

YELLOWSTONE NATIONAL PARK



Ana Noel

MAR 373

May 5th

Geographic Region

- Yellowstone National Park
- Within boundaries of park
- 3,468 square miles
- Exclude bodies of water





Environmental Conditions



Spring and fall

Day: 0 to 20 °C
Night: -5 to -20 °C



Summer

Day: 25 to 35 °C
Night: below freezing, high
elevations



Winter

-5 to -20 °C



Average snowfall

30.5 cm/day
381 cm/year



Average elevation

2,400 m

Environmental Conditions

Monthly Averages

Month	Average High Temperature		Average Low Temperature		Average Precipitation		Average Total Snow Fall	
	°F	°C	°F	°C	Inches	cm	Inches	cm
January	28.6	-1.9	9.6	-12.4	1.1	2.8	14.5	36.8
February	34.0	1.1	13.0	-10.6	0.75	1.9	10.4	26.4
March	39.6	4.2	17.2	-8.2	1.1	2.8	13.1	33.3
April	49.4	9.7	26.0	-3.3	1.2	3.0	5.9	15.0
May	60.4	15.8	34.3	1.3	2.0	5.1	1.5	3.8
June	70.0	21.1	41.2	5.1	1.5	3.8	0.1	0.3
July	79.6	26.4	46.7	8.2	1.5	3.8	0.0	0
August	78.3	25.7	45.3	7.4	1.4	3.6	0.0	0
September	67.8	19.9	37.0	2.8	1.3	3.3	0.5	1.3
October	55.7	13.2	29.4	-1.4	1.0	2.5	3.7	9.4
November	38.7	3.7	19.2	-7.1	1.0	2.5	9.0	22.9
December	30.5	-0.8	11.8	-11.2	1.0	2.5	13.5	34.3
Annual	52.8°F	11.6°C	27.6°F	-2.4°C	15.4"	39.1 cm	72.1	183.1 cm

Daylight Hours

9 hours

11 hours

12 hours

14 hours

15 hours

16 hours

15 hours

14 hours

13 hours

11 hours

10 hours

9 hours

Secondary and tertiary consumers

28.1 kg (primary consumers)

.5 kg (small primary consumers)

.468 kg/scat (berries)

Omnivores

36 kg/ha (berries)

