U.S. Department of the Interior
U.S. Geological Survey

Truth and Consequences:

Science to Inform Decision Making in the Klamath Basin

Michael Casazza

Research Wildlife Biologist

Western Ecological Research Center,
Dixon Field Station

Objectives of this Presentation:

- Touch on a sample of the current literature and key findings focusing on the Klamath Basin, wetlands and waterfowl
- Highlight some of our team’s recent data collection
- Describe a new approach to gathering and delivering wildlife monitoring data

Current Science:

Western North American Naturalist 67(3), © 2007, pp. 409–428

WATERFOWL DISTRIBUTION AND ABUNDANCE DURING SPRING MIGRATION IN SOUTHERN OREGON AND NORTHEASTERN CALIFORNIA

Joseph P. Fleskes[1] and Julie L. Yee[2]

ABSTRACT.—We used aerial surveys to study abundance and distribution of waterfowl (ducks, geese, swans, and coots) during spring in southern Oregon and northeastern California (SONEC). Total waterfowl-use days in SONEC during the 119-day, 5 January–3 May, spring period was similar during 2002 (127,977,700) and 2003 (128,076,200) and averaged 1,075,900 birds per day (bpd); these estimates should be adjusted upward 4%–10% to account for areas not surveyed. Waterfowl abundance peaked in mid-March in both years: 2,095,700 in 2002 and 1,681,700 in 2003. Northern Pintail (*Anas acuta*) was the most abundant species in both years, accounting for 25.6% of the 2002 and 24.5% of the

Current Science:

USGS

TABLE 2. Peak waterfowl abundance in southern Oregon and northeastern California (SONEC) during spring and as a percentage of midwinter abundance in all of California and Oregon survey area 69-3 during 2002 and 2003.

	2002		2003		2002–2003 average[a]	
Species or group	peak	%	peak	%	peak	%
Dabbling ducks	1,276,900	54.2	966,700	38.1	1,121,800	46.1
Northern Pintail	689,300	74.3	532,100	53.9	610,700	64.1
Northern Shoveler	189,900	45.1	276,800	82.5	233,400	63.8
American Wigeon	227,100	56.7	137,700	30.5	182,400	43.1
Green-winged Teal	148,100	73.6	154,600	46.2	151,300	59.9
Mallard	49,100	19.2	47,800	15.8	48,500	17.5
Gadwall	38,400	24.2	41,900	36.0	40,200	30.1
Cinnamon Teal	2400	87.6	3000	36.4	2700	62.0
Wood Duck	0	0	0	0	0	0
Diving ducks	242,700	76.0	153,700	48.7	198,200	62.4
Ruddy Duck	97,700	124.6	59,300	77.9	78,500	101.2
Scaup	84,100	64.3	40,400	45.5	62,200	54.9
Bufflehead	40,200	96.6	30,400	86.3	35,300	91.4
Canvasback	31,000	183.5	26,100	45.4	28,600	114.4
Mergansers	19,200	98.4	20,400	99.0	19,800	98.6
Ring-necked Duck	14,300	53.3	13,100	41.7	13,700	47.5
Goldeneyes	1100	23.7	4700	83.8	2900	53.8
Redhead	2300	323.4	3000	250.0	2600	286.7
Geese	476,700	80.3	476,000	66.9	476,400	73.6
Snow Goose and Ross's Goose	307,700	90.5	293,300	73.3	300,500	81.9
White-fronted Goose	203,100	107.2	212,000	83.9	207,500	95.6
Canada Goose	19,100	61.2	24,200	41.3	31,650	51.3
Tundra Swan	74,800	141.0	61,000	77.7	68,000	109.4
American Coot	121,900	38.3	120,600	49.2	121,300	43.8
ALL WATERFOWL	2,095,700	57.3	1,681,700	43.2	1,888,700	50.3

[a]Brant (*Branta bernicla*; 2002: 4092; 2003: 3124), scoters (*Melanitta* spp.; 2002: 28,722; 2003: 28,958), and unidentified ducks (2002: 20,199; 2003: 18,270 [nearly all in San Francisco Bay]) were present during midwinter surveys in California (United States Fish and Wildlife Service 2002, 2003) but were excluded from this comparison because none were seen in SONEC.

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"SONEC is a critical spring staging area for waterfowl that winter in the Central Valley of California and other Pacific Flyway regions and should be a major focus area for waterfowl-habitat conservation efforts."

Current Science:

Volume 13, Issue 1

June 2022

OCTOBER 15 2021

Assessment of Cereal Grain Waste Densities to Aid Waterfowl Conservation Planning in the Klamath Basin FREE

Daniel A. Skalos; Joseph P. Fleskes; Jeffery D. Kohl; Mark P. Herzog; Michael L. Casazza

Journal of Fish and Wildlife Management (2022) 13 (1): 3–16.

https://doi.org/10.3996/JFWM-20-091 Article history

Management Implications

Our study shows that there is more waste grain in Klamath Basin grain fields than previously thought, but widespread postharvest residue management using tillage buries seeds and considerably reduces the accessibility of waste grain to waterfowl. Flooding rarely occurs off of NWRs, limiting access to forage for dabbling ducks. Cooperative farming practices where standing grain is left in fields to increase food resources are certainly beneficial and may offset any reductions in grain resources stemming from the harvest process. Managers could also consider investigating the impacts of alternative residue management methods that do not include tillage. For example, grazing by sheep or goats may be a useful way to reduce straw residues and incorporate nutrients back into grainfields while allowing seeds to remain available to foraging waterfowl (see Peterson et al. 2020). Incentivizing flooding of cereal grain off NWRs should also be taken into consideration when and where possible.

