Exploring the exploitation of migratory moths by radio-marked grizzly bears in Wyoming

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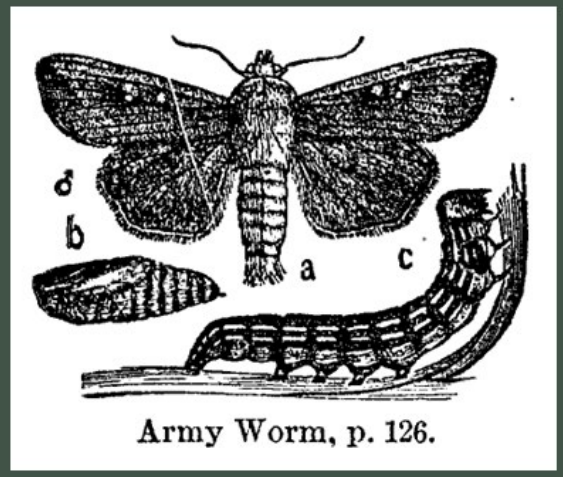
Background

- Gunther et al. (2014) reported ≥ 266 species consumed by grizzlies in GYE
- Foraging on moths appears unique to central Rockies (Mattson et al. 1991, French et al. 1994)

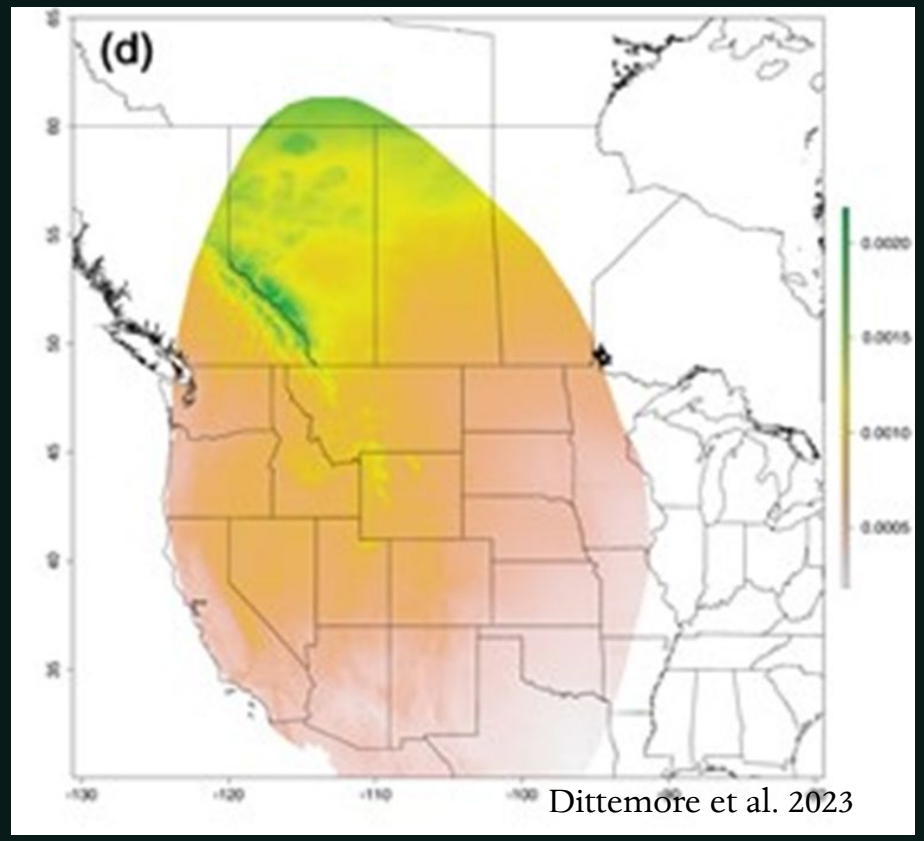


Army Worm, p. 126.

USGS

Background

- Dittemore et al. (2023) documented most moths originate from Great Plains
- Moths spend the day under loose rock/talus adjacent to alpine meadows
- Moths feed on nectar of alpine flowers at night