Primary consumers

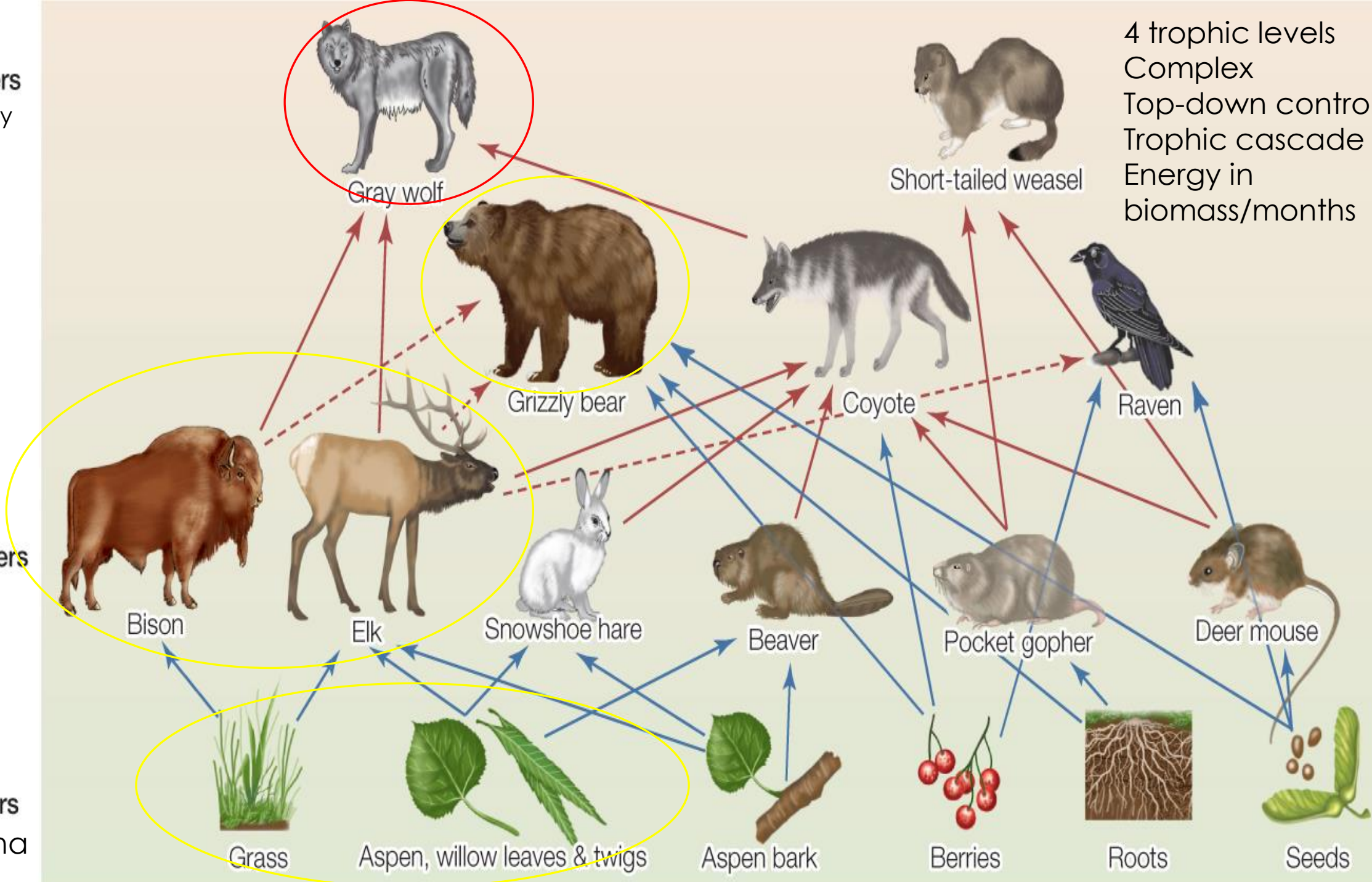
228 kg/ha (grass)

.273 kg/ha (trees, leaves)

Primary producers

209,250 kg/ha

4 trophic levels
Complex
Top-down control
Trophic cascade
Energy in biomass/months



