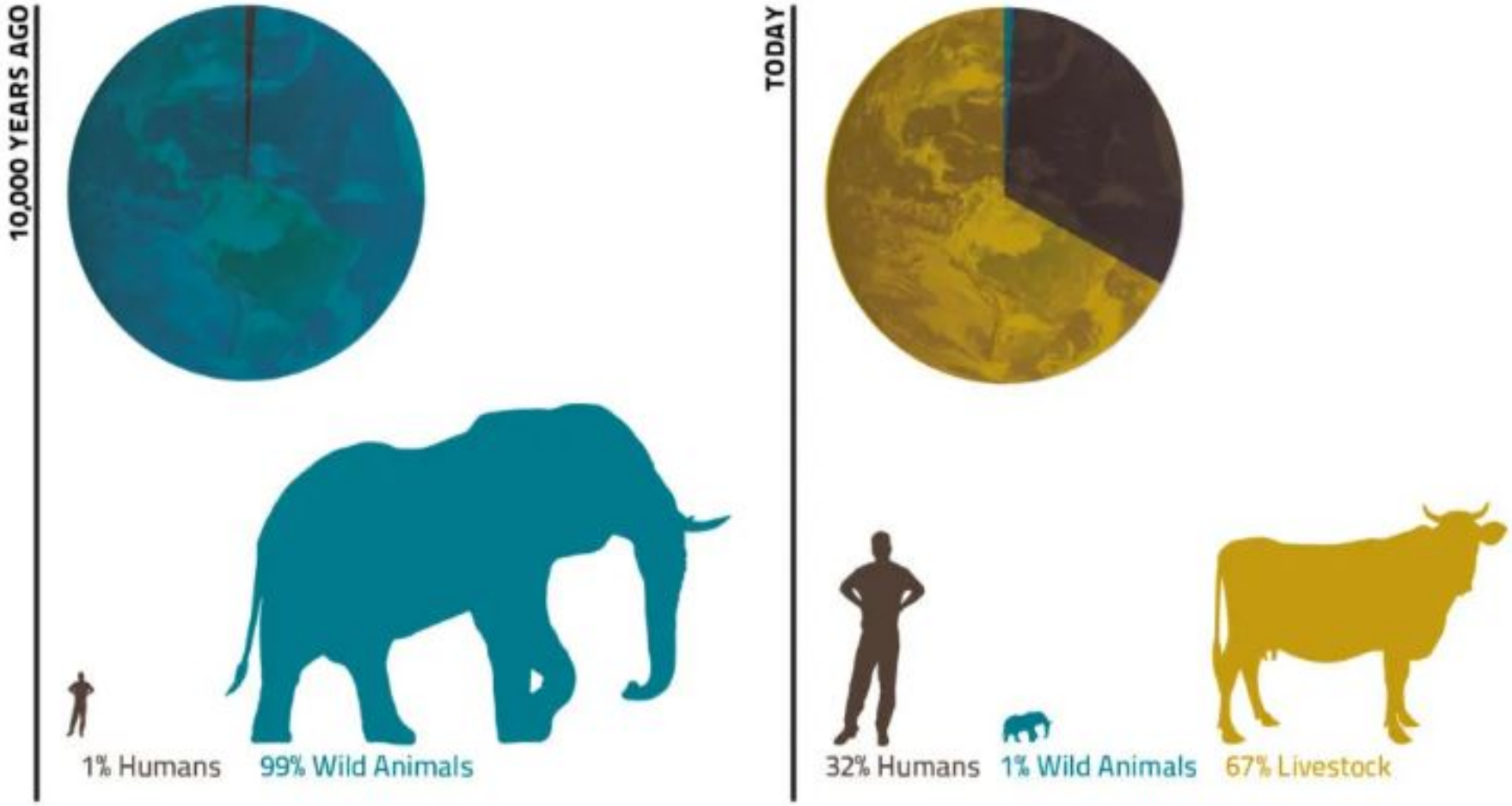
1% Wild Animals

32% Humans

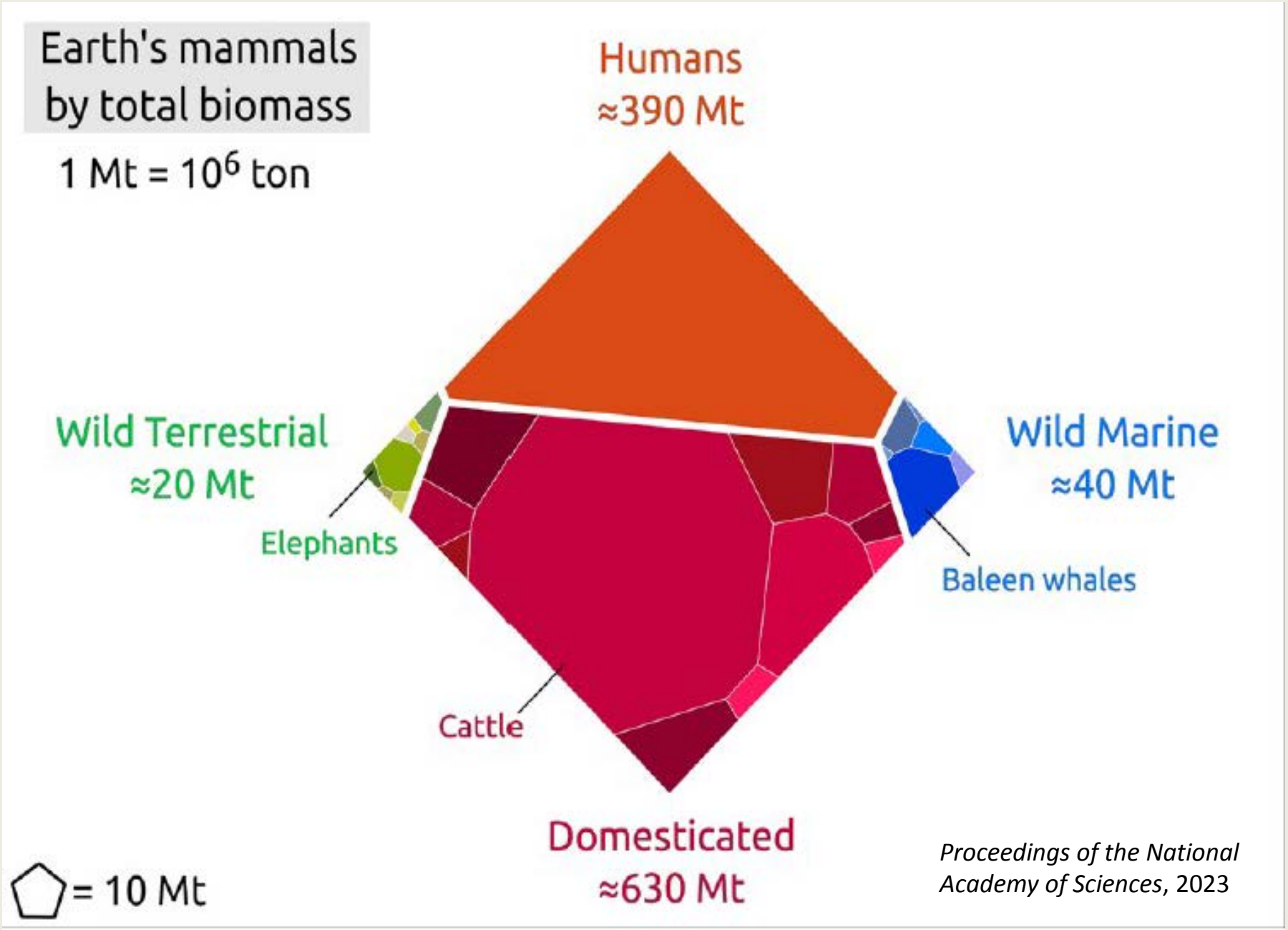
Calculations based on Smil (2011)