Current Science:

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"there is more waste grain than previously thought…Our results indicate that reducing tillage treatments would boost accessibility of cereal grain food resources to waterfowl in the Klamath Basin, and incentives to flood grain fields on private properties should be considered for the same purpose when and where possible."

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Current Science:

THE JOURNAL OF WILDLIFE MANAGEMENT

RESEARCH ARTICLE | Open Access

Postbreeding movements and molting ecology of female gadwalls and mallards

Jeffrey D. Kohl, Michael L. Casazza, Cory T. Overton, Mark P. Herzog, Joshua T. Ackerman, Cliff L. Feldheim, John M. Eadie

First published: 21 September 2022 | https://doi.org/10.1002/jwmg.22314

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TABLE 3 Number of female gadwalls and mallards that used each wetland type to undergo molt in each geographical zone (Suisun Marsh [Suisun], Central Valley of California [Central Valley], southern Oregon-northeastern California [SONEC], other regions in California [other CA], and Nevada regions [NV]) and associated planning regions (Intermountain West Joint Venture 2013, Central Valley Joint Venture 2020) within California, Oregon, and Nevada, USA, 2015–2018. All female gadwalls and mallards were captured in Suisun Marsh, California, and affixed with a global positioning system and global system for mobile communications (GPS-GSM) transmitter.

Geographical zones	Regions	Wetland type	Gadwalls	Mallards	Total
Suisun		Permanent	2	27	29
		Semi-permanent	1	7	8
		Seasonal			
Central Valley	Sacramento Valley	Permanent		8	8
		Semi-permanent	2	4	6
		Seasonal	2	19	21
	Yolo-Delta	Permanent		3	3
		Semi-permanent		2	2
		Seasonal		7	7
	San Joaquin	Permanent	1	4	5
		Semi-permanent			
		Seasonal			
SONEC	Lower Klamath	Permanent	14	11	25
		Semi-permanent		1	1
		Seasonal			
	Upper Klamath	Permanent	16	13	29
		Semi-permanent			
		Seasonal			
	Other	Permanent	6	2	8
		Semi-permanent			
		Seasonal			
		Flooded agriculture		1	1
Other CA and NV		Permanent	8	3	11
		Semi-permanent			
		Seasonal			
Total			52	112	164

Current Science:

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		Flooded agriculture		1	1
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Current Science:

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"Suisun-breeding gadwalls have a strong affinity to permanent wetlands in the Klamath Basin when selecting a molt site…. Conservation and active management of these high-use molting areas used by California's primary breeding waterfowl species could enhance post-breeding survival, leading to increased breeding waterfowl populations"

Current Science:

frontiers in Ecology and Evolution

ORIGINAL RESEARCH
published: 10 March 2022
doi: 10.3389/fevo.2022.844278

Check for updates

Functional Wetland Loss Drives Emerging Risks to Waterbird Migration Networks

J. Patrick Donnelly[1], Johnnie N. Moore[2], Michael L. Casazza[3] and Shea P. Coons[4]*

[1] Intermountain West Joint Venture - U.S. Fish and Wildlife Service, Migratory Bird Program, Missoula, MT, United States, [2] Group for Quantitative Study of Snow and Ice, Department of Geosciences, University of Montana, Missoula, MT, United States, [3] U.S. Geological Survey, Western Ecological Research Center, Dixon, CA, United States, [4] Avian Science Center - University of Montana, Missoula, MT, United States

OPEN ACCESS

Migratory waterbirds (i.e., shorebirds, wading birds, and waterfowl) rely on a diffuse continental network of wetland habitats to support annual life cycle needs. Emerging threats of climate and land-use change raise new concerns over the sustainability of these habitat networks as water scarcity triggers cascading ecological effects impacting wetland habitat availability. Here we use important waterbird regions in Oregon and