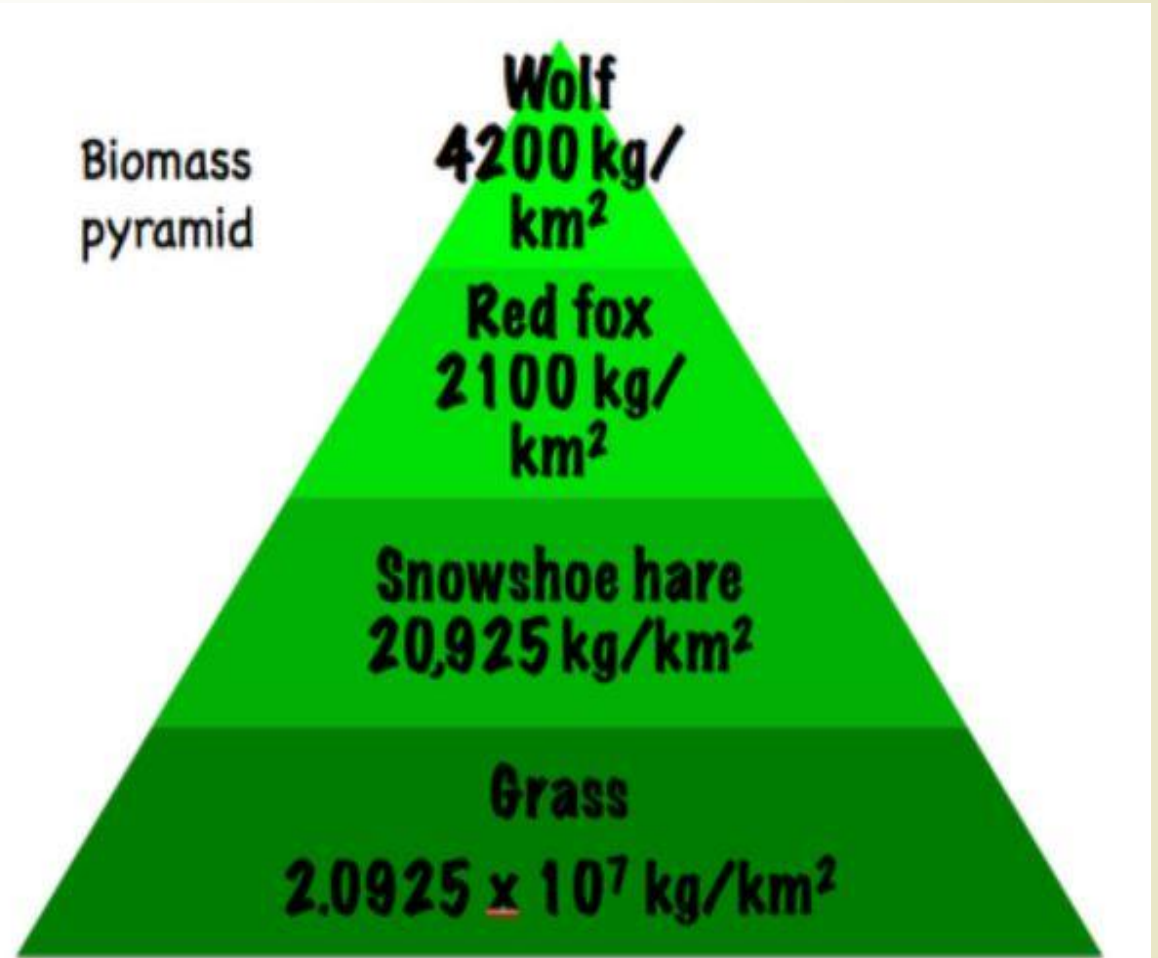
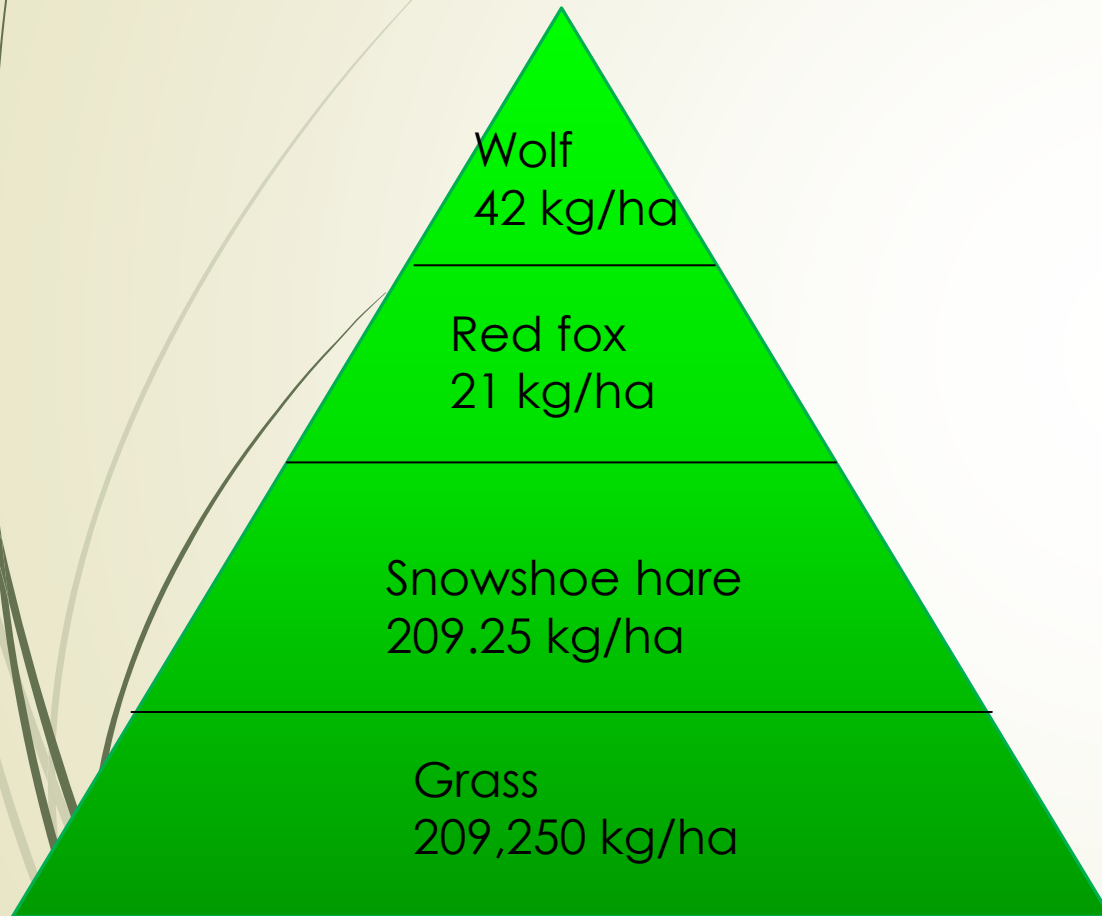
Biomass: Wolf