Weight of vertebrate land animals

population matters



Calculations based on Smil (2011)



Proceedings of the National Academy of Sciences, 2023

science.org SCIENCE

3 MARCH 2023 • VOL 379 ISSUE 6635

CONSERVATION

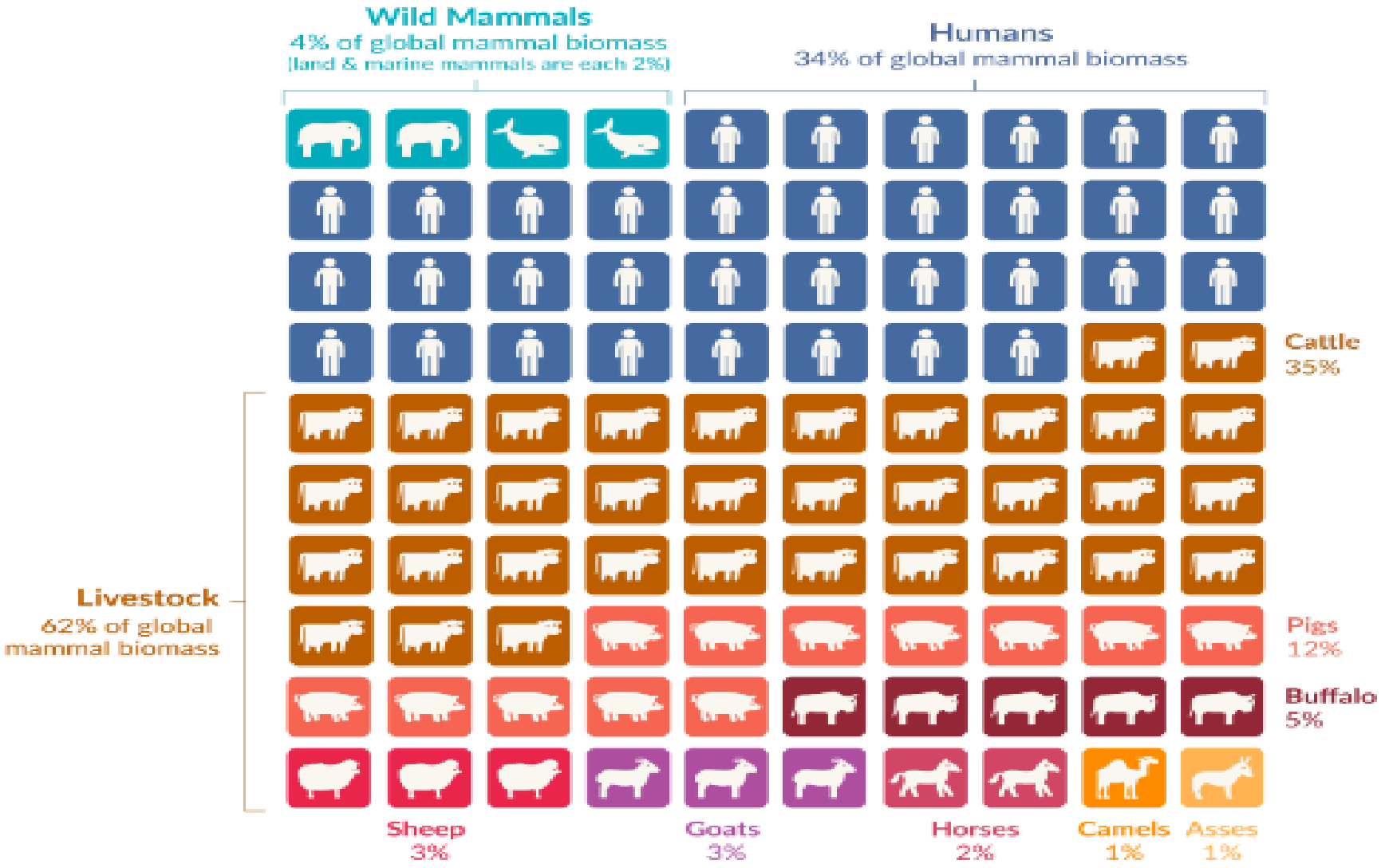
Wild mammals add up to a 'shockingly tiny' total biomass

Humans and domestic species far outweigh other mammals

Distribution of mammals on Earth

Our World in Data

Mammal biomass is measured in tonnes of carbon, and is shown for the year 2015. Each square corresponds to 1% of global mammal biomass.



Wildlife populations plummet by 69% since 1970

The crucial importance of Greater Yellowstone in the face of this gloomy temporal and global context

Wildlife in the Greater Yellowstone Ecosystem matters to Americans

How important to you is it that large wildlife species continue to survive and flourish in the Greater Yellowstone Ecosystem?

70% Very important
25% Somewhat important
4% Not very important
1% Not at all important
1% Not sure

Does the United States have a responsibility to the rest of the world to preserve the Greater Yellowstone Ecosystem or is preserving this ecosystem not a matter of global concern?

70% Yes
20% No
10% Not sure

Survey of 1,128 U.S. Likely Voters Conducted July 28-29, 2024
By Rasmussen Reports and NumbersUSA

Photo by Holly Pippel

Wildlife in the Greater Yellowstone Ecosystem matters <u>even more</u> to residents of Idaho, Montana, and Wyoming

How important to you is it that large wildlife species continue to survive and flourish in the Greater Yellowstone Ecosystem?

76% Very important
19% Somewhat important
3% Not very important
1% Not at all important
1% Not sure

Does the United States have a responsibility to the rest of the world to preserve the Greater Yellowstone Ecosystem or is preserving this ecosystem not a matter of global concern?

