



Economic value of angling on the Colorado River at Lees Ferry: Using secondary data to estimate the influence of seasonality

Lucas Bair, U.S. Geological Survey

David Rogowski, Arizona Game and Fish Department

Chris Neher, University of Montana

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



Study Objective

- Estimate the economic value of angling at Lees Ferry and identify angler preferences that influence the value attributed to the experience.
- Richards and Wood (1985) and Bishop et al. (1987)
- Changes over three decades
 - Flow regime
 - Fishery characteristics
 - Regulation

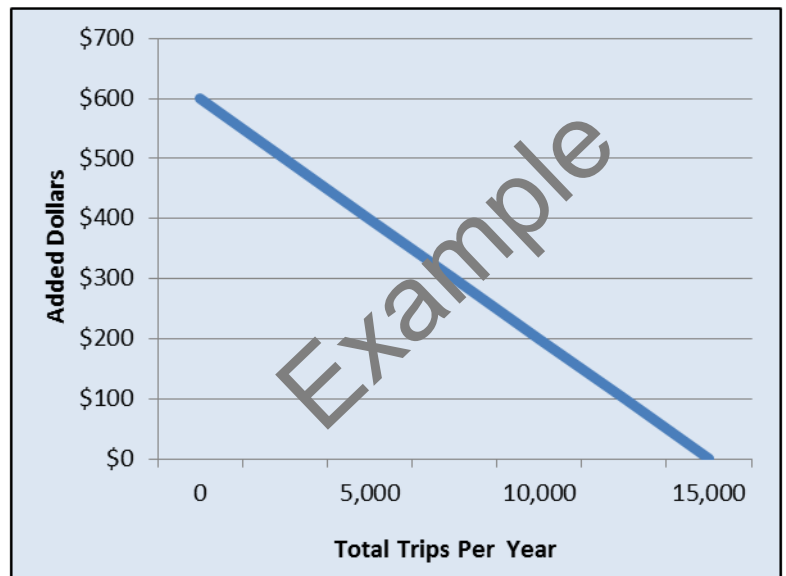
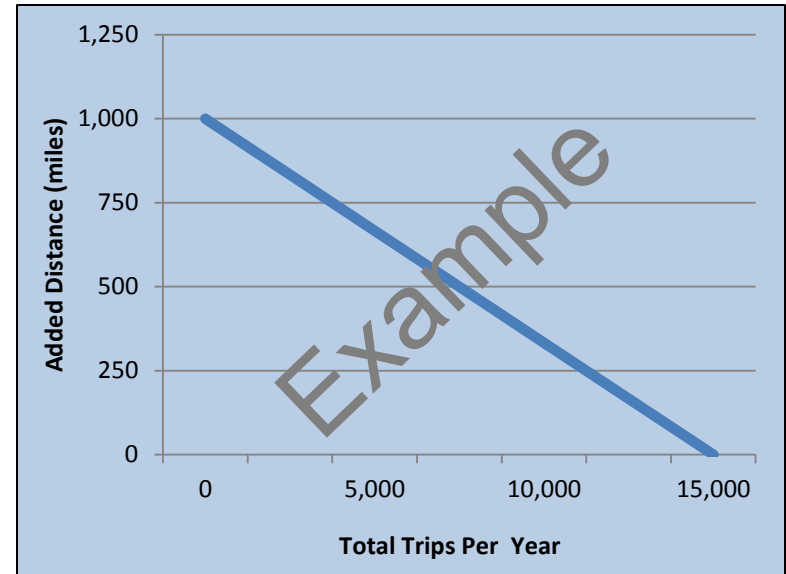


Presentation Outline

- Economic method used to estimate the value of nonmarket goods and services
- Arizona Game & Fish Dept. (AGFD) creel survey
- Study area and research methods
- Results from the study
- Conclusion and ongoing research

Estimating Economic Value

- Nonmarket goods and service
 - Unobservable market behavior
- Revealed or stated preference methods
- Revealed preference: **travel cost method**



Estimating a Demand Function

- Quantity of recreation (trips per year)
 - cost (or price) of participation
 - cost (or price) of substitute opportunities
 - socioeconomic characteristics (e.g., income, education, age)
- Secondary data used to identify individual trips per year, travel cost, and proxies for substitute angling opportunities and socioeconomic information

Arizona Game and Fish Department Creel Survey

AZGFD 2015 Lees Ferry Access Point Creel Survey																					
Clerk:		Start Time:		Trailer Count:		Anglers Missed:		Comments:		Page: ____ of ____											
Date:		End Time:		Boat Count:		Anglers Declined:															
People Count		Guide		Fishing duration		Gear		Fish		Total		Catch		Satisfaction		Trips/		Creel		Size Opinion	
Int#	Juv	Adu	Ret	Y/N	Zip Code	Start	Interview	F/S	Spp	Catch	Harvest	>18	1-5	year	2015?	"	"	10@10	2@18	"	"
Name:						Address:						Gender:						Ethnicity:			

- Data collected from 2012 – 2014
- Sample size of 2,189
- Individual observation travel cost model