Type of food	Number of scats (N = 508)		Ingested biomass		Prey mean mass ^c		
	N	%	kg	%	Adult	Juvenile	Mean mass
Wild ungulates							
Roe deer	319	62.8	38.2	42.9	24.5	7	11.5
Red deer	64	12.6	28.1	31.6	90	25	90
Wild boar	51	10.0	10.2	11.5	75	22	31.2
Fallow deer ^a	5	1.0	0.9	1	51.5	5.2	28.4
Mouflon ^a	1	0.2	0.1	0.1	33.8	2.3	18.1
Domestic ungulates							
Sheep	39	7.7	7.4	8.3	28.5	5	28.5
Goat	15	2.9	2.7	3	26.3	5	26.3
Other prey							
Dog ^a	3	0.6	0.4	0.5	15.0	-	-
Badger ^a	3	0.6	0.4	0.5	12.0	-	-
Cat ^a	1	0.2	0.1	0.1	4.3	-	-
Rabbit ^a	6	1.2	0.5	0.5	1.2	-	-
Birds ^b	1	0.2	-	-	-	-	-

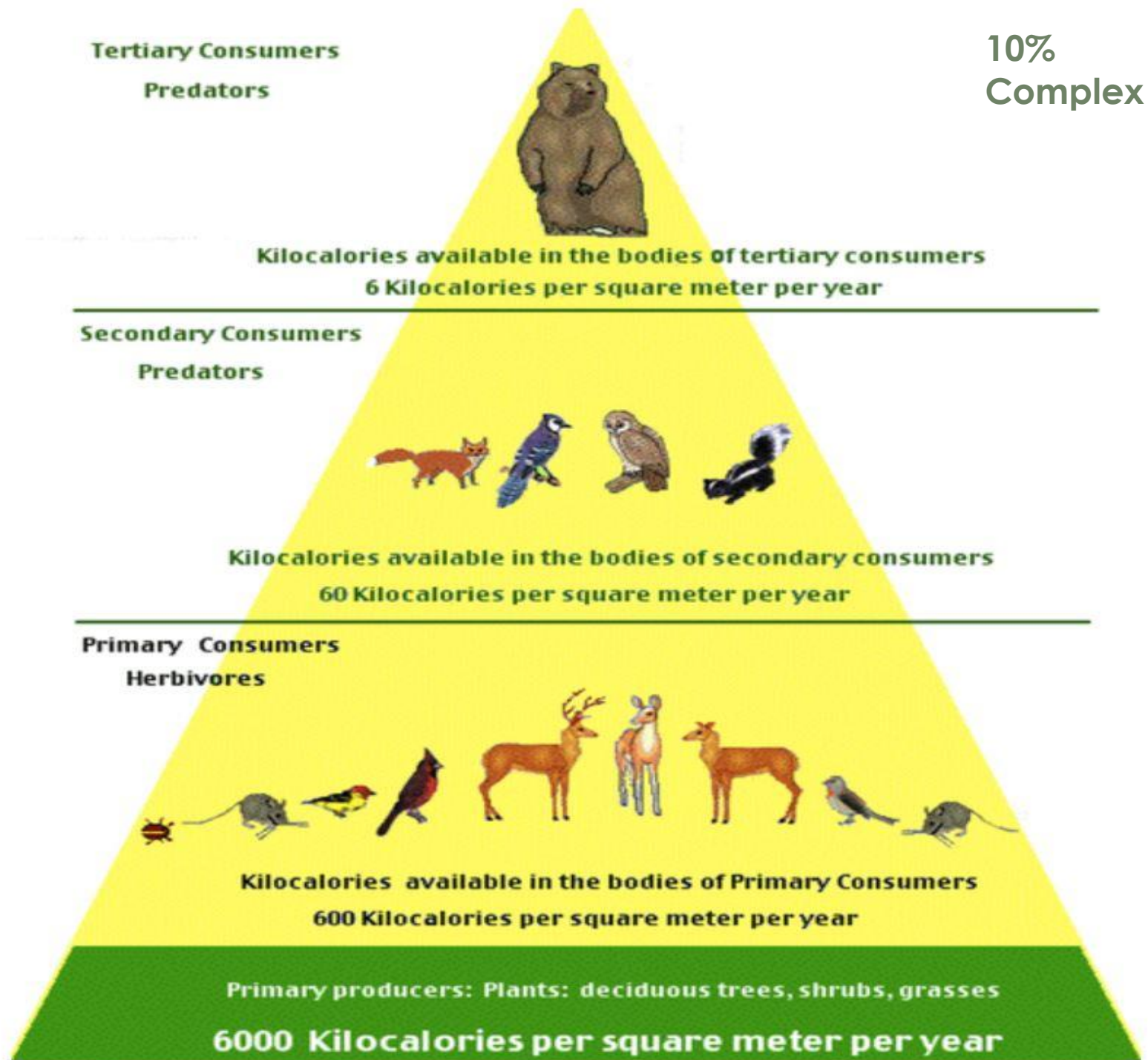
Biomass: Primary Consumers

Item	Biomass/ha	Area ha	Total biomass kg/month	Consumption	
	kg/ha/month			kg/month	%
Short grasses in the grassland	228 ± 55	2.3	→ 524 ± 127	524 ± 127	17.2 ± 4.2
Understory plants in deciduous forests*	0.872 ± 0.366	457.1	399 ± 167	124 ± 52 [†]	4.1 ± 1.7
Understory plants in coniferous plantations	0.273 ± 0.228	31.5	→ 9 ± 7	3 ± 2 [†]	0.1 ± 0.1
Deciduous leaves	0.208 ± 0.070	435.5	91 ± 30	91 ± 30	3.0 ± 1.0
Litterfall	28.7 ± 5.3	435.5	12 499 ± 2308	2300 ± 425 [†]	75.6 ± 14.0

Biomass Pyramid



Energy Percentages



Trophic Cascade and Top Down Control



WOLVES KEEP YELLOWSTONE IN BALANCE

⬇️ **IN THE 1920S**, government policy allowed the extermination of Yellowstone's gray wolf — the apex predator — triggering an ecosystem collapse known as *trophic cascade*.

⬆️ **IN 1995** — through use of the Endangered Species Act — the conservation community reintroduced the gray wolf to restore balance.