Current Science:

frontiers
in Ecology and Evolution

ORIGINAL RESEARCH
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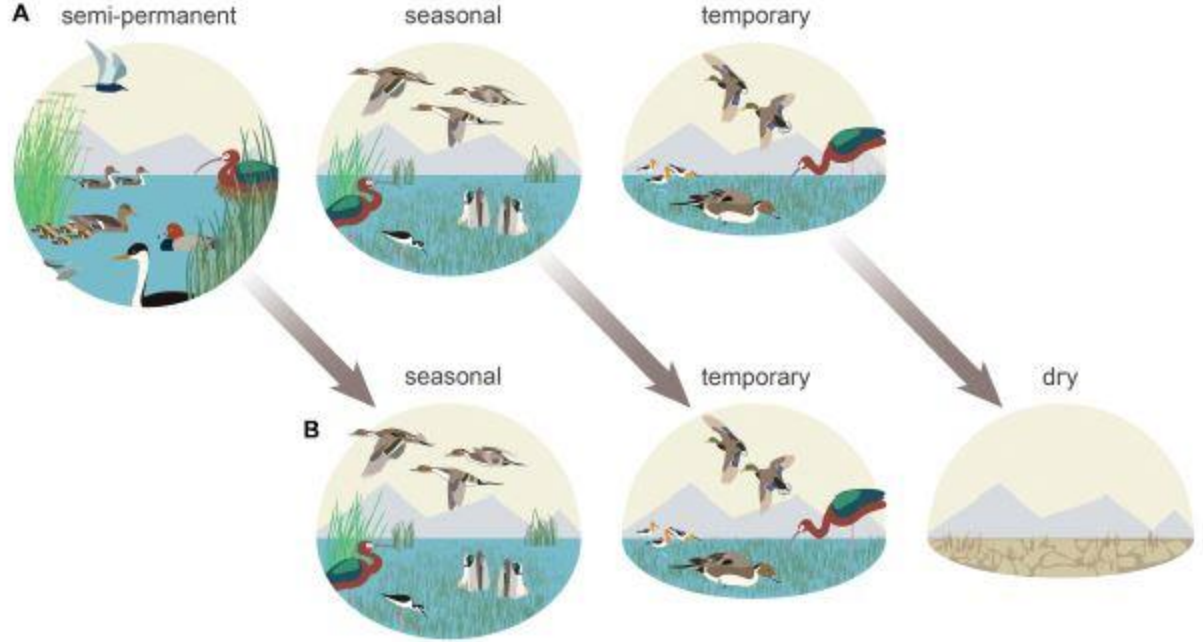

FIGURE 10 | Functional wetland declines indicate disproportionate impacts to waterbird species heavily reliant on semi-permanent wetlands during all or portions of their annual life-cycle. Diving ducks (redhead), black terns, and grebes (western grebe) showed the greatest potential impact in addition to nesting white-faced ibis and molting and breeding waterfowl **(A)**. Semi-permanent losses resulted from shortened hydroperiods caused by excessive drying that forced the transition of these habitats to seasonal and temporary hydrologies—a process that offset concurrent seasonal and temporary wetland declines. Shorebirds (American avocets and black-necked stilts), migrating-wintering dabbling ducks (northern pintails and mallards), and white-faced ibis benefited from more persistent seasonal and temporary wetlands that were bolstered by stable agricultural habitats **(B)**.

Current Science:

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ORIGINAL RESEARCH
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"Our results suggest that increased pressure on waterbird migration networks will necessitate increased coordination between important waterbird breeding, wintering, and stopover regions to proactively identify and address emerging risks impacting populations as changes to climate and land use accelerate."

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Current Science:

USGS

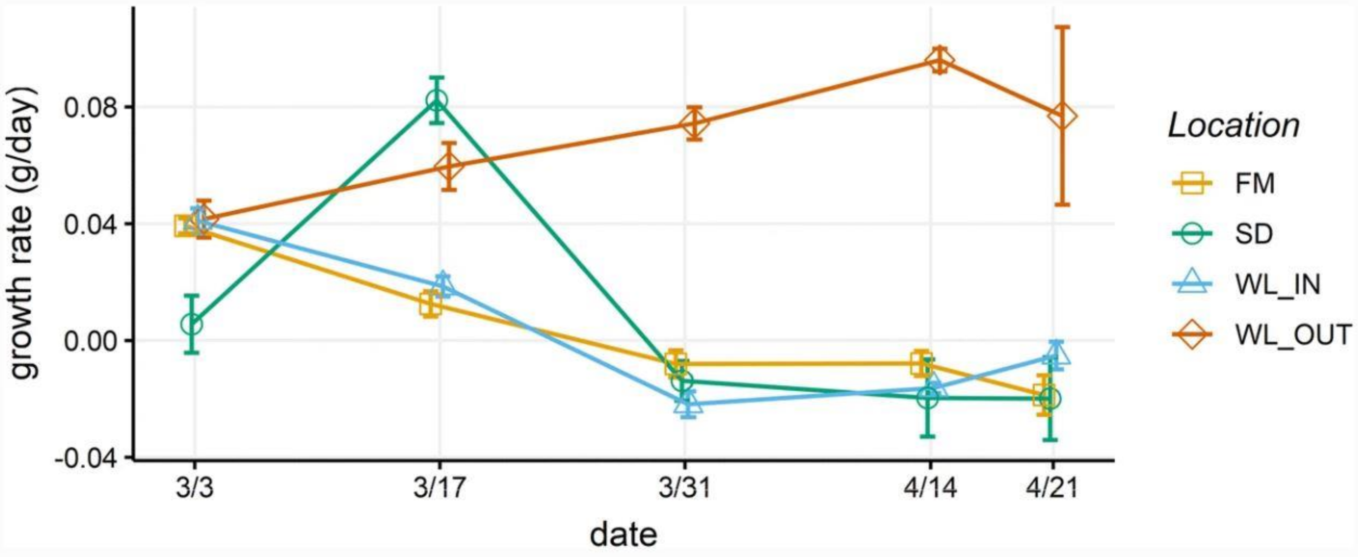
Managed Wetlands Can Benefit Juvenile Chinook Salmon in a Tidal Marsh