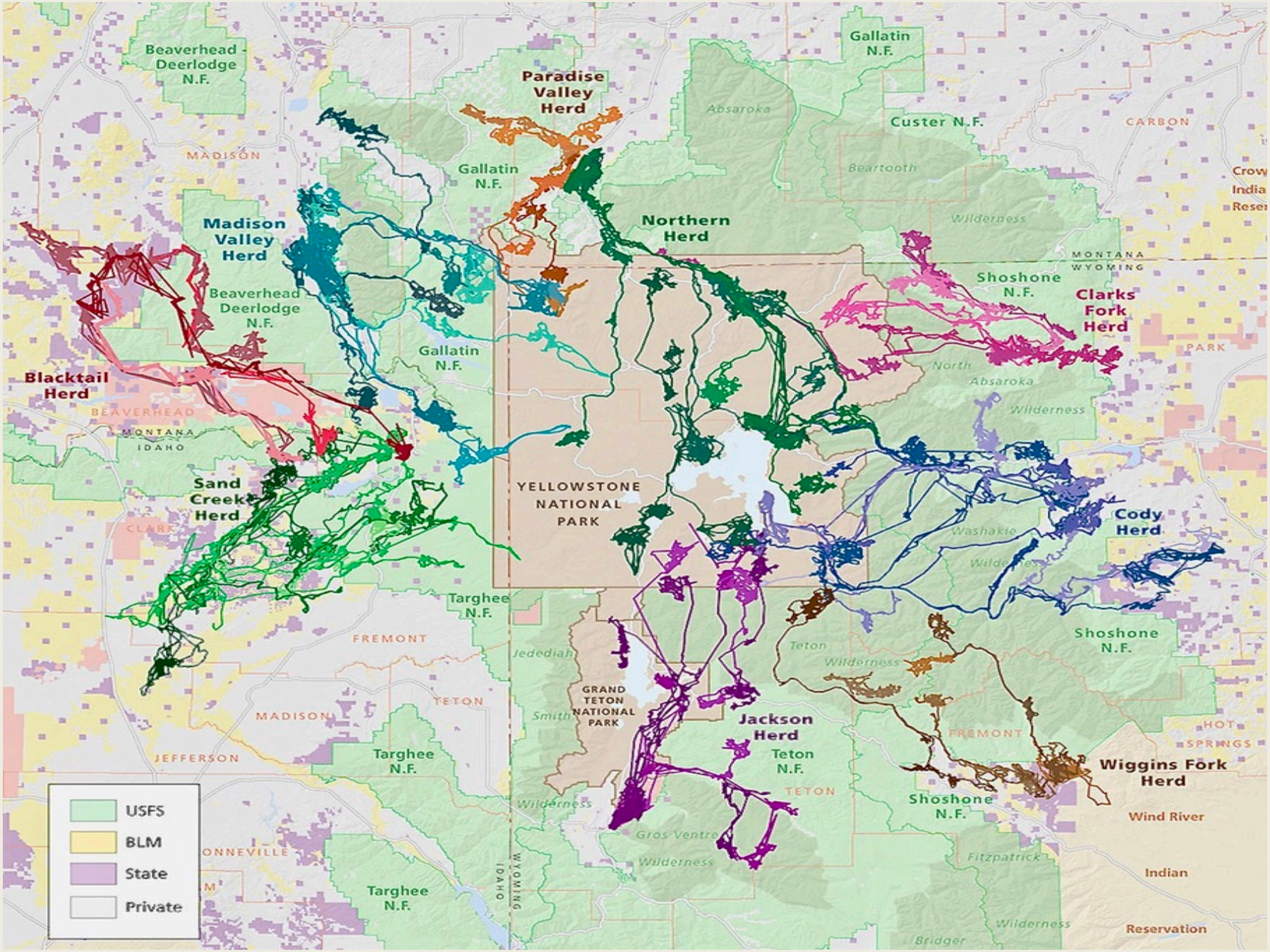
76% Yes
14% No
10% Not sure

Survey of 829 Idaho, Montana, and Wyoming Likely Voters Conducted July 28-30, 2024 by Rasmussen Reports and NumbersUSA

Photo by Holly Pippel

But in recent decades, especially on the private, non-federal lands in the GYE, the squeeze is on as the population and development boom.

Photo by Holly Pippel


Paradise Valley Herd
Northern Herd
Madison Valley Herd
Blacktail Herd
Sand Creek Herd
Clarks Fork Herd
Cody Herd
Jackson Herd
Wiggins Fork Herd
YELLOWSTONE NATIONAL PARK
GRAND TETON NATIONAL PARK
Beaverhead - Deerlodge N.F.
Gallatin N.F.
Custer N.F.
Shoshone N.F.
Targhee N.F.
Teton N.F.
Absaroka Wilderness
Beartooth Wilderness
North Absaroka Wilderness
Washakie Wilderness
Teton Wilderness
Gros Ventre Wilderness
Fitzpatrick Wilderness
Bridger Wilderness
MONTANA
WYOMING
IDAHO
MADISON
BEAVERHEAD
CLARK
FREMONT
TETON
JEFFERSON
CARBON
PARK
HOT SPRINGS
Wind River Indian Reservation
USFS
BLM
State
Private

Everyday

Traffic

Everyday

Casualties

Photos by Holly Pippel

Wildlife, especially large ungulates, gradually being squeezed out of private lands in the Greater Yellowstone Ecosystem

IPAT

Or

I = P x A x T

Or

[Environmental] Impact = Population x Affluence x Technology

Paul R. Ehrlich and John P. Holdren, “Impact of Population Growth,” *Science* 171 (1971), 1212–17.

Photo by Holly Pippel

POPULATION

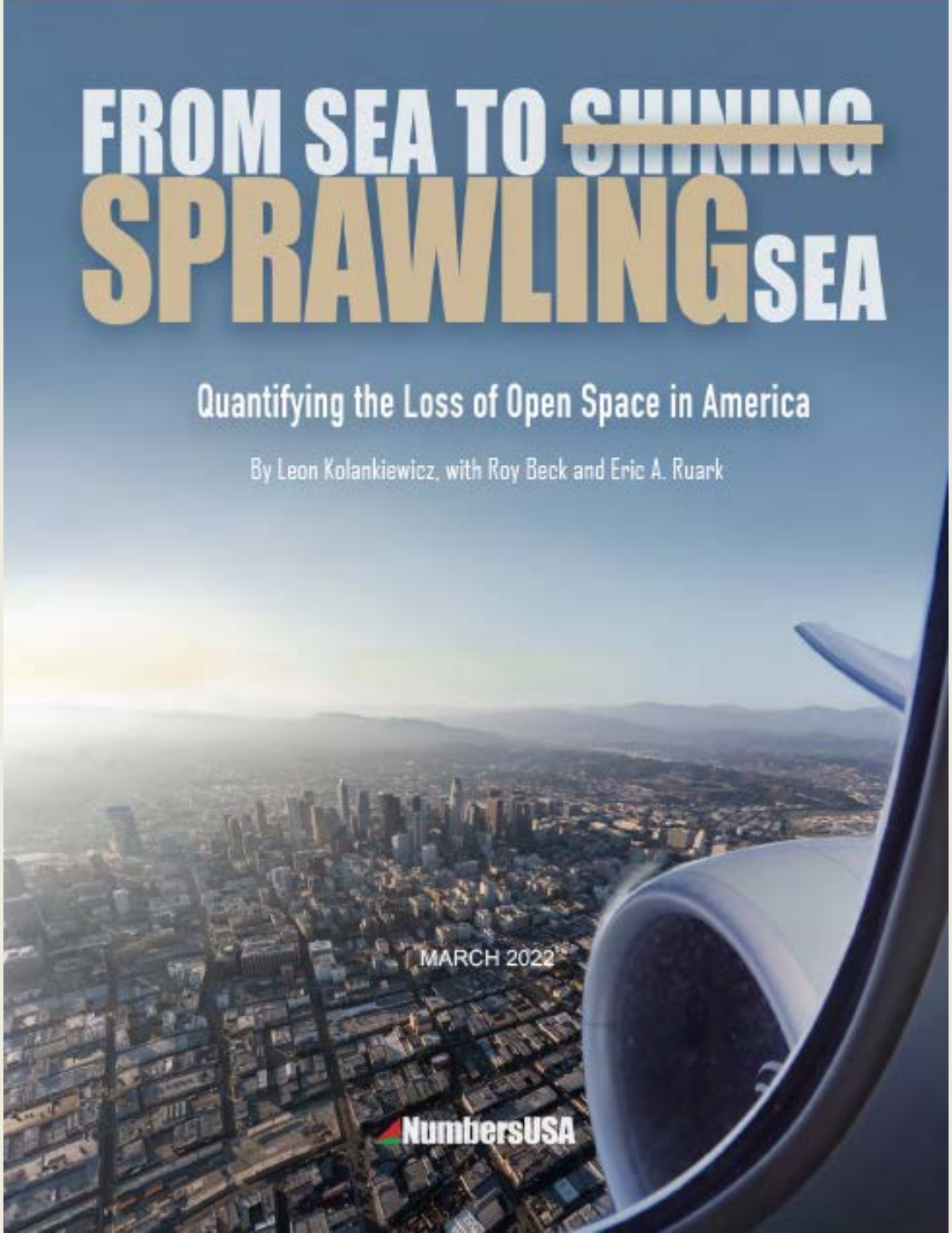
I = _ AT:

The Missing Part of the Environmental Impact Equation

FROM SEA TO ~~SHINING~~ SPRAWLING SEA

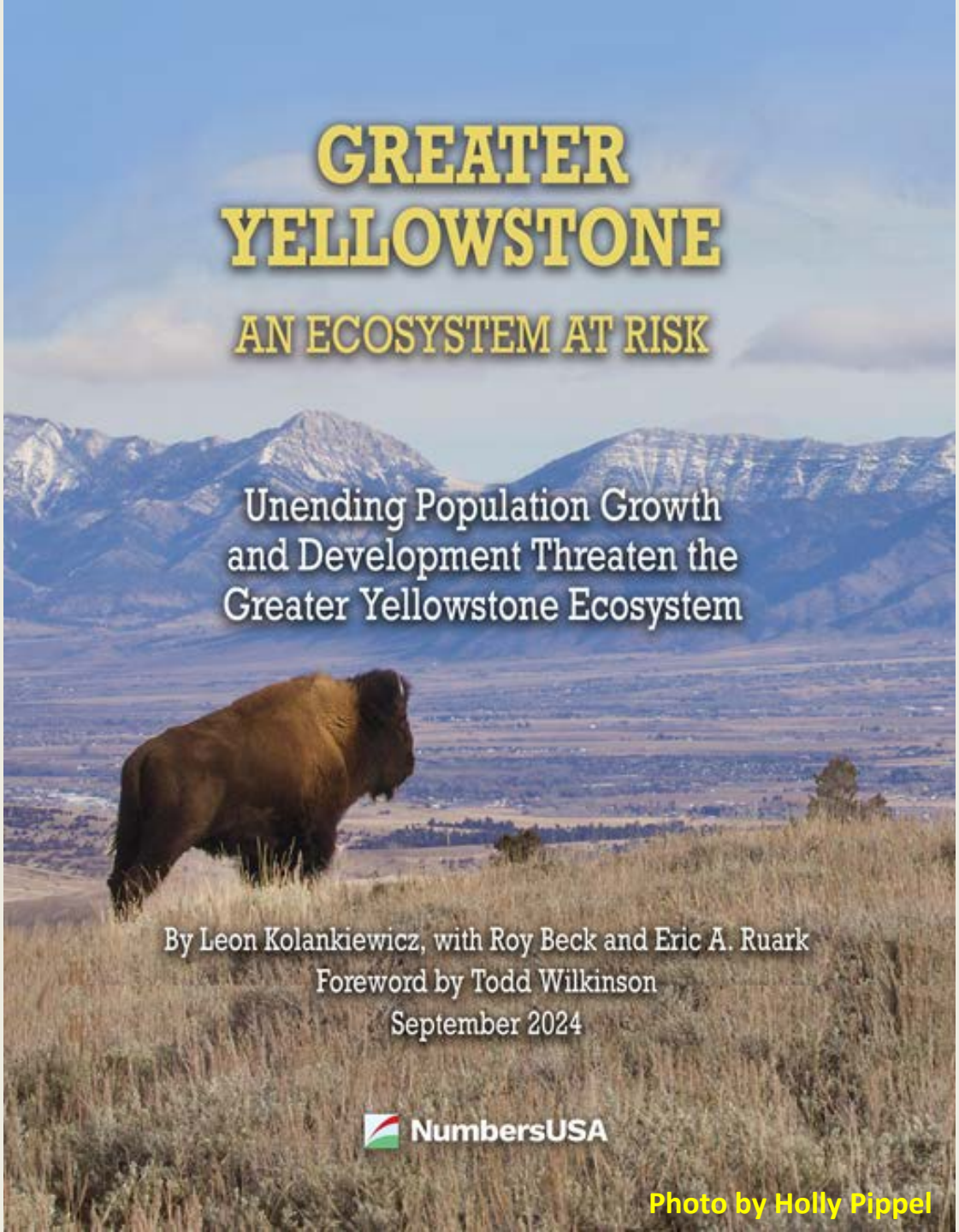
Quantifying the Loss of Open Space in America

By Leon Kolankiewicz, with Roy Beck and Eric A. Ruark



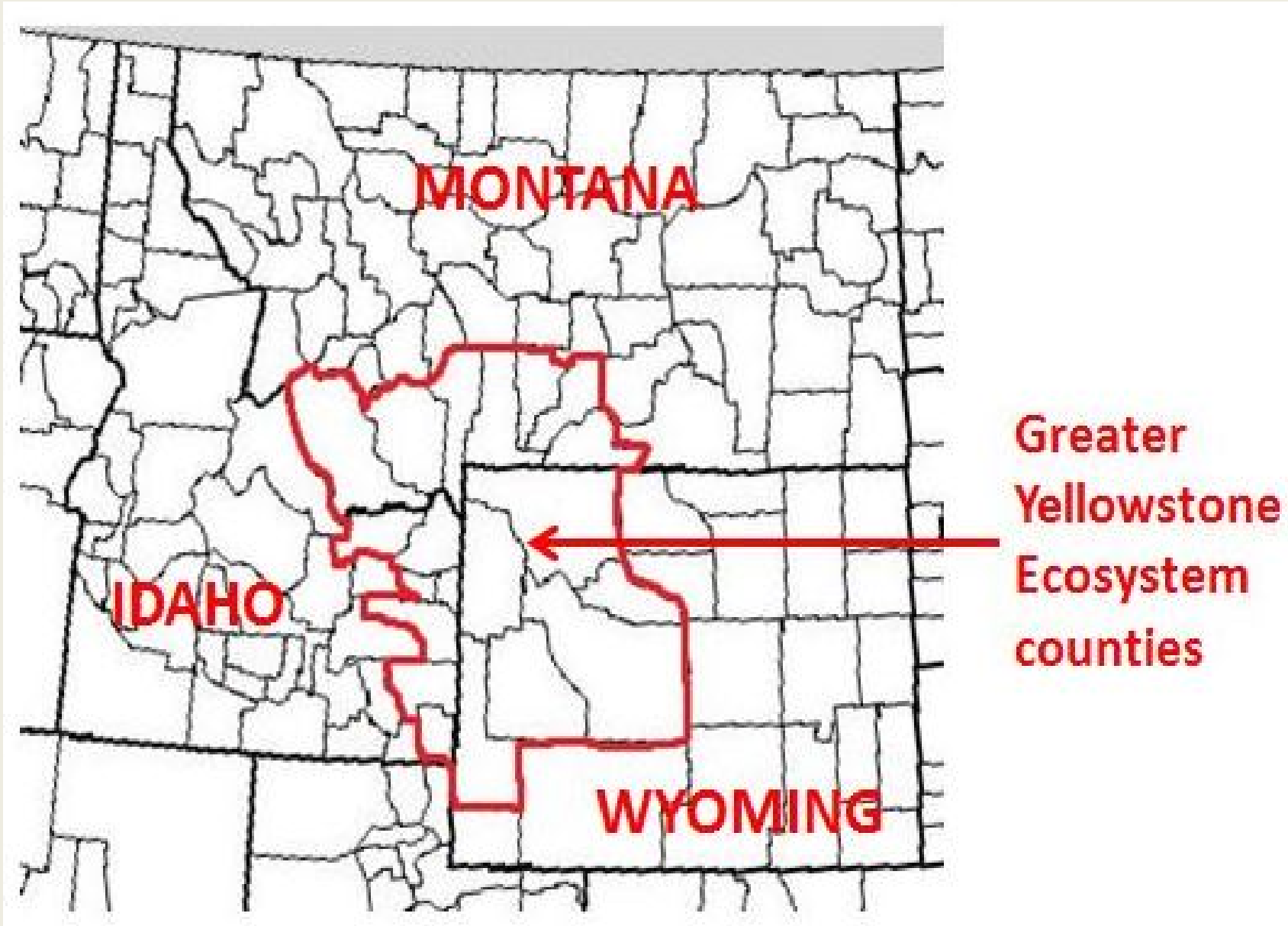
MARCH 2022

NumbersUSA


GREATER YELLOWSTONE
AN ECOSYSTEM AT RISK
Unending Population Growth and Development Threaten the Greater Yellowstone Ecosystem
By Leon Kolankiewicz, with Roy Beck and Eric A. Ruark
Foreword by Todd Wilkinson
September 2024
NumbersUSA
Photo by Holly Pippel