The impact is dramatic.



⬇️ **Elk populations exploded** without their primary predator, resulting in severe overgrazing of willows and aspen needed by beavers for food, shelter and dam building.



⬇️ **Various scavenger species** suffered without year-round wolf kills to feed on.

⬆️ **Today, biodiversity is enriched** and scavenger species reap the benefits of regular, wolf-supplied meals.



⬇️ **Without wolves**, the coyote became an apex predator, driving down populations of pronghorn antelope, red fox and rodents, and birds that prey on small animals.



⬇️ **Beavers virtually disappeared** in the northern range. Dams disintegrated, turning marshy ponds into streams. Massive loss of mature willows and aspens. Heavy stream erosion. Many plant and animal species affected.



⬆️ **After wolf reintroduction**, in the northern range, elk numbers drop and beaver colonies increase from 1 to 12. Insects, songbirds, fish, and amphibians thrive.



⬆️ **As the wolf returns**, coyote numbers drop by half, allowing antelope, rodent and fox populations to increase.



SOURCES: OSU Trophic Cascades Program, NWF, NRDC, Predator Defense, "The Wolf's Tooth"

Next Steps

- ▶ Temporal: with and without wolves
- ▶ Find energy percentages
- ▶ Limit food web to dominate species at each level
- ▶ Focus on prey 1 or 2 trophic levels below the predator



Scientific Resources

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Pictures and Websites

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