Nicole M. Aha, Peter B. Moyle, Nann A. Fangue, Andrew L. Rypel & John R. Durand

Estuaries and Coasts **44**, 1440–1453 (2021) | Cite this article

Fig. 2

From: Managed Wetlands Can Benefit Juvenile Chinook Salmon in a Tidal Marsh



Mean growth rates (± SE) at each location over the course of the study. $N = 4$ cages at First Mallard (FM), $N = 4$ cages at Sheldrake (SD), $N = 2$ cages at Wings Landing Inlet (WL_IN), and $N = 3$ cages at Wings Landing Outlet (WL_OUT)

Conservation and Flood Protection

Choosing between conservation and flood protection no longer has to be an either-or proposition. In the Sacramento River Basin, farmland, wildlife refuges and the bypasses not only serve as flood protection for our cities and rural areas, but are now being managed to work together to create dynamic conservation habitat for fish and wildlife. This effort is underway on both sides of the levees.

What is the Wet Side and Dry Side?

The two areas located on both sides of the levees are defined as ***Wet Side*** and ***Dry Side:***

- **Wet-Side** lands are located within the footprint of the current flood protection system, including the river channels and bypasses. Allows for fish to freely access during wet stages.
- **Dry-Side** farm fields are located outside the current flood protection system but were once part of the historical floodplain. Fish cannot access this side.

With today's knowledge of the landscape and scientific understanding of how wildlife interacts with these historical floodplains, we have improved our water management to mimic natural flows across the lands once seen here centuries ago.

Floodplainreactivation.wetdryoct2019.pdf (norcalwater.org)

Current Science:

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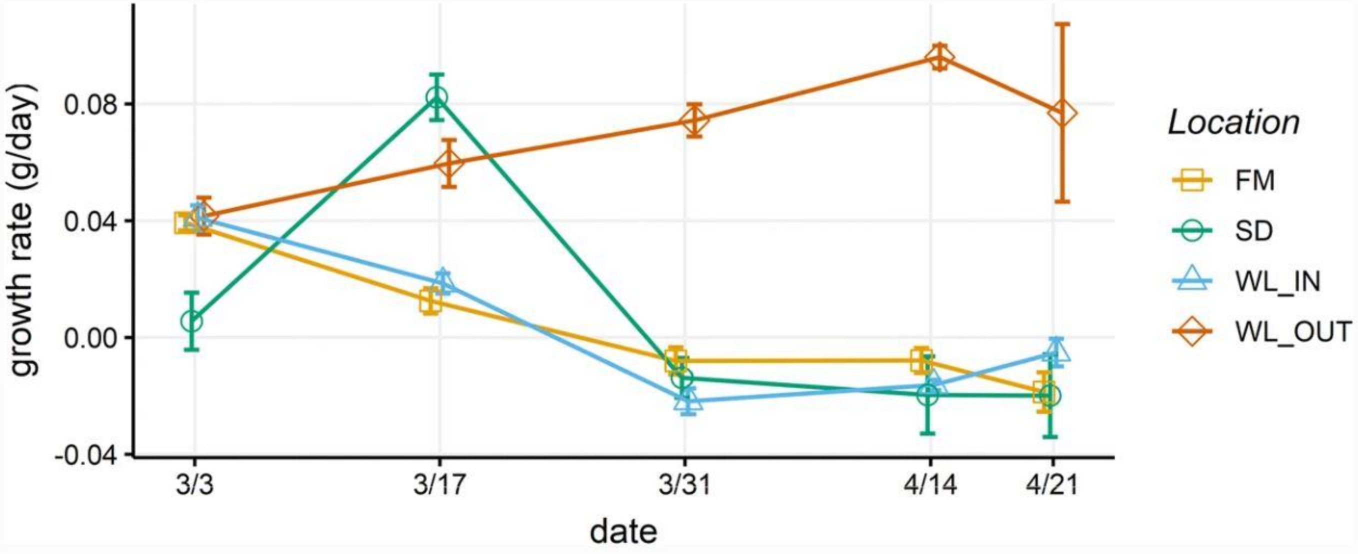

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WATERFOWL TELEMETRY 2015-2022

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- Marked over 1500 individuals of 16 species with GPS/GSM transmitters
- Primarily in the Central Valley of CA and some geese in the arctic
- 10 million locations