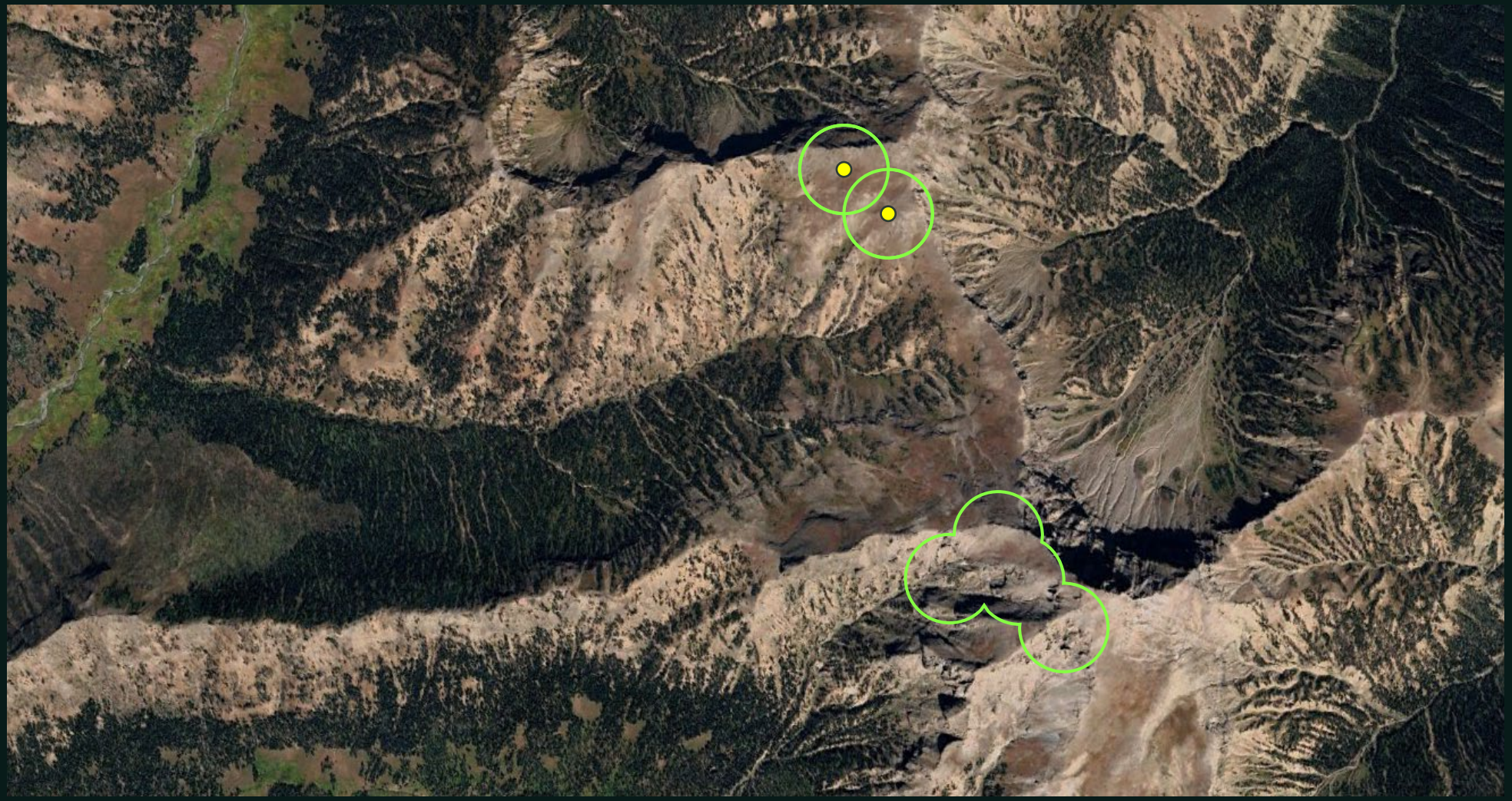


Dittemore et al. 2023

Background

- Moths are one of the most high-calorie foods available to bears (7.9 Kcal/gm; French et al. 1994)
- White et al. (1999) estimated that bears can consume up to 40,000 moths/day
- Increase in bear abundance and distribution has led to increase in use of this resource (~20-25% of population; Gould et al. 2024)

Moth Site Identification

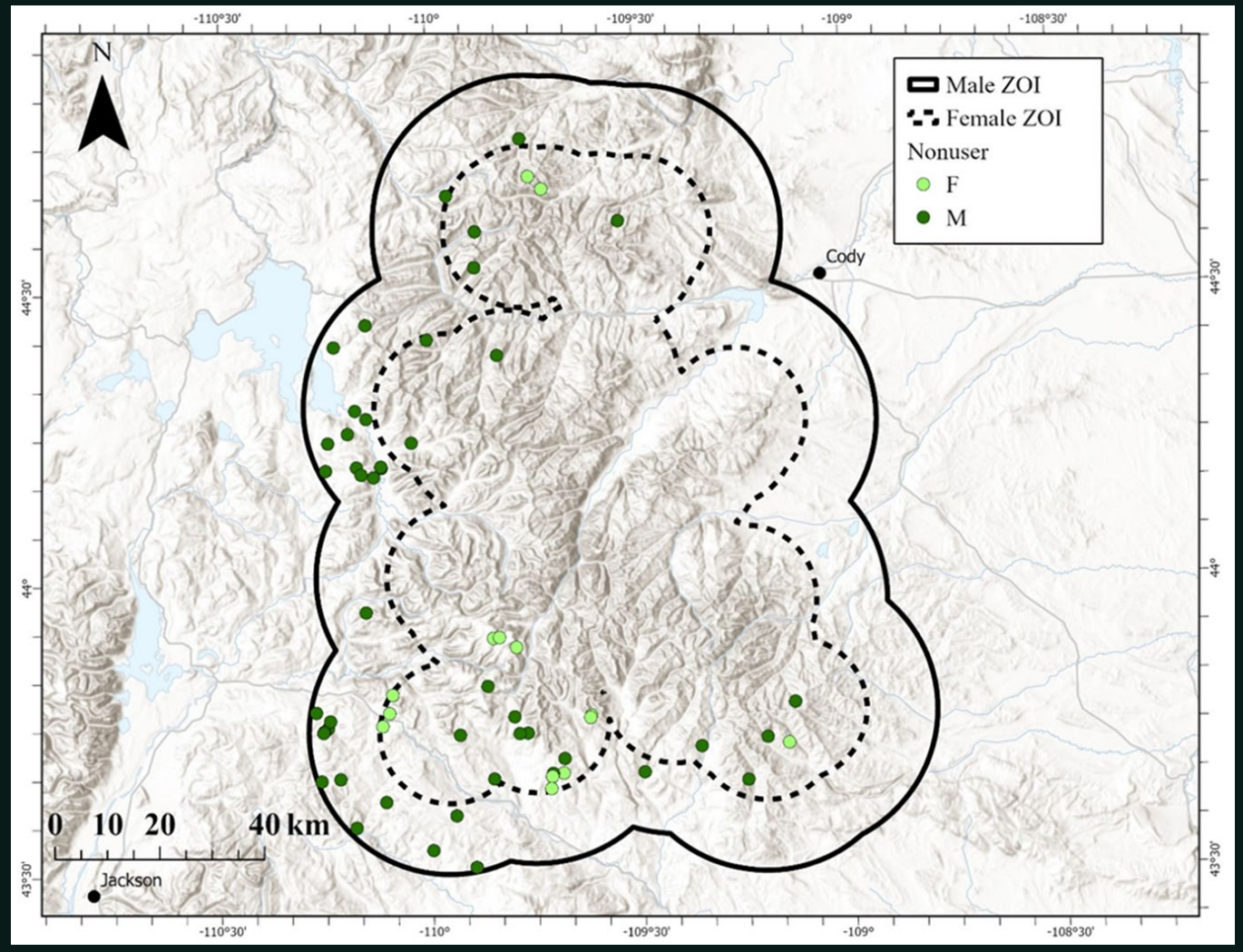


Derive “moth users” from monitoring data

- VHF → minimum 2 flight locations within moth polygon
- GPS → minimum 2 days where >= 50% locations within moth polygon
- GPS daily use → minimum 50% locations within moth polygon