This study quantified the respective roles of two fundamental factors that drive increasing development on non-federal (mostly private) lands in the 20 counties that comprise the GYE: 1) population growth, and 2) increasing per capita land consumption (i.e., declining population density).

Photo by Holly Pippel


MONTANA
IDAHO
WYOMING
Greater
Yellowstone
Ecosystem
counties

I = P x A x T

can also be stated as

I = P x c

Where

P = population size

and

c = per capita consumption

Photo by Holly Pippel

We used a mathematical formula originally developed to assess the relative weights of increasing population size and per capita energy use in determining the nation's aggregate energy consumption.* This "apportioning" approach can be applied to any natural resource whose aggregate consumption is increasing over time. In this study, rural, undeveloped land is the natural resource in question.

*John P. Holdren. 1991. "Population and the Energy Problem." *Population and Environment*, Vol. 12, No. 3, Spring 1991. Holdren served as Director of the White House Office of Science and Technology Policy from 2009-2017

Photo by Holly Pippel

Data Sources:

- National Resources Inventory (NRI) of USDA's Natural Resources Conservation Service (NRCS). The NRI has estimated land use and cover on America's non-federal lands county-by-county every five years from1982 up through 2017.

- U.S. Census Bureau county population estimates for 1982, 2002, and 2017.

Photo by Holly Pippel

Results

The area of developed non-federal land in the 20 GYE counties grew from 345,300 acres in 1982 to 497,400 acres (777.2 square miles) in 2017, an increase of 44% or 152,100 acres (237.7 square miles). Approximately 67% of this increase was related to population growth and 33% to increasing per capita developed land consumption.