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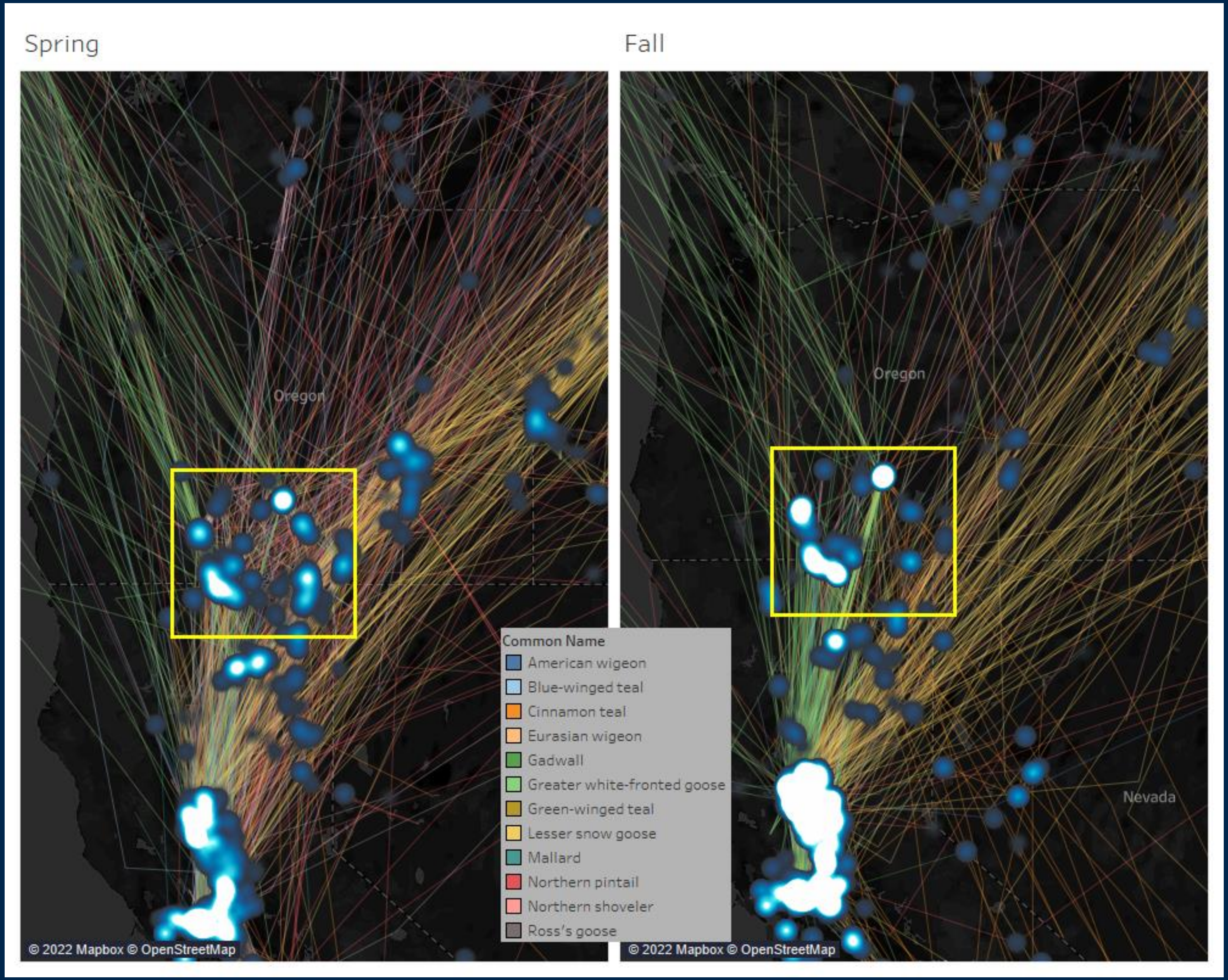
Klamath Region
- 9 species of ducks
- 4 species of geese
- 1 raptor species
- 453 individuals
- 900,000+ locations


Spring
Fall
Oregon
Oregon
Nevada
Common Name
American wigeon
Blue-winged teal
Cinnamon teal
Eurasian wigeon
Gadwall
Greater white-fronted goose
Green-winged teal
Lesser snow goose
Mallard
Northern pintail
Northern shoveler
Ross's goose
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CURRENT MONITORING PARADIGM