Derive “non-moth users” from monitoring data

- Movement metrics of GPS collared bears used to establish availability
- Availability was 12.9 km (female) and 26.5 km (males)
- Applied availability to identify non-moth users
- Compared movement and activity data of GPS-collared moth users and non-moth users



(Clapp et al. 2024)

Results

- 4,754 observations of bears on moth sites
- 36 distinct moth sites within 7 complexes
- Moth sites average >3,500 m in elevation, wide range in slope and aspect

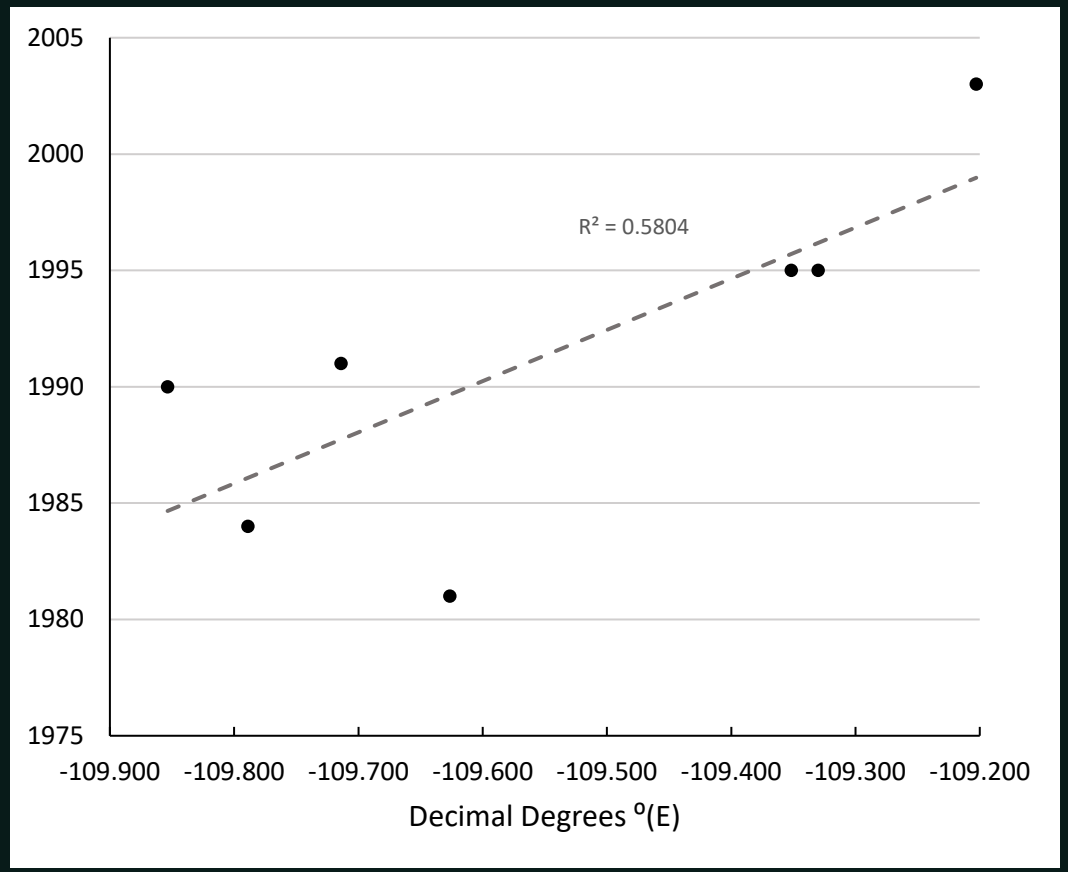
(Clapp et al. 2024)