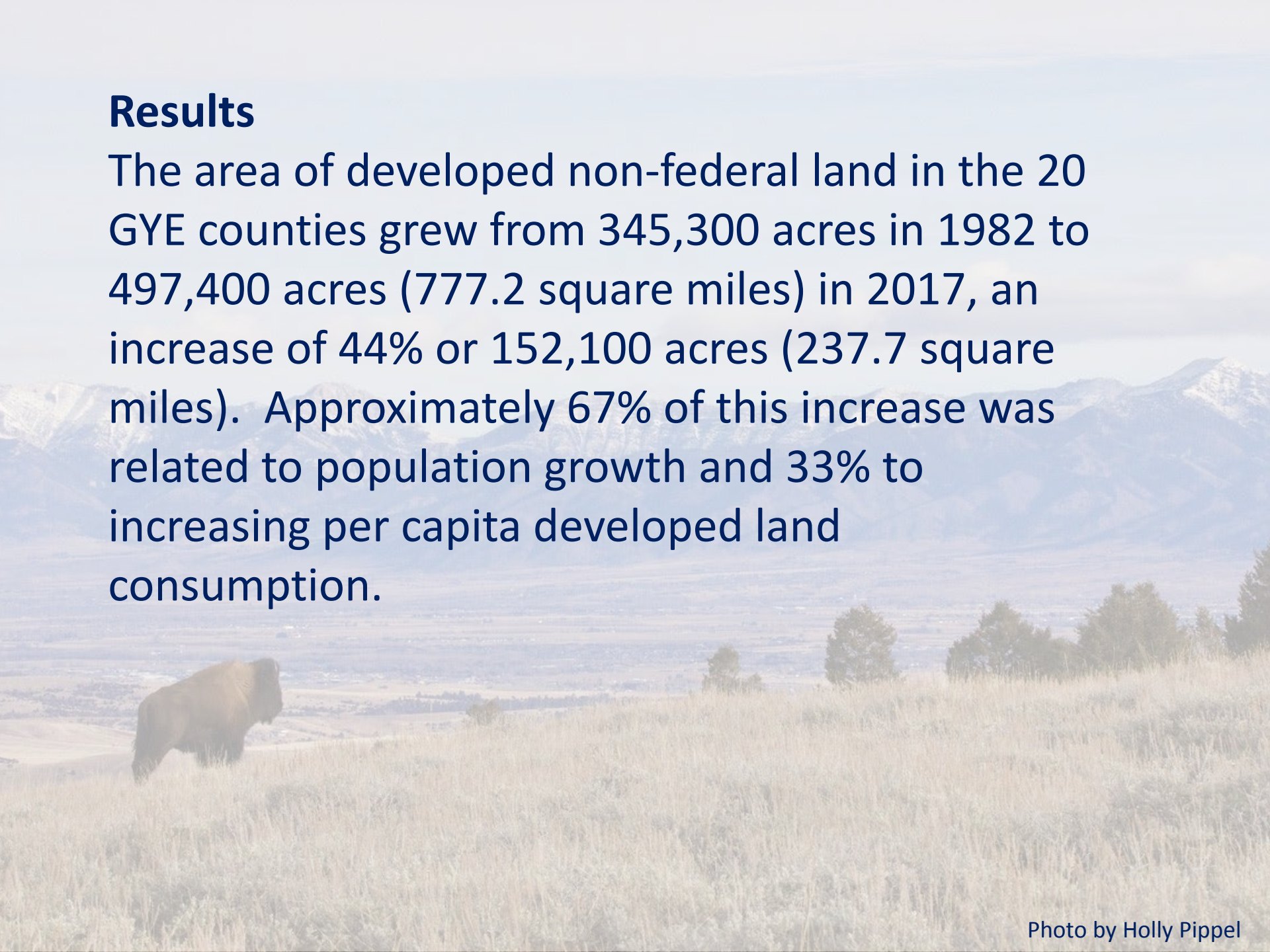
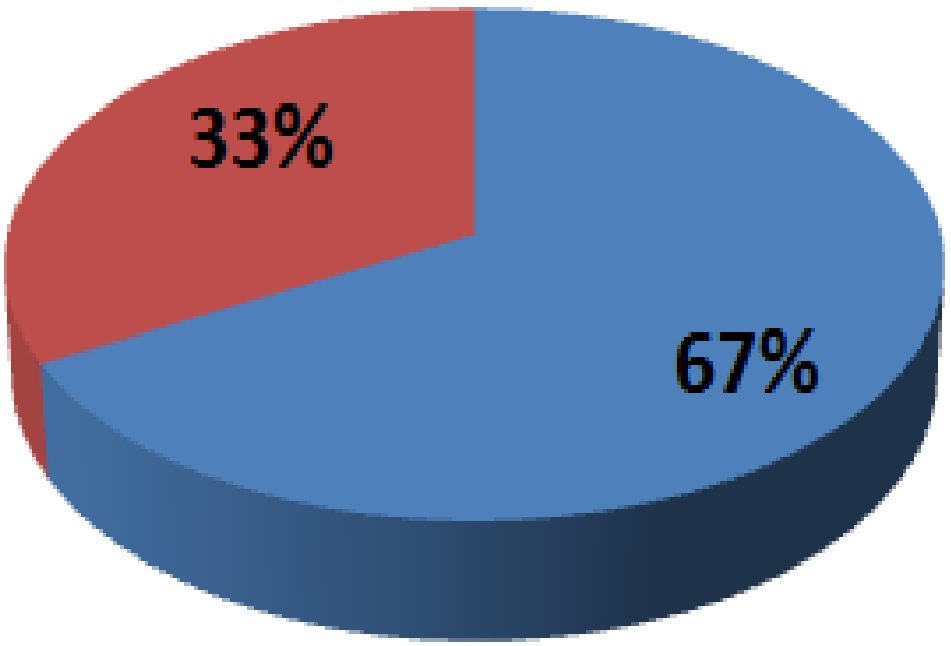
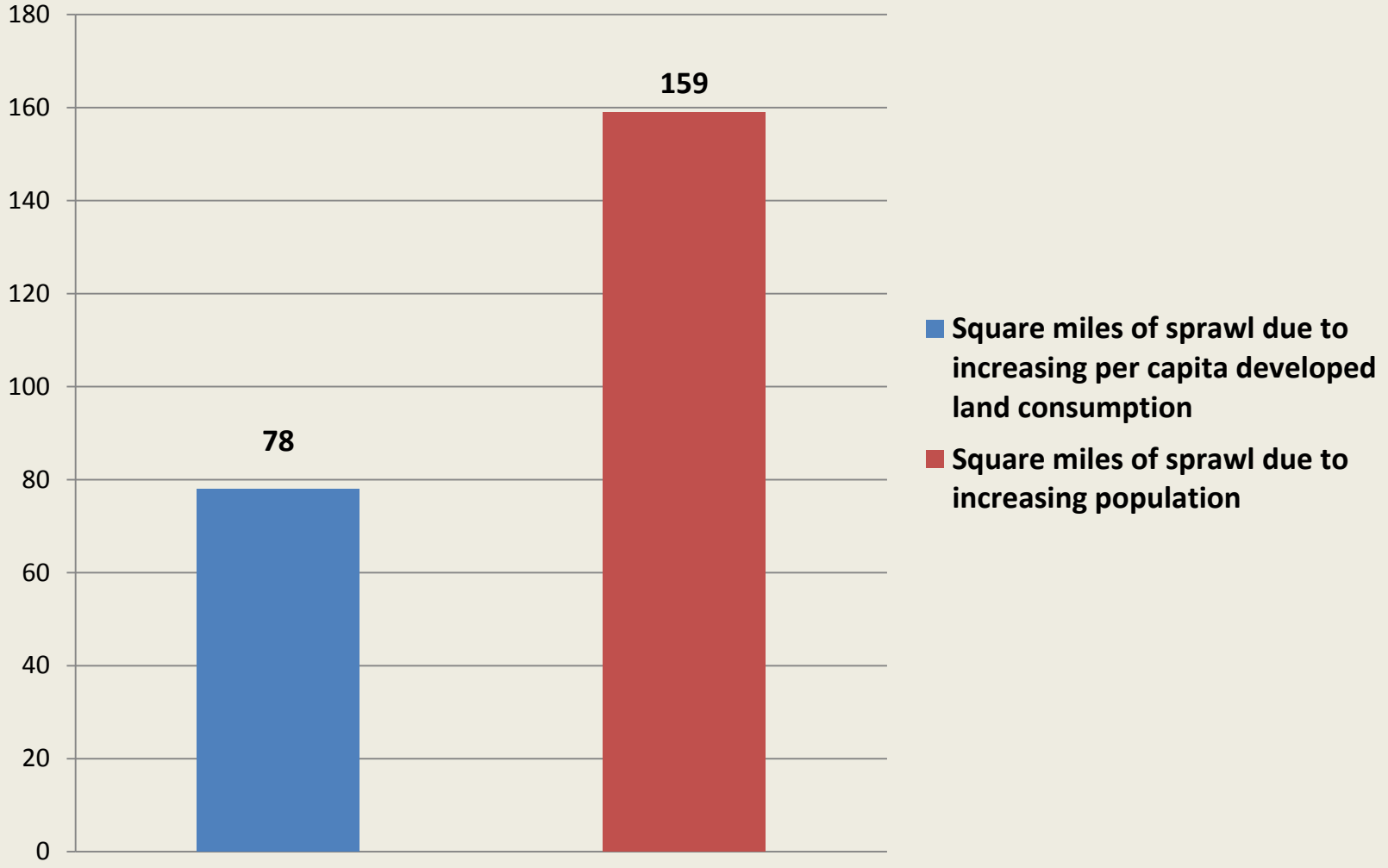
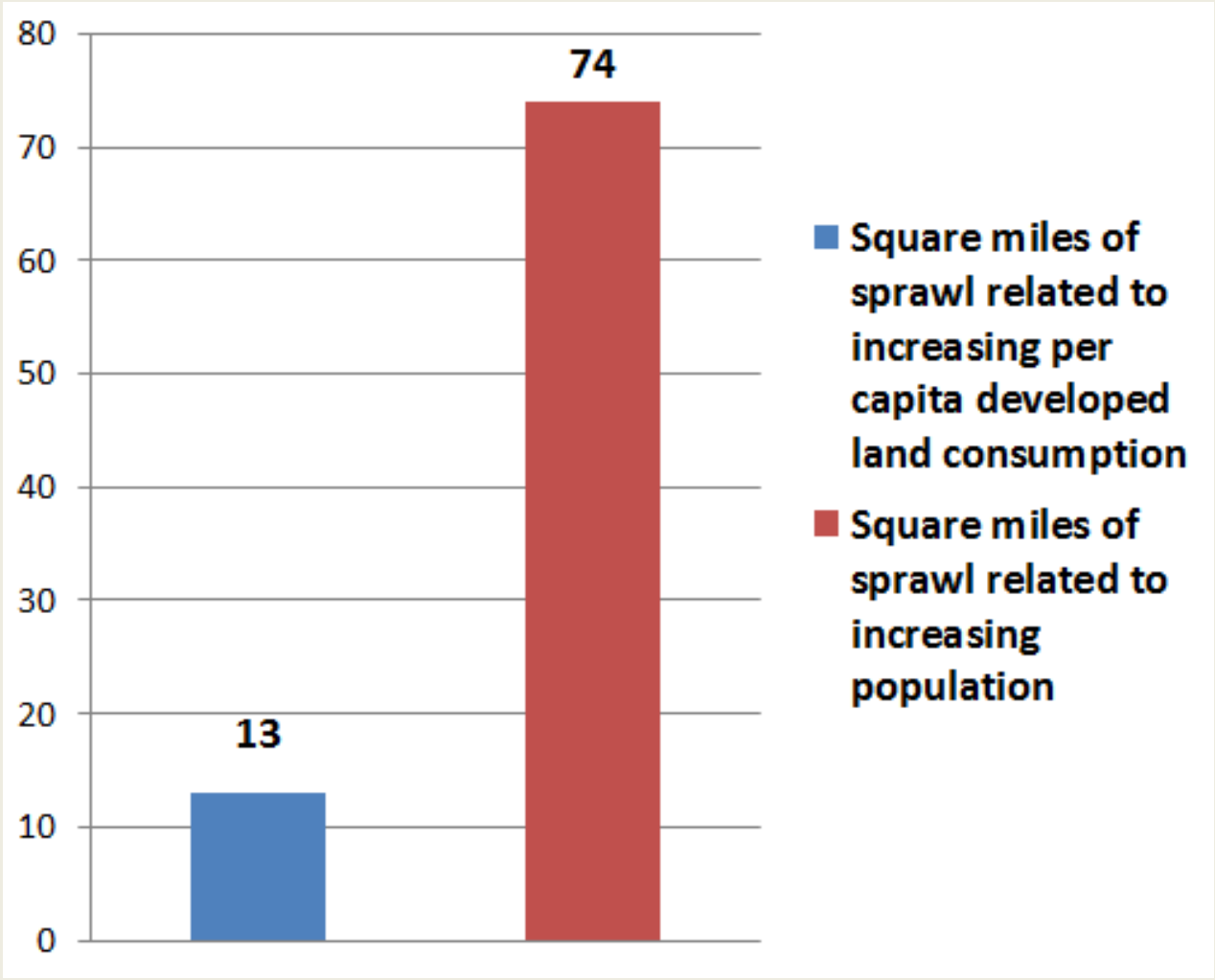