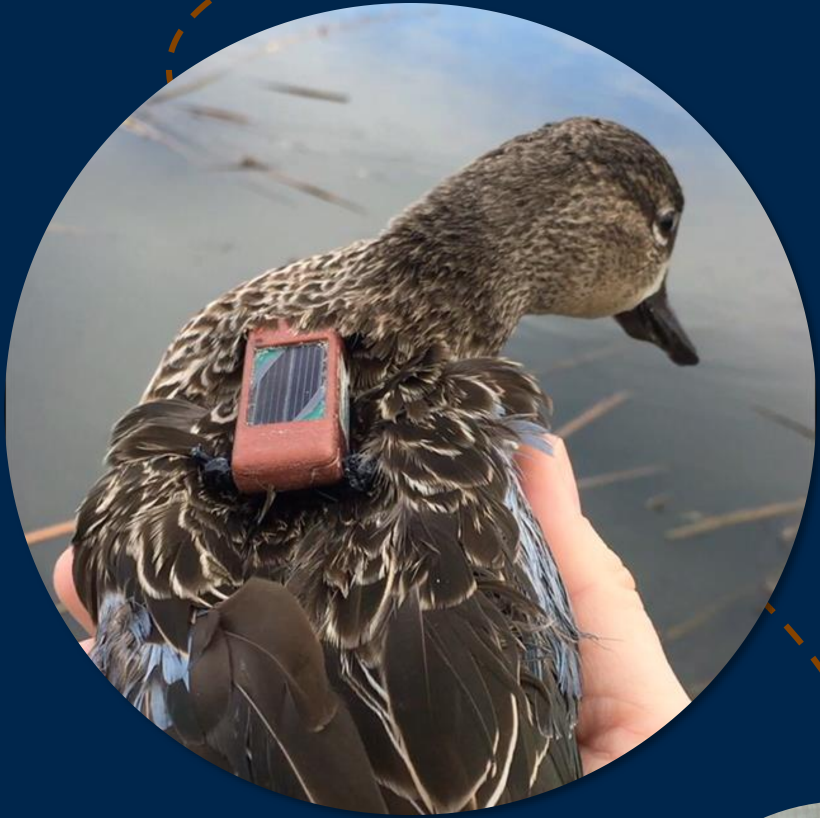
- Currently: “how many” or “what’s the trend”
- Documents species demise
- Not proactive
- Limits complexity of questions
- Lacks real-time actionable Information

IT'S TIME FOR A CHANGE

Banding studies & visual surveys	VHF telemetry	Satellite telemetry	GSM-GPS telemetry
<2 locations/individual	~100 locations/individual	~200 locations/individual	~5,000 locations/individual
Early 1900s	1970s	2000s	2010s

TECHNOLOGICAL ADVANCES

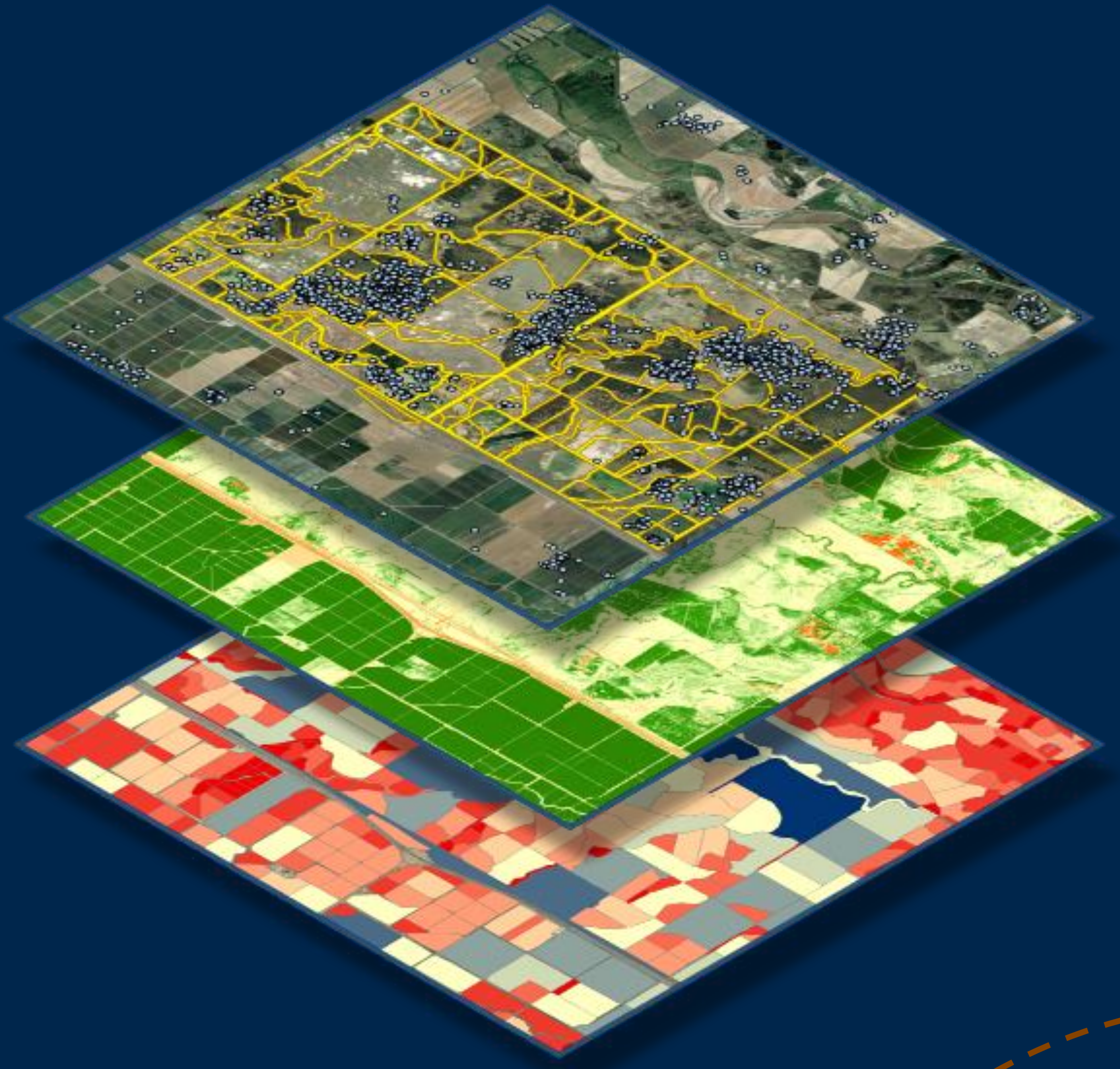
- Precise locational data
- Transmitters smaller, less costly, more relocations, longer lasting
- Sensors: accelerometry, temperature, etc.
- Standardized outputs (Movebank), available in real time