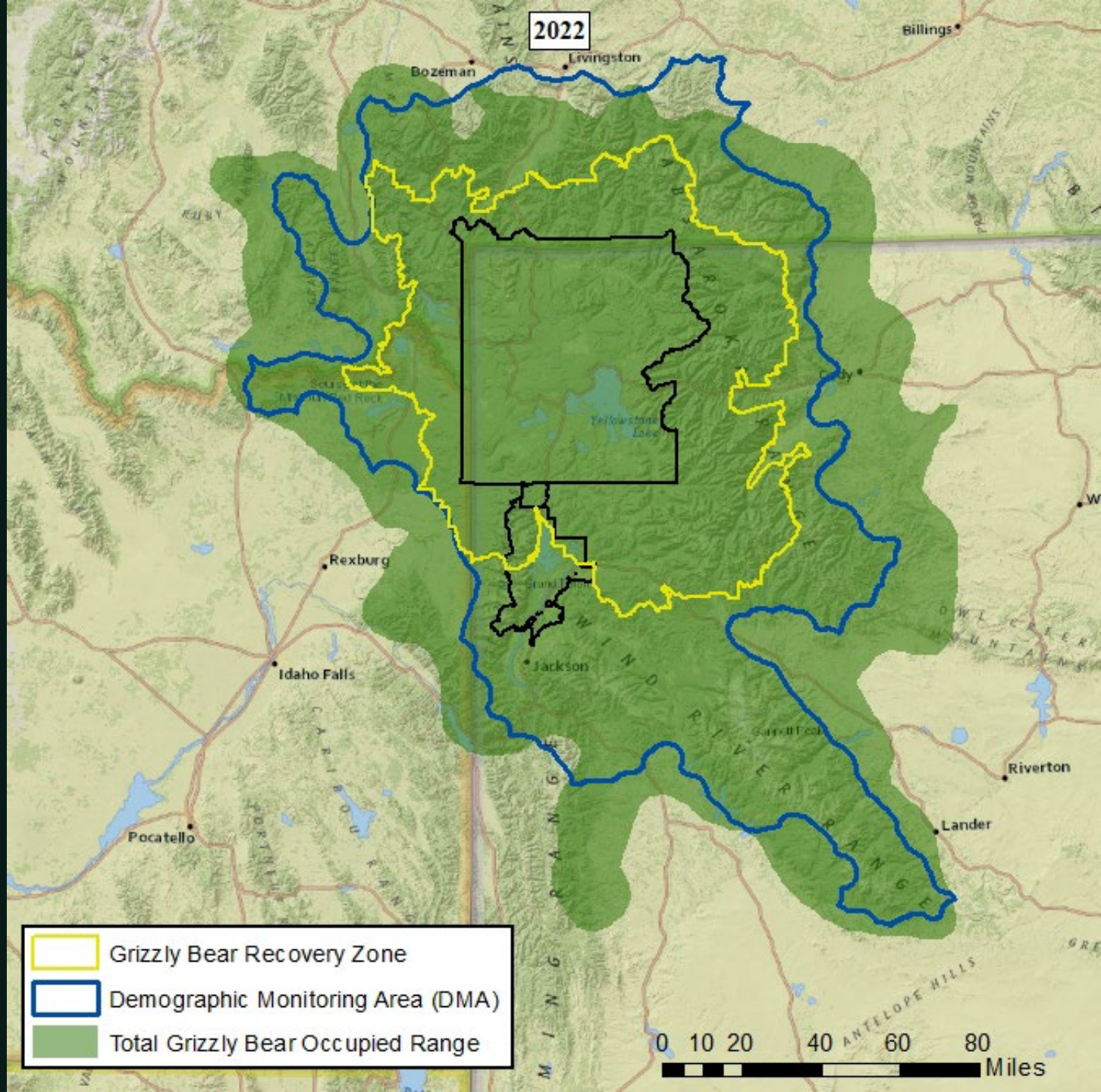
Complex and Site ID	YEAR																																										Total years used since 1981	First year used	Use range (years)
	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023			
A - 1	x															x	x	x		x		x	x					x			x	x	x	x	x		x	x		x	x	x	18	1981	43
A - 2		x																											x					x					x					4	1982	38
A - 4						x		x		x	x	x		x		x	x	x	x	x	x	x	x			x		x	x	x		x	x	x	x	x	x	x		x	x	x	29	1986	38
A - 18															x	x	x					x	x			x			x			x	x	x	x	x		x	x		x	x	x	17	1995	29
A - 20																x						x	x		x				x			x	x	x	x	x	x		x		x	x	x	15	1996	28
B - 3				x		x	x	x	x			x				x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x		x				x	x	x	29	1984	40
B - 5							x	x	x			x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	34	1987	37
B - 6									x	x								x	x			x	x				x			x					x			x				x			11	1989	33
B - 10												x	x	x		x		x	x		x	x	x	x		x	x	x	x		x	x	x	x	x				x		x	x	x	23	1992	32
B - 11												x																															x		5	1992	31
B - 12																																							x						2	1992	28
B - 21																																													2	1998	5
B - 24																																							x		x	x			8	2002	21
B - 36																																							x						2	2018	2
C - 7																																													2	1990	13
C - 33																																									x				2	2011	11
D - 8																																							x		x	x	x	28	1991	33
D - 9																																							x	x	x	x	x	25	1991	33
D - 13																																							x		x	x	x	24	1992	32
D - 14																																							x	x			x	17	1994	30
D - 15																																							x	x			x	8	1994	30
D - 19																																									x	x		12	1996	27
D - 23																																							x	x	x	x	x	22	2000	24
D - 25																																							x		x	x	x	18	2002	22
D - 29																																												4	2005	14
D - 30																											x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	16	2007	17
E - 17															x					x		x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	23	1995	29
E - 22																			x										x		x	x	x	x	x		x		x			x	x	11	1999	25
E - 28																									x		x	x	x				x		x		x	x		x		x		10	2005	18
E - 31																													x				x	x	x			x	x	x	x	x	x	10	2009	15
E - 32																													x							x	x	x	x	x			x	7	2009	15
E - 35																																					x		x					2	2010	10
F - 16															x							x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	23	1995	29
F - 26																							x												x					x	x		x		5	2003	20
G - 27																							x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	21	2003	21
G - 34																																x	x							x				3	2012	9

Site Code	Total grizzly observations	Years with use since 1981	Average observations/ year (A)	Constancy of use from initial year to 2023 (B)	Product (A*B)	Scaled product	Rank scaled product	Use by radio-collared bear(s)[a]
E-17	1115	23	48.5	79.3	3845	100	1	Both
F-16	600	23	26.1	79.3	2069	54	2	Both
B-11	518	5	15.2	15.6	1400	36	3	None
D-14	395	17	15.8	56.7	1197	31	4	VHF
G-27	196	21	9.3	100	933	24	5	Both
A-2	336	4	11.6	9.5	884	23	6	None
D-13	210	24	7.5	75	636	17	7	Both
B-21	201	2	8.7	7.7	628	16	8	None

(Clapp et al. 2024)

Results





"Preliminary Information–Subject to Revision. Not for Citation or Distribution."