Photo by Holly Pippel


33%
67%
Percent of GYE's 1982-2017 sprawl (conversion of rural to developed land) related to population growth
Percent of GYE's 1982-2017 sprawl (conversion of rural to developed land) related to increasing per capita land consumption



Rural Land Lost to Population Growth vs. Per Capita Sprawl in the 20 Greater Yellowstone Ecosystem Counties, 1982-2017



Rural Land Lost to Population Growth vs. Per Capita Sprawl in the 20 Greater Yellowstone Ecosystem Counties, 2002-2017

By 2060, the aggregate population of the GYE counties is projected to grow to 763,471, from 538,702 in 2022, an increase of 224,769 or 42%. If average population density were to remain constant, this would lead to the loss of another 231,500 acres (362 square miles) of rural land (e.g., habitat, ranchland), unevenly distributed throughout the GYE, with adverse, potentially significant, long-term effects on large mammals in particular.

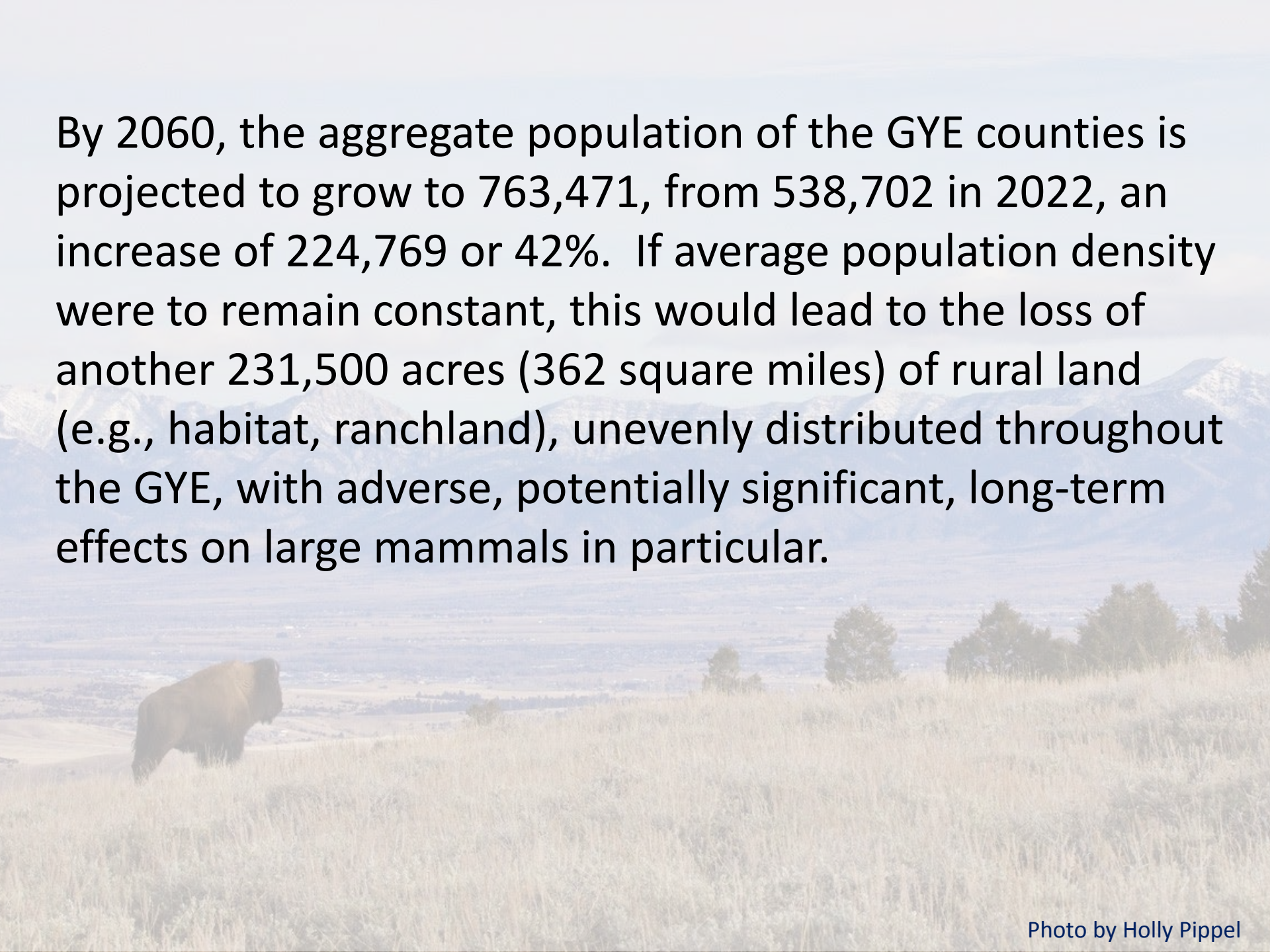


Photo by Holly Pippel

What can be done at the local level to slow the rate of sprawl and habitat loss (municipal, county, regional, statewide measures)?

- Smart growth and growth management tools
- Land use zoning
- Transfer of development rights
- New funding sources for land protection
- Urban growth boundaries
- Open space bonds and local land trusts
- Compact development

All of these require political support at the local, municipal, county, regional, and state levels