TOOLS TO HANDLE "BIG DATA"

USGS

- Satellite based remote sensing readily available
- Cloud Based solutions allow for data integration
- Machine learning/Artificial intelligence
- Time: from years to minutes



USGS

AIMS FOR WILDLIFE

AUTOMATED

INTERACTIVE

MONITORING

SYSTEM

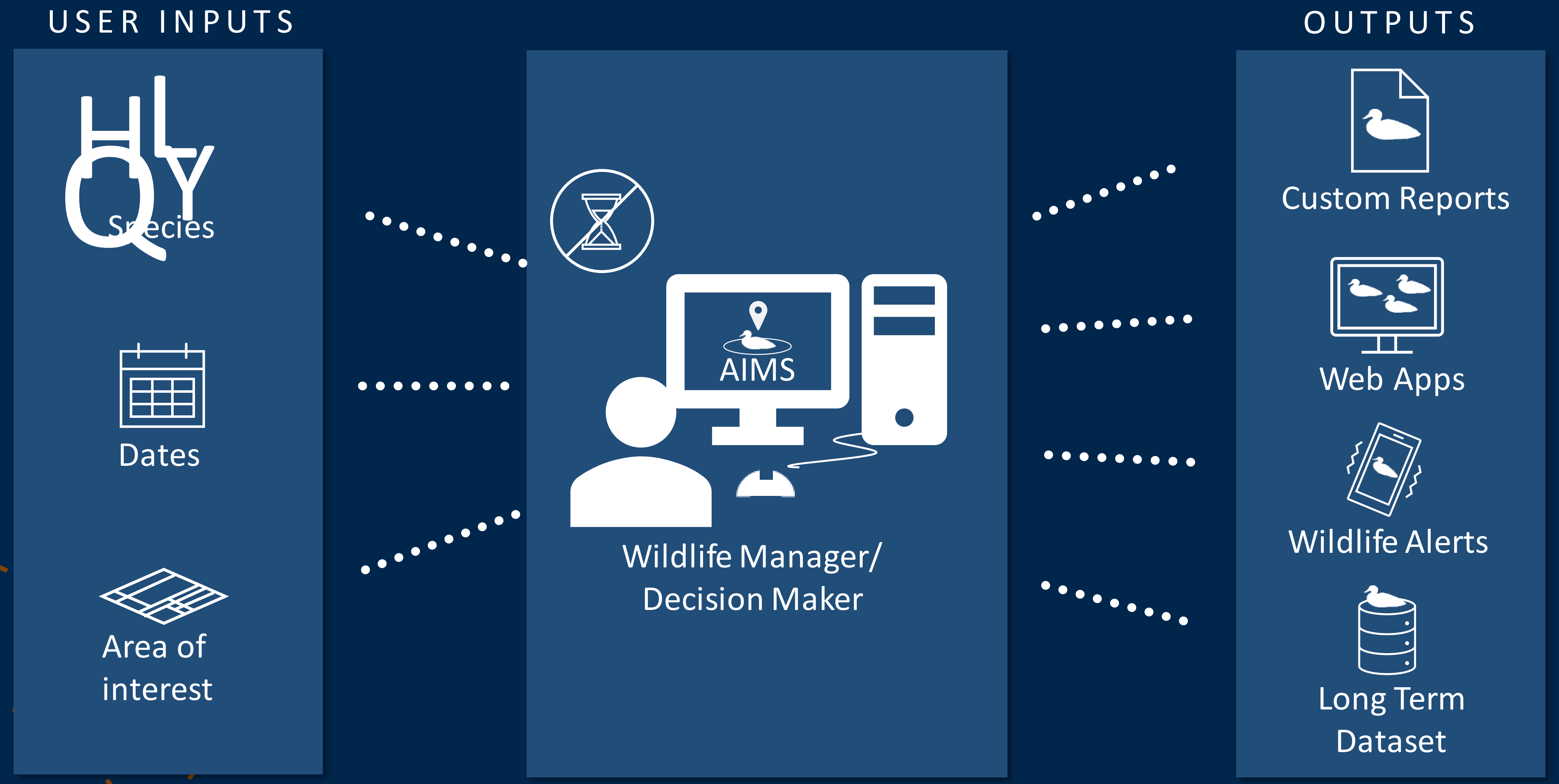
Collects real-time wildlife and environmental data