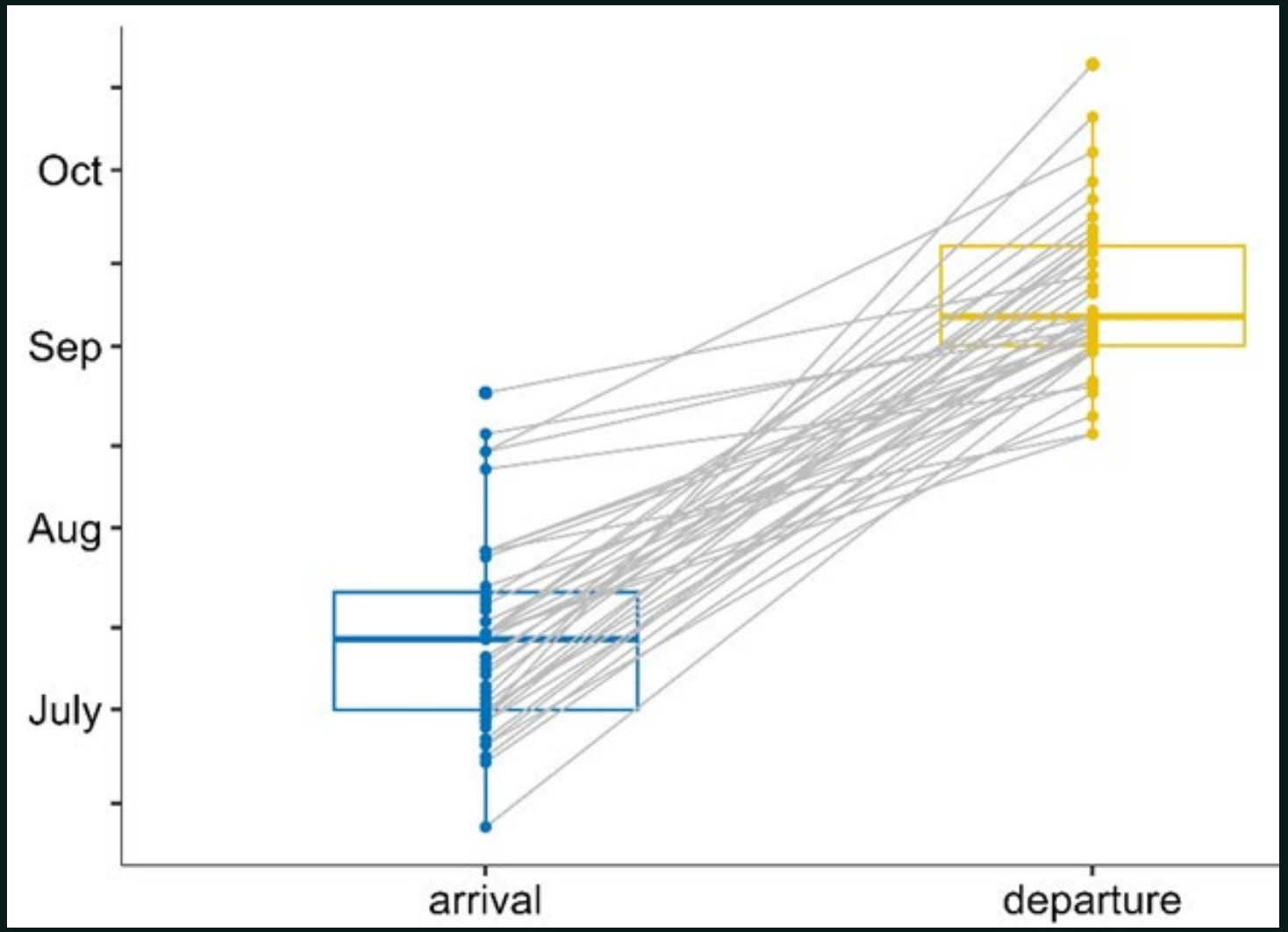
Results

- 47 VHF and 35 GPS bears → moth users (129 bear years)
- 81% used one site annually
- 31 bears used sites across multiple years (1.2 sites across seasons)
- 40 GPS bears → non-users (60 bear years)

(Clapp et al. 2024)