Lees Ferry Access Point (boat ramp)







Lees Ferry Walk-in Area





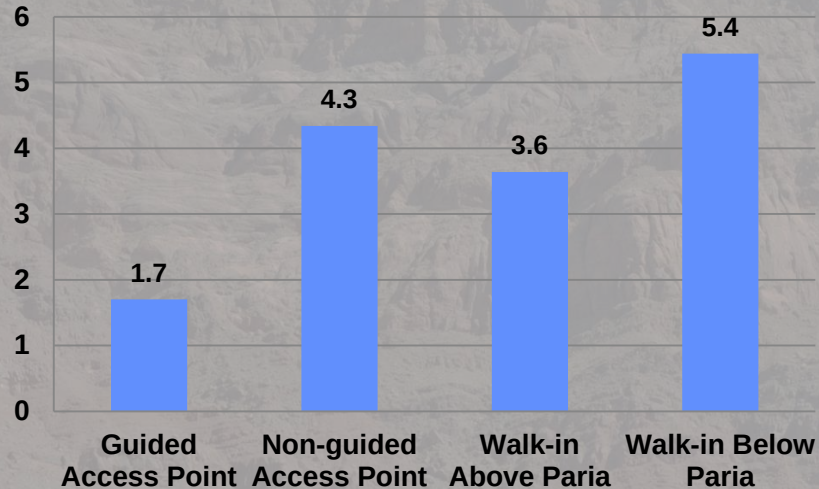




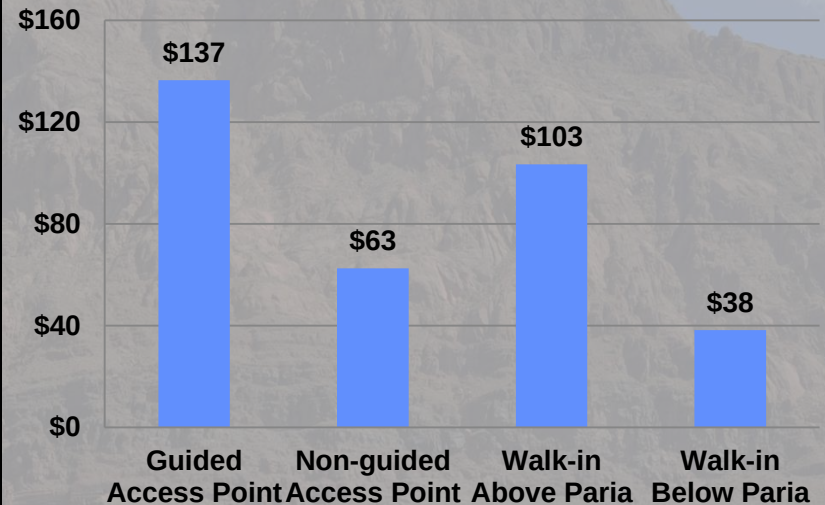
Descriptive Statistics

Variable	Description	Aggregate Sample	Guided at Access Point	Non-guided at Access Point	Walk-in Above Paria	Walk-in Below Paria
Annual trips	Number of angling trips to Lees Ferry in the past 12 months	3.28	1.7	4.3	3.6	5.4
Travel cost	Round trip road miles * \$0.14 + \$15 (vehicle) +\$16 (watercraft)	-	\$137	\$63	\$103	\$38
Income	Annual income by zip code of residence (thousand dollars)	\$62	\$68	\$61	\$61	\$48
Substitute angling opportunities	Percentage of total US trout fishing days by state of residence	1%	1%	1%	1%	1%
Age	=1 if categorized as retired; =0 if adult	42%	52%	37%	37%	15%
Catch per unit effort	Continuous variable of catch per hour of fishing	1.81	2.42	1.69	1.14	0.65
Fly	=1 if gear categorized as fly fishing; =0 if other (spinner and bait)	70%	89%	54%	92%	12%
Highway 89 closure	=1 if U.S Highway 89 was closed; =0 if U.S Highway 89 was open	62%	62%	62%	52%	84%
Spring	=0 if categorized as spring	52%	61%	42%	61%	33%
Summer	=1 if categorized as summer	15%	13%	14%	4%	48%
Fall	=1 if categorized as fall	16%	13%	21%	16%	6%
Winter	=1 if categorized as winter	18%	14%	22%	18%	13%

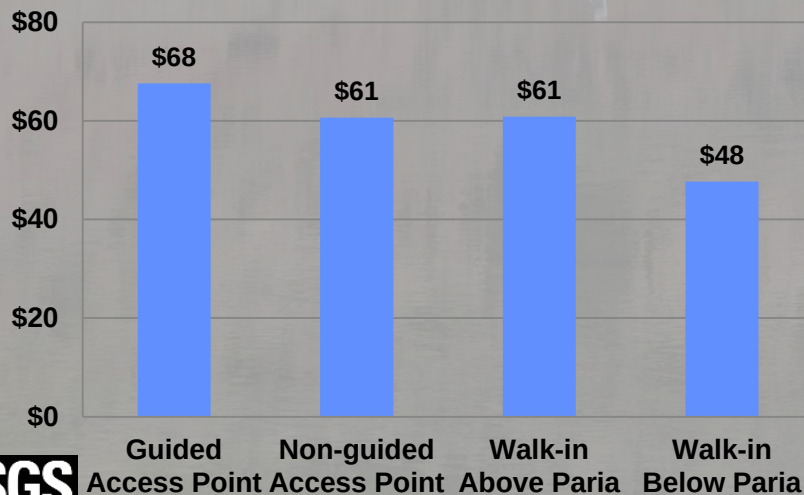
Angling trips to Lees Ferry in past 12 months