Aggregates, processes, and analyzes data

Produces customized summaries and reports in a simple user interface

AIMS FOR WILDLIFE

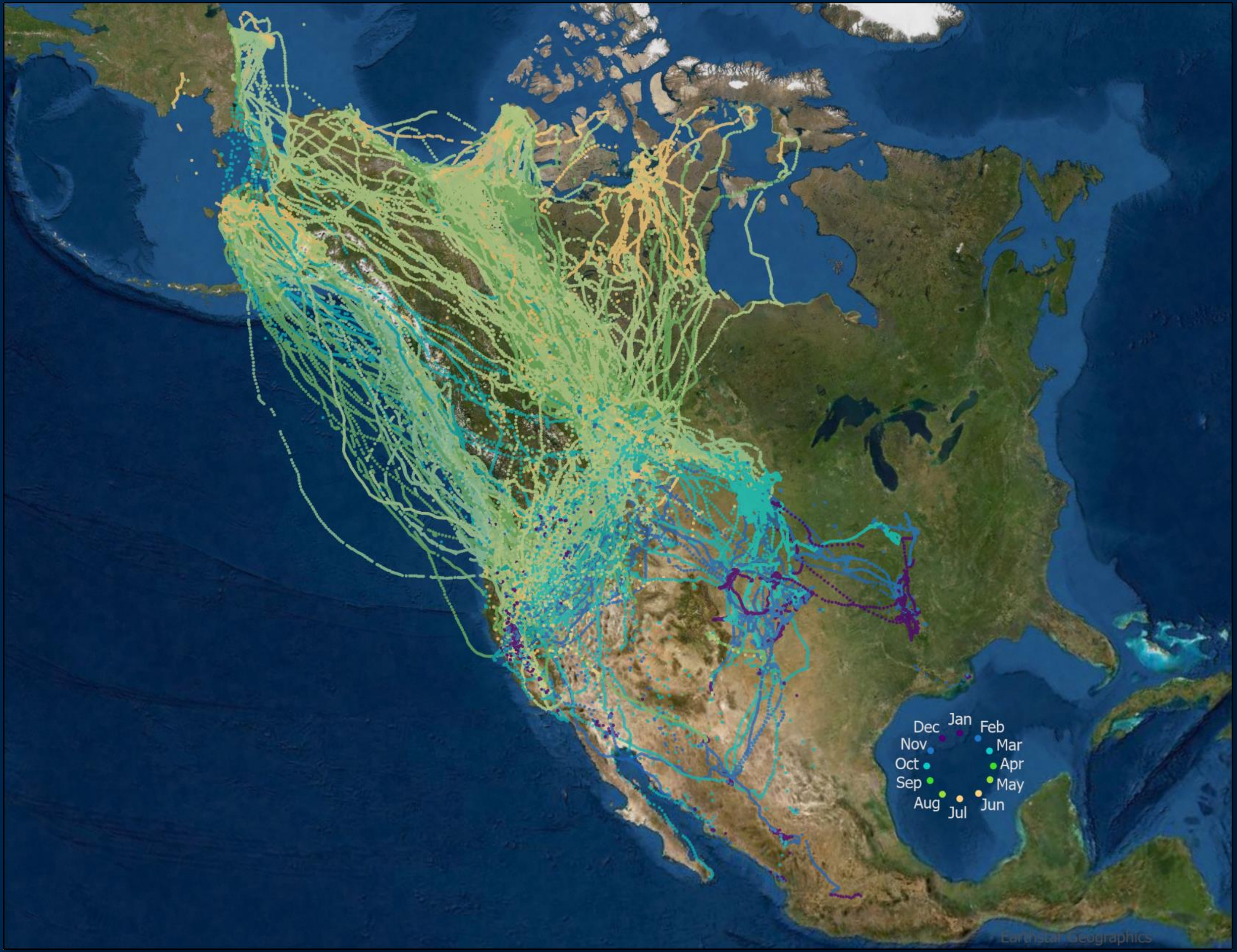
AIMS USER EXPERIENCE



AIMS: Program in development (USGS, USFWS, CDFW, others?)

AIMS FOR WILDLIFE

USGS



- Data stream applicable at multiple scales across time and space
- Provides baseline data to assess future changes (BACI design)
- Actionable data
- Adaptive management realized
- Addresses: water use decisions, disease risk, renewable energy, migration, water availability, climate change
- Reduce the need for costly and high-risk aerial surveys

AIMS FOR WILDLIFE

A wildlife monitoring system to answer the challenging questions of the 21st Century

- Telemetry data accessible and operationally relevant
- Real-time actionable data to make faster decisions
- Leverage existing products

- Reduces need for specialized skills (telemetry, GIS)
- Communicates information in digestible format
- Saves managers/decision makers valuable time

USGS
science for a changing world

Contact:
Michael Casazza
mike_casazza@usgs.gov