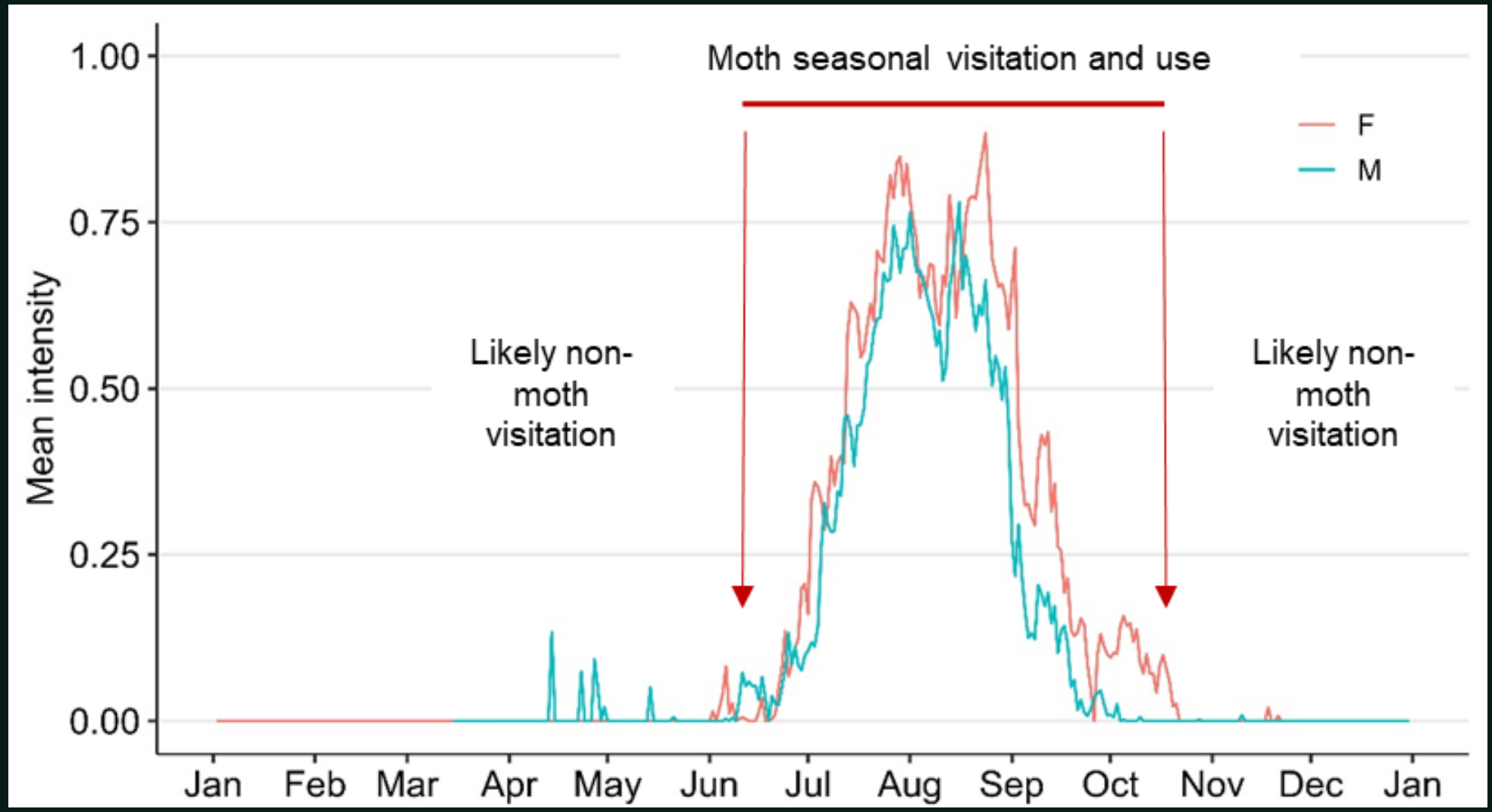
Arrival and Departure from Sites

- 12 July – 8 Sept.
- Females arrived ~ 1 week earlier than males
- Females stayed longer (67 days) than males (52 days)



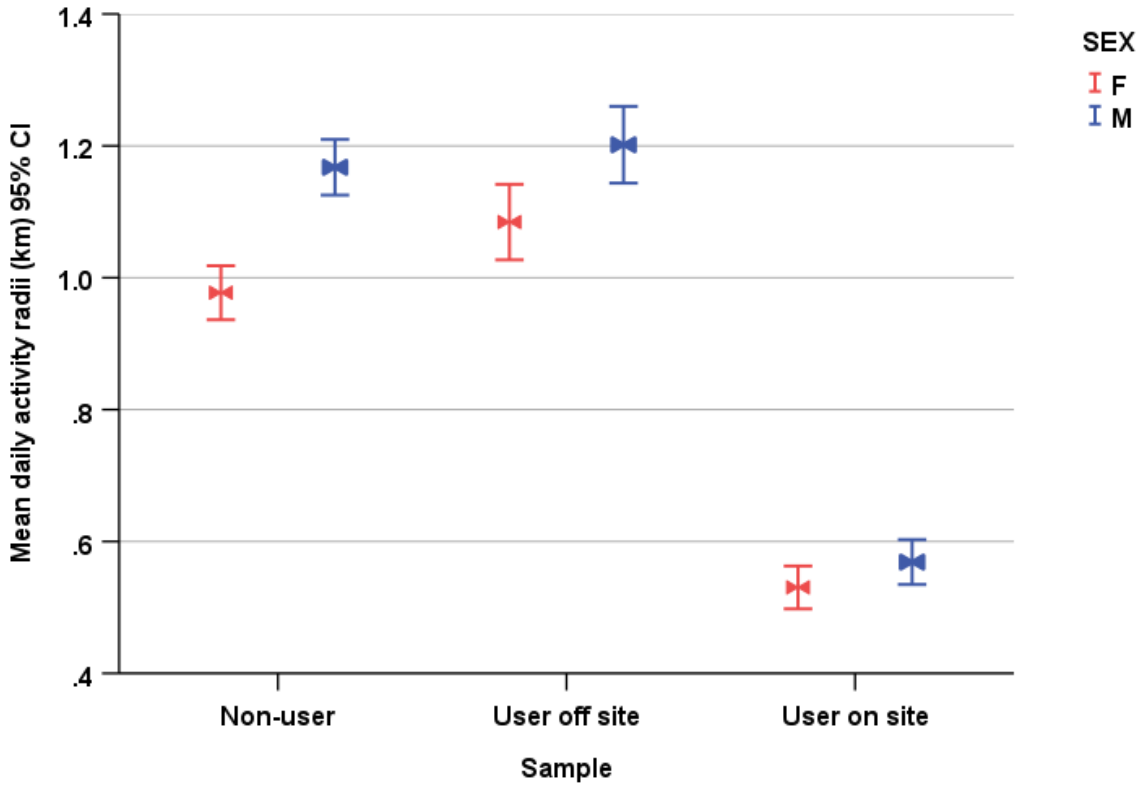
(Clapp et al. 2024)