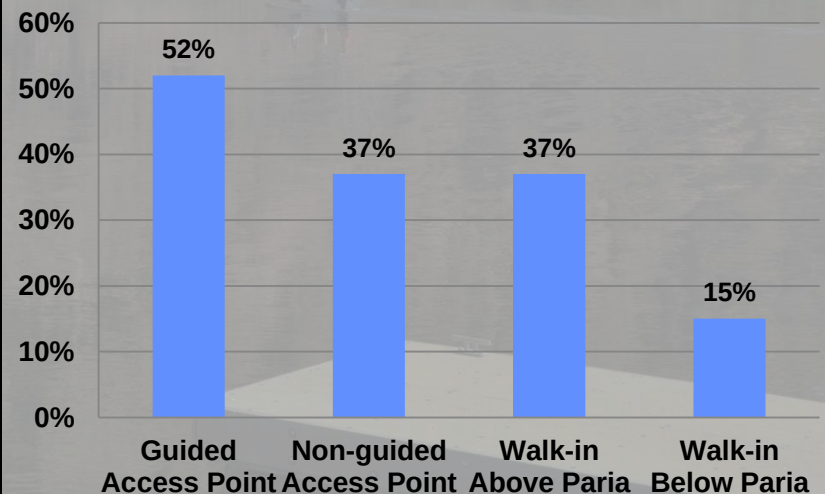
Travel Cost (round trip road miles * \$0.14)



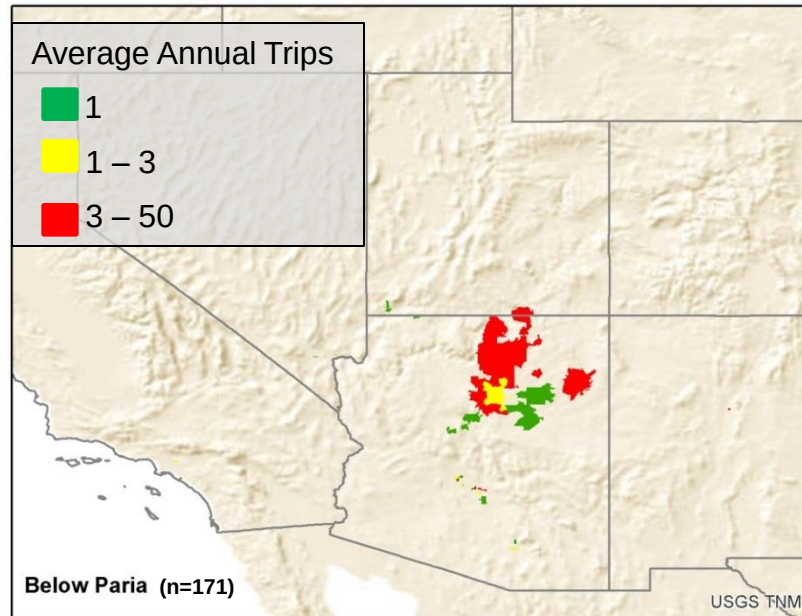
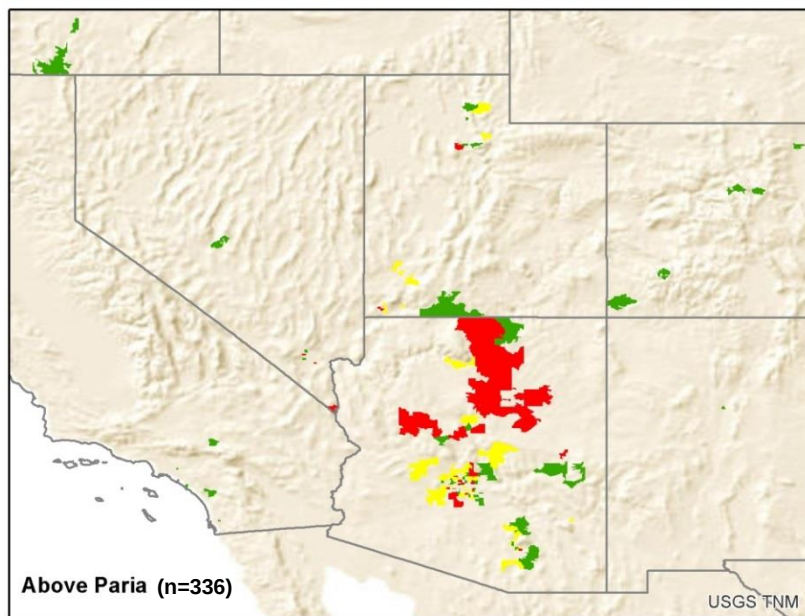
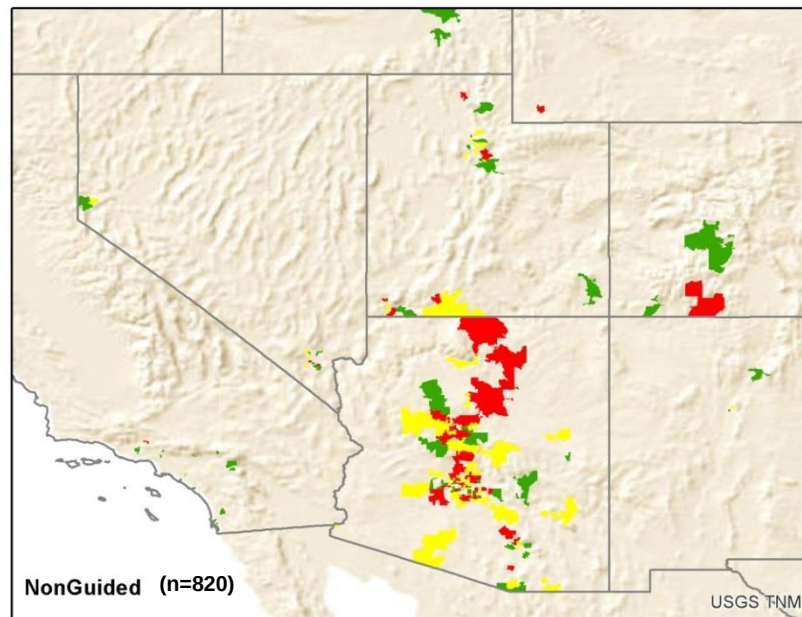
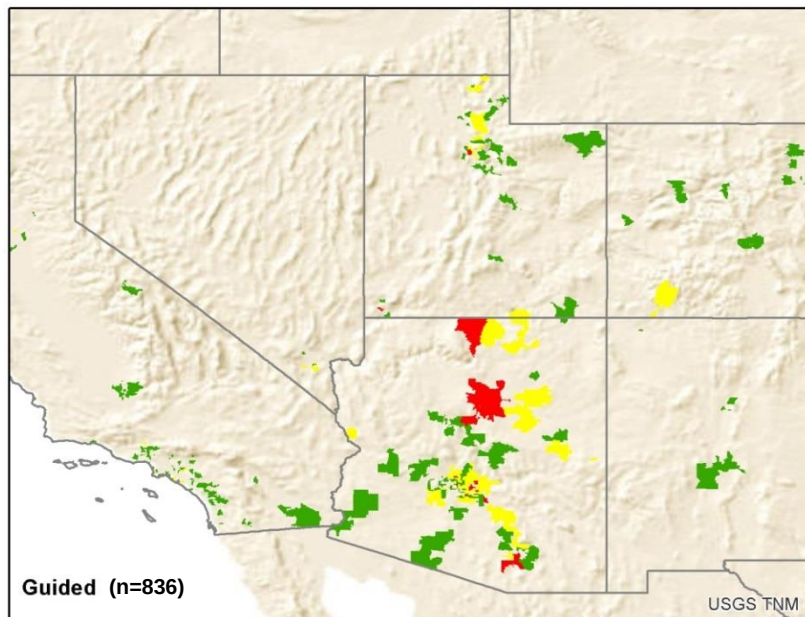
Annual income by zip code of residence (thousand dollars)



Percent of anglers categorized as retired



Angler Visitation by Area

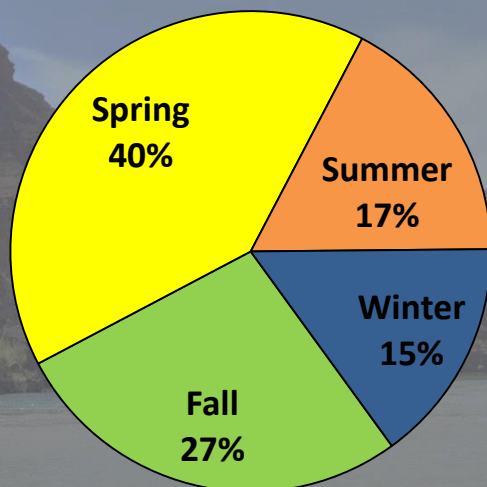


Average Annual Trips

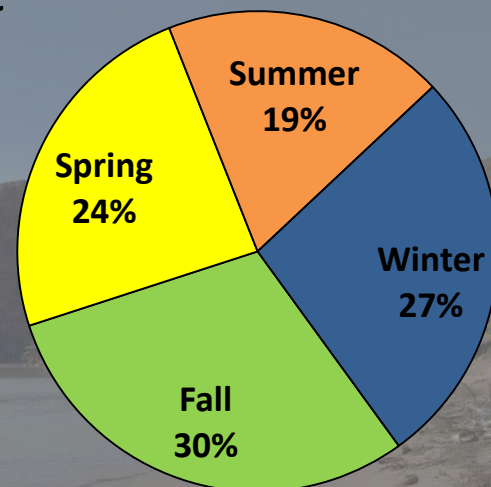
- 1
- 1 – 3
- 3 – 50

Visitation by Season

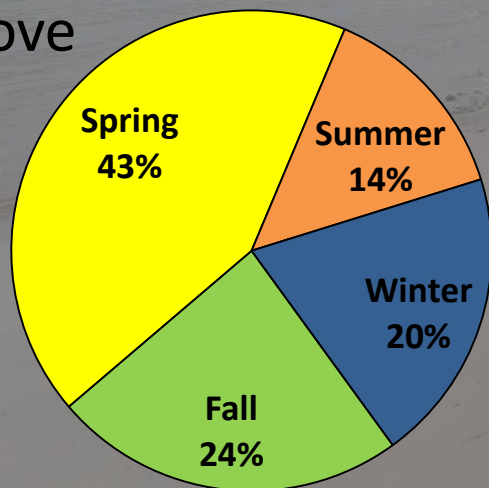
Guided at
Access Point



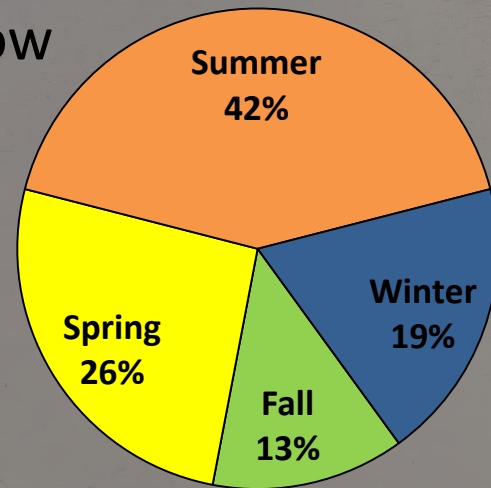
Non-guided at
Access Point



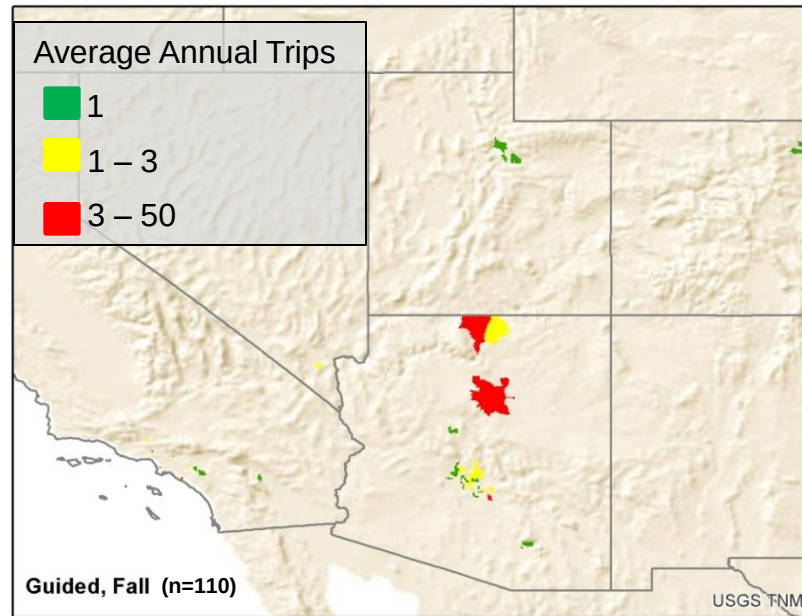
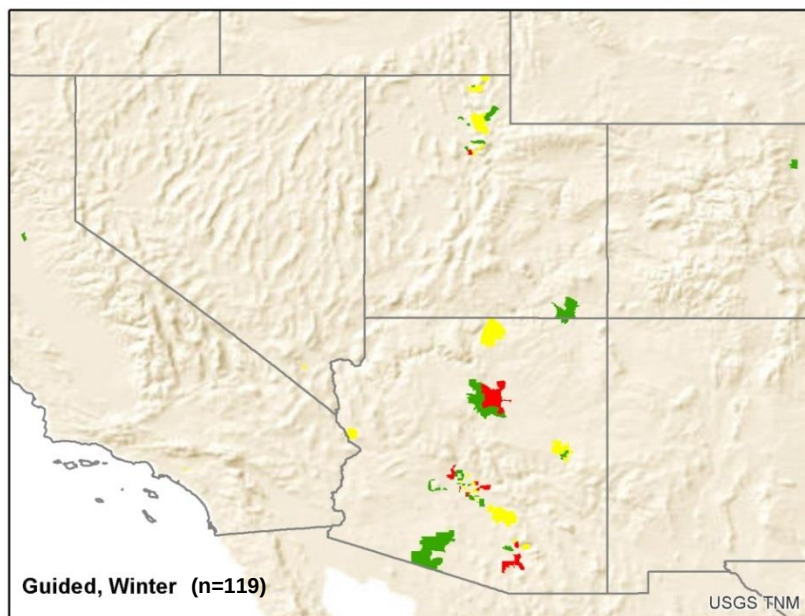
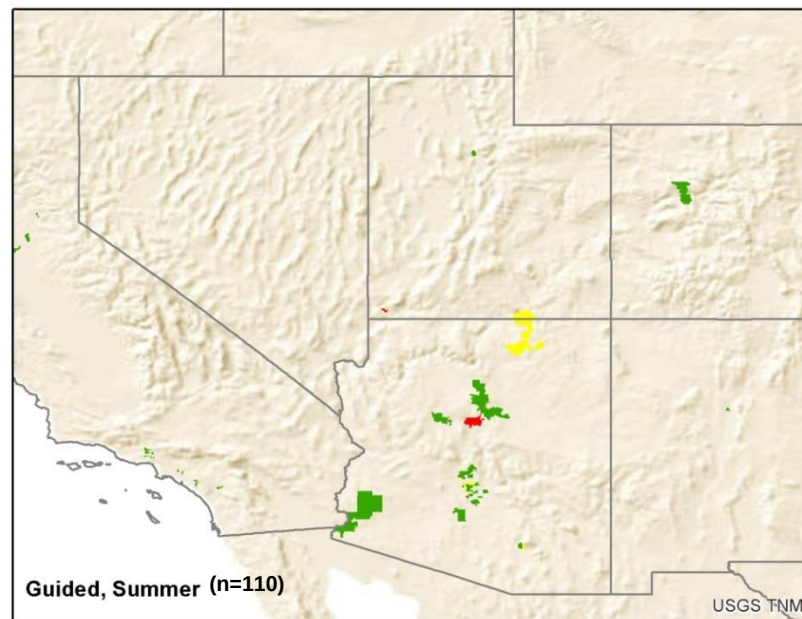
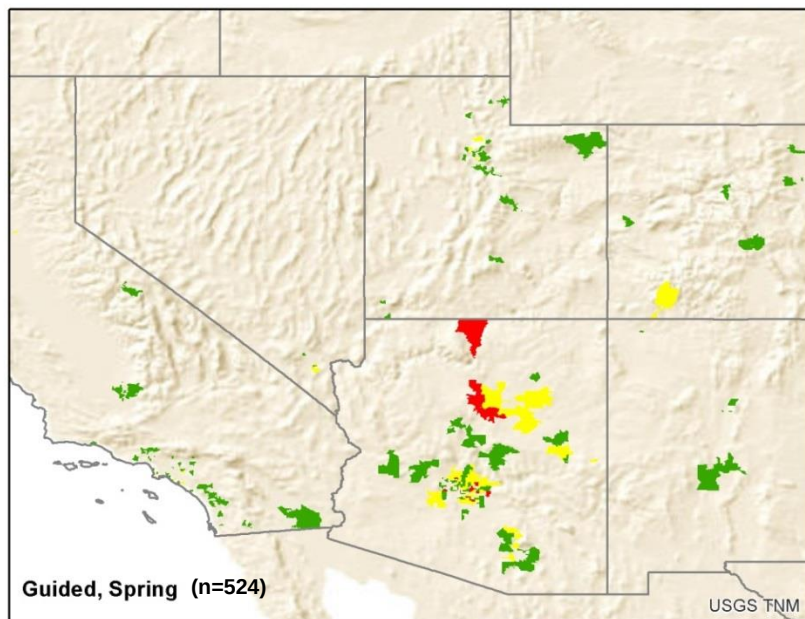
Walk-in Above
Paria



Walk-in Below
Paria



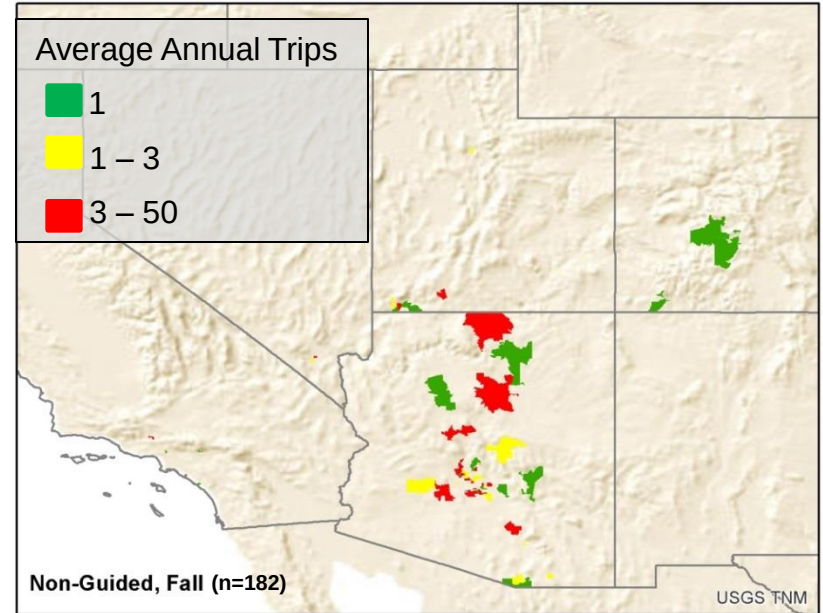
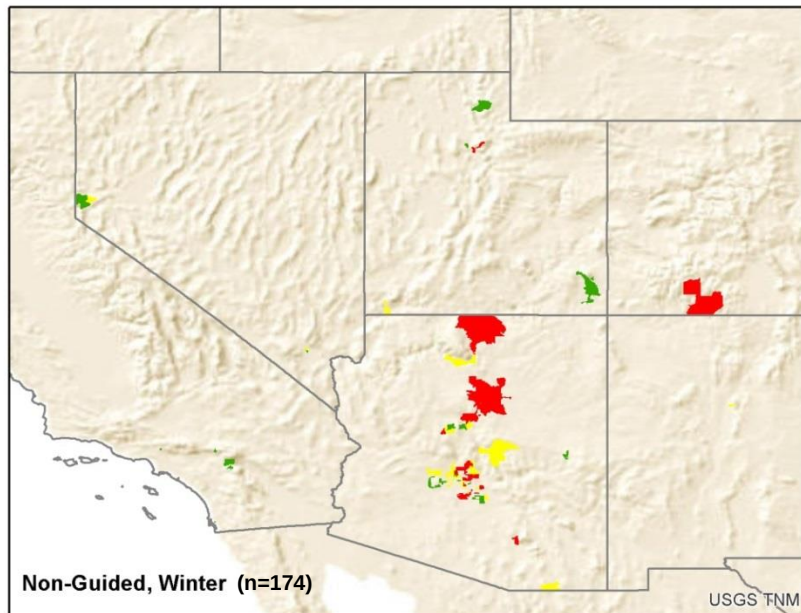
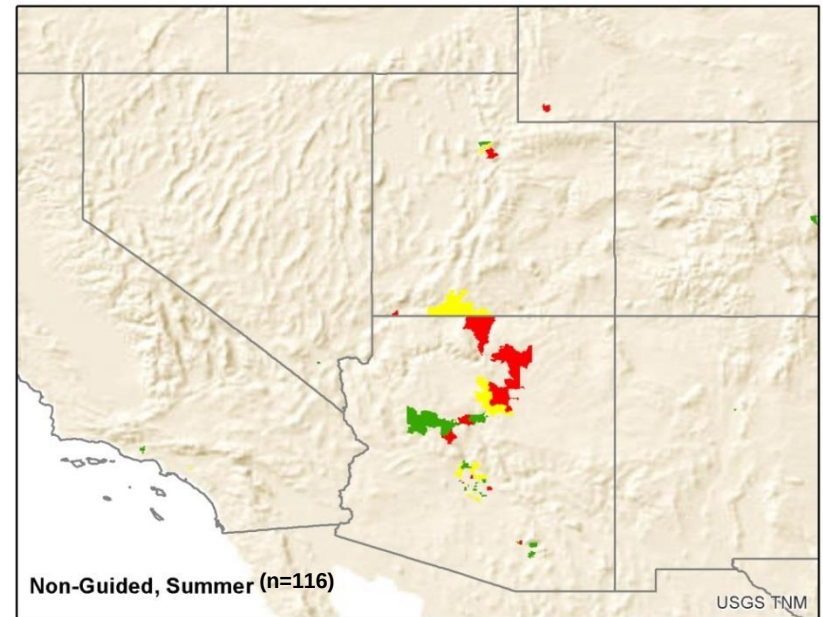
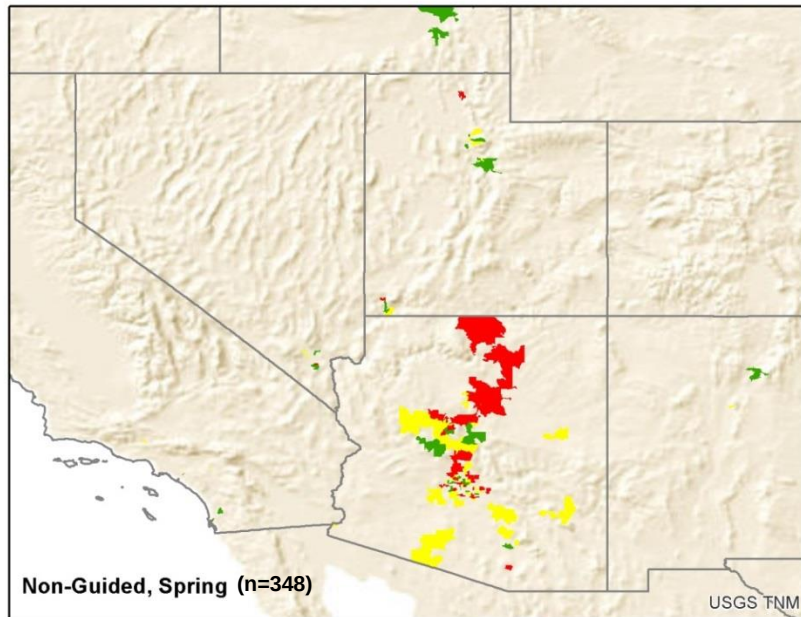
Guided Visitation by Season



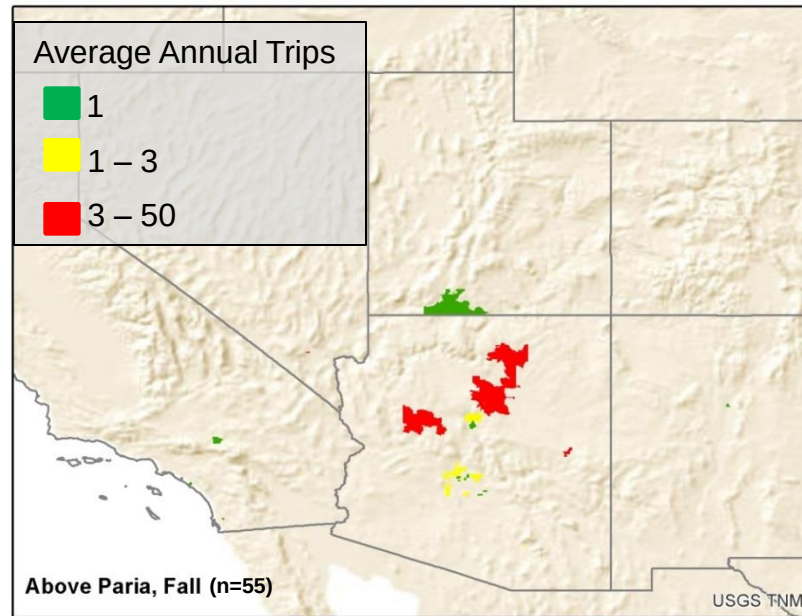
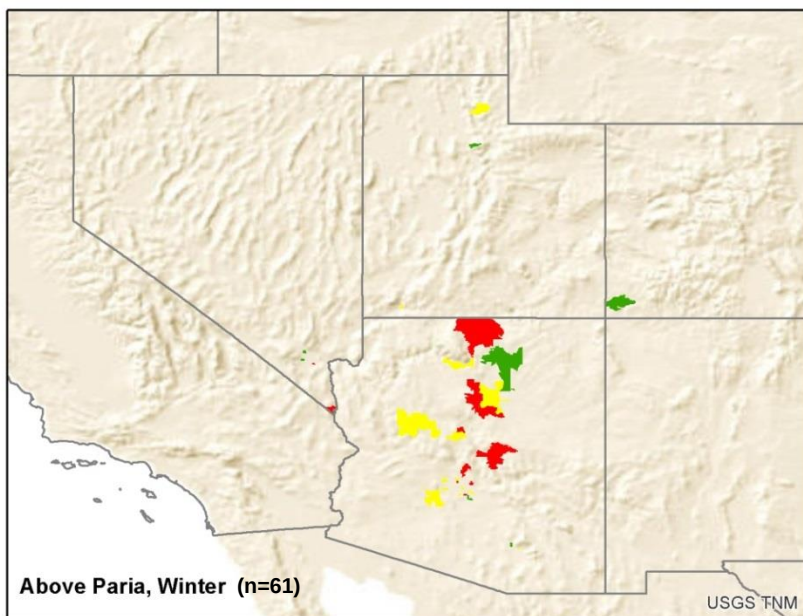
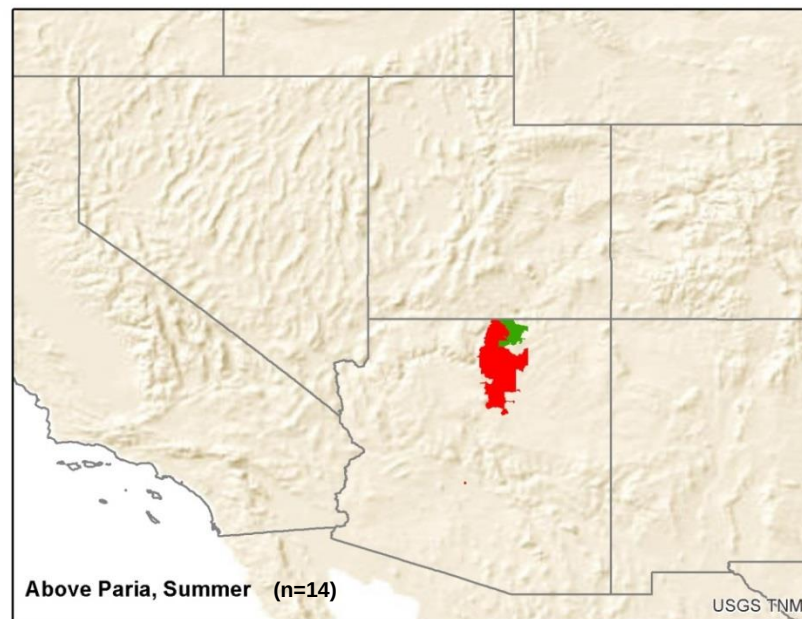