Photo by Holly Pippel

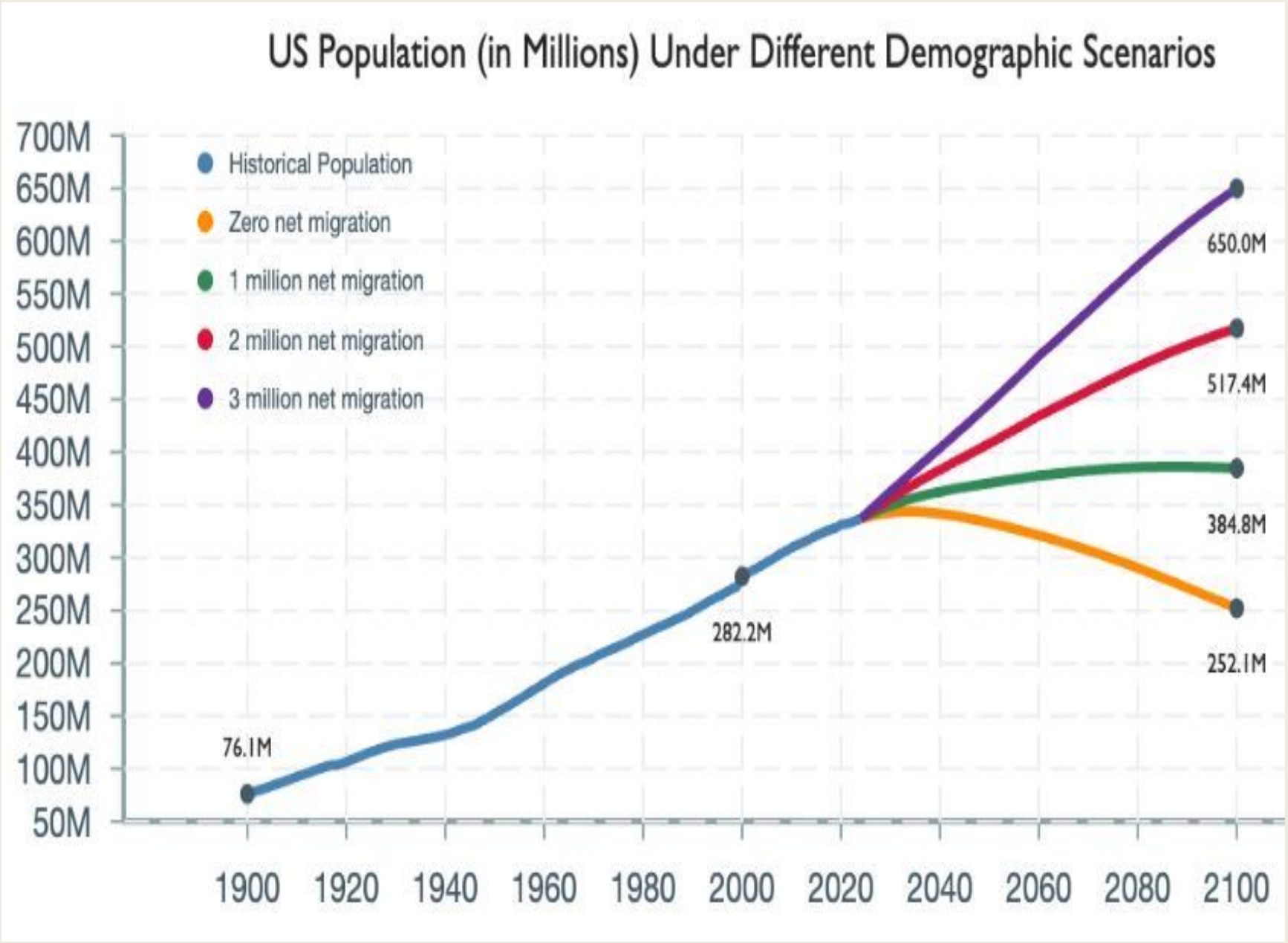
All of the approaches and measures on the preceding page have the net effect of accommodating additional population growth by increasing population densities on developed lands.

One way to accommodate continued population growth in Greater Yellowstone without losing as much natural habitat and farmland to development would be to increase population density by changing zoning and other regulations so more residents live in apartments.

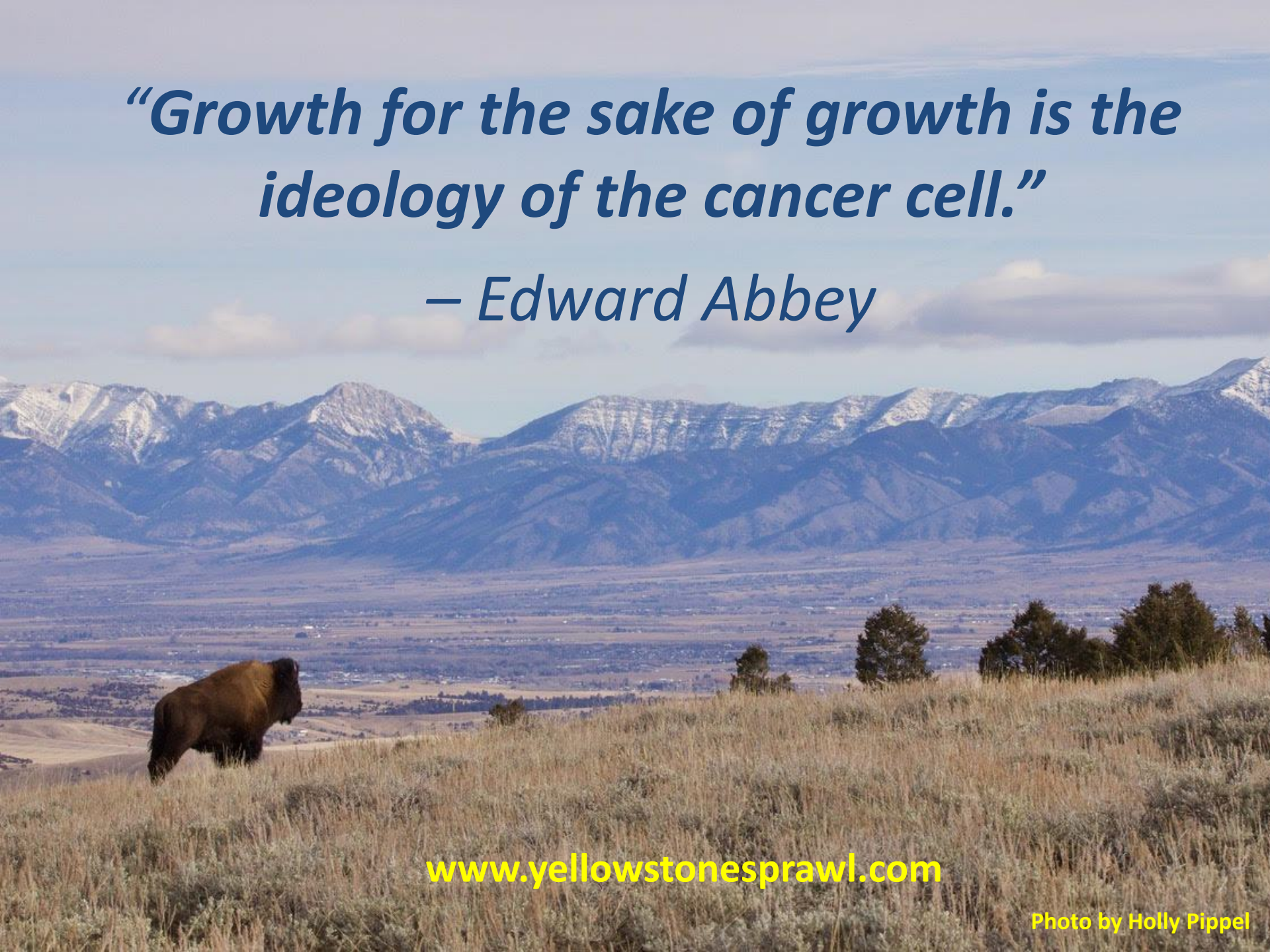
24% Strongly favor
31% Somewhat favor
20% Somewhat oppose
16% Strongly oppose
10% Not sure

Survey of 829 Idaho, Montana, and Wyoming Likely Voters conducted July 28-30, 2024 by Rasmussen Reports and NumbersUSA

Photo by Holly Pippel


US Population (in Millions) Under Different Demographic Scenarios
700M
650M
600M
550M
500M
450M
400M
350M
300M
250M
200M
150M
100M
50M
Historical Population
Zero net migration
1 million net migration
2 million net migration
3 million net migration
650.0M
517.4M
384.8M
282.2M
252.1M
76.1M
1900
1920
1940
1960
1980
2000
2020
2040
2060
2080
2100

But for how long at current growth rates?


“Growth for the sake of growth is the ideology of the cancer cell.”
– Edward Abbey
www.yellowstonesprawl.com
Photo by Holly Pippel