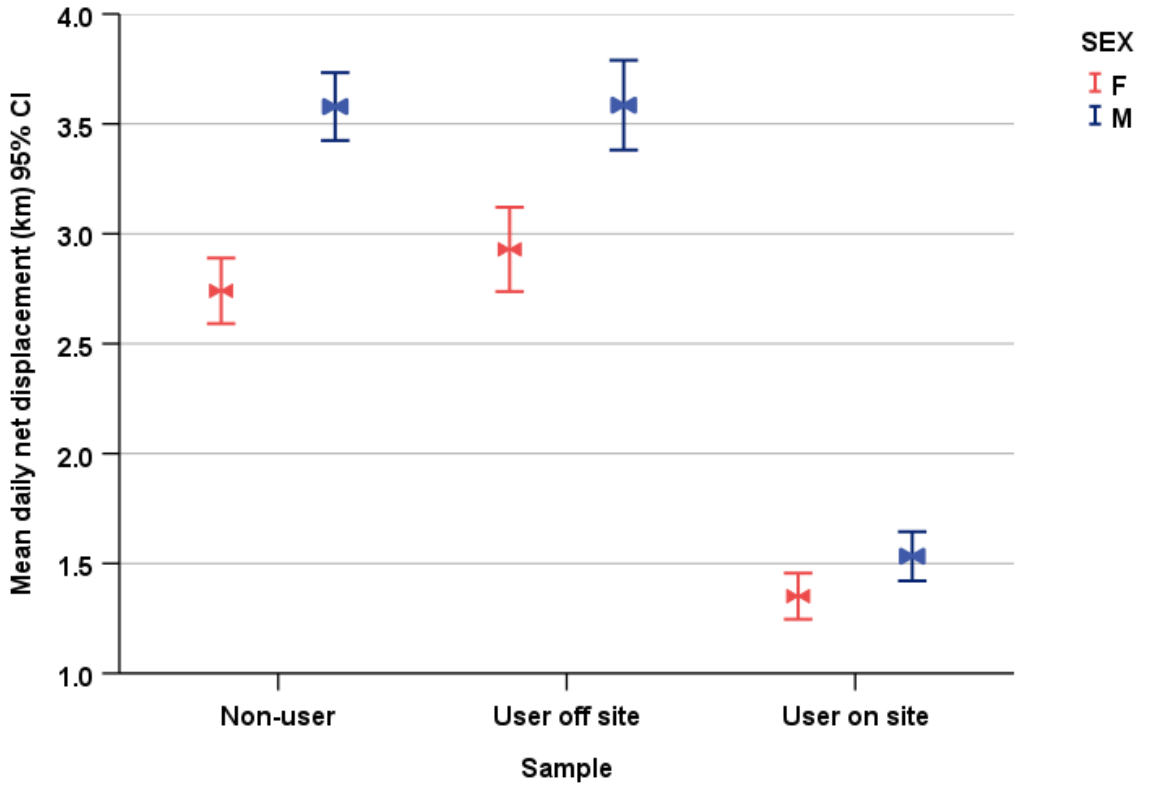
Intensity of Use and Seasonal Variation



(Clapp et al. 2024)

Variation in Movement Patterns





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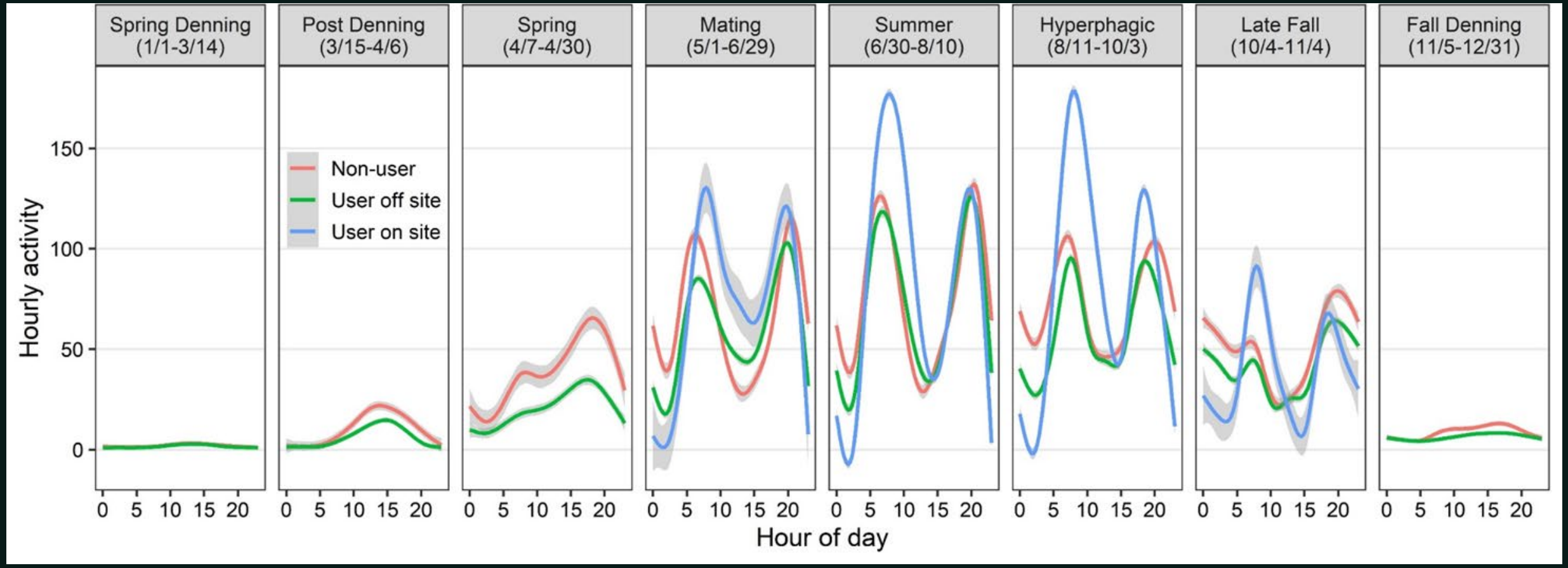
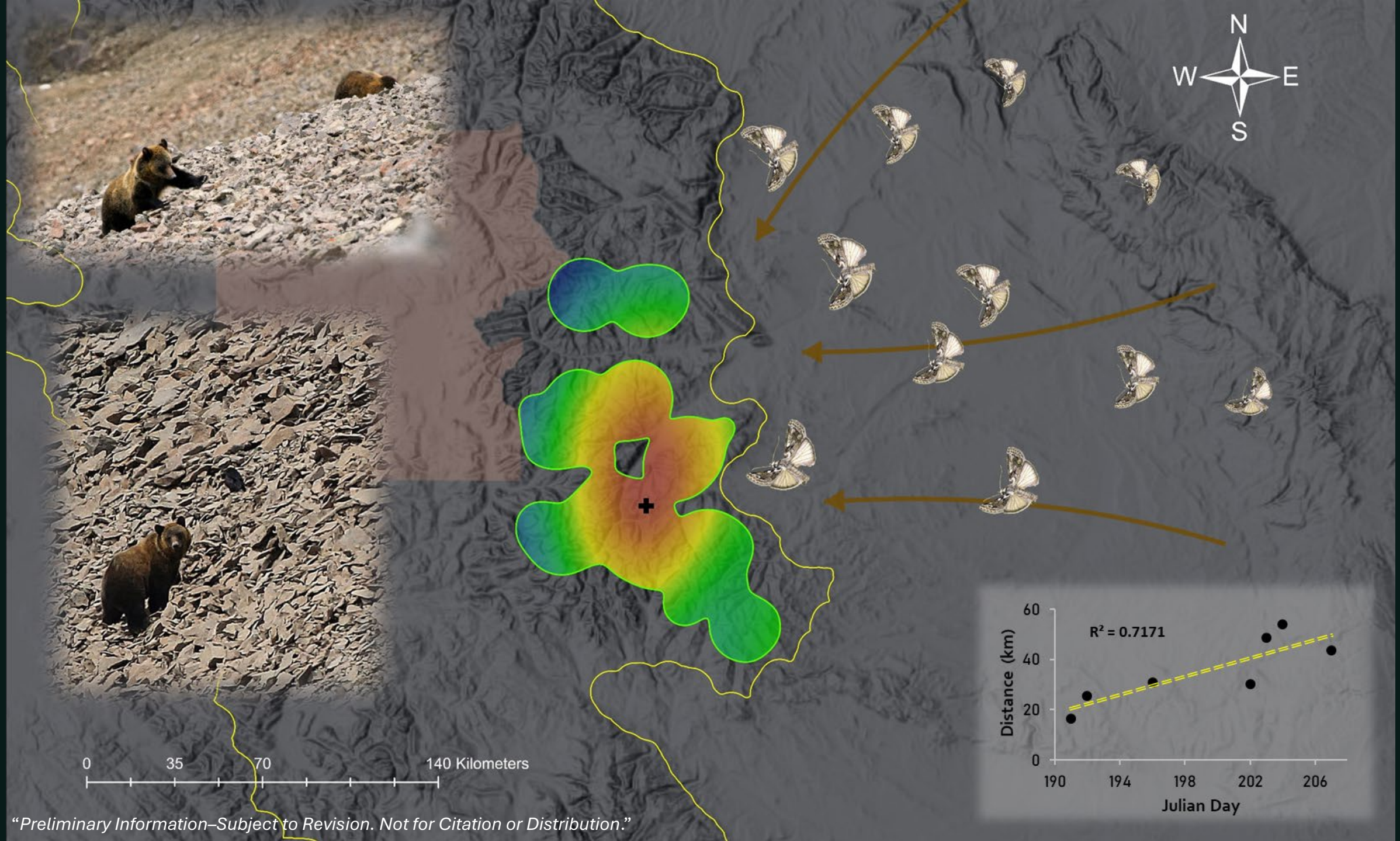
Variation in Activity by Season and Time of Day



(Clapp et al. 2024)



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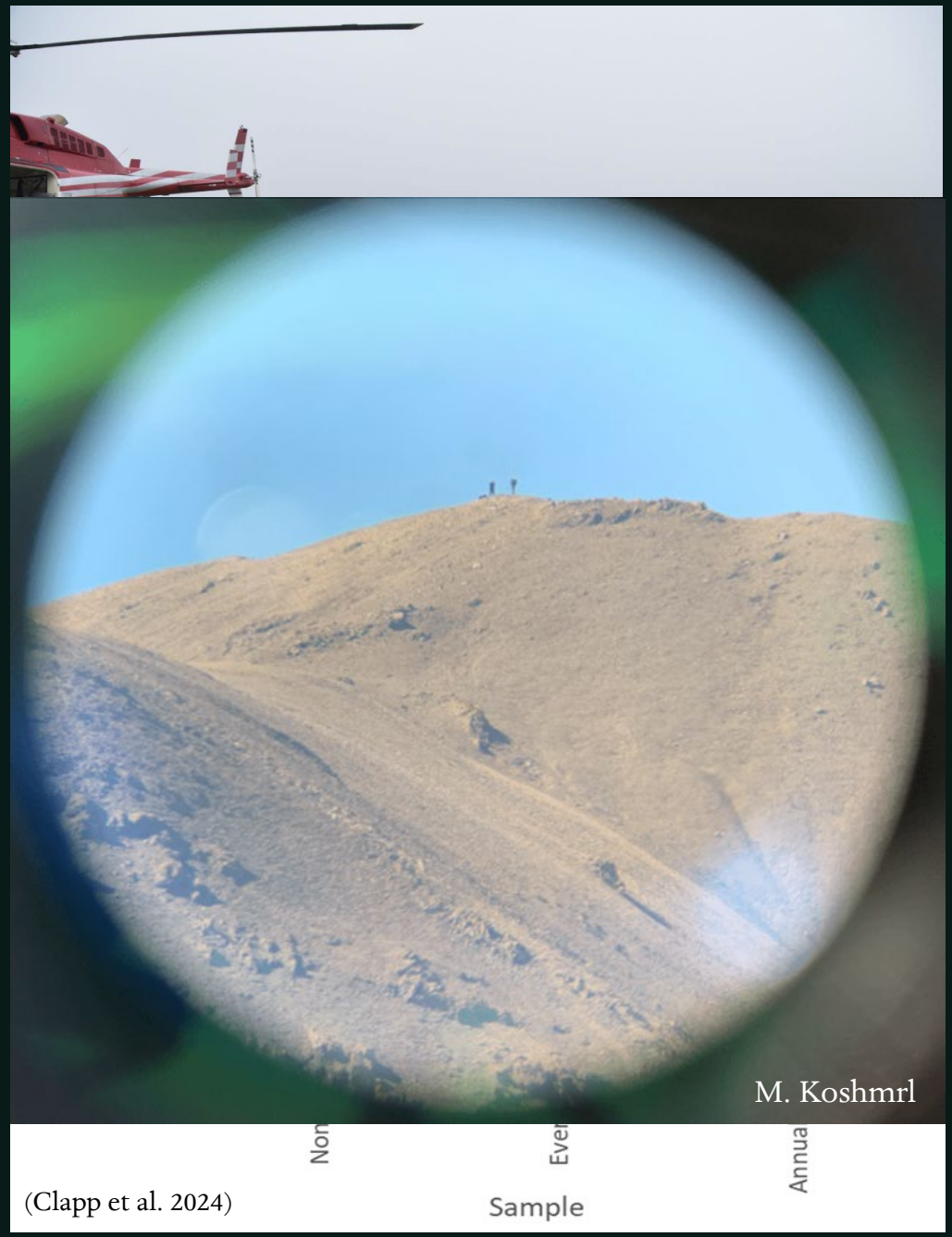
Further Thought

- The ability to quantitatively assess use and exploitation of this food source is due to long-term monitoring and robust dataset spanning decades of collaborative interagency effort
- Human exploitation of this interaction between bears and moths is an ongoing challenge in reporting of results

Future Work

- Increase sample size
- Influence of moth use on demographics, energetics, and behavior
- Influence of human recreation on bears using moth sites



(Clapp et al. 2024)

Acknowledgements

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Thank You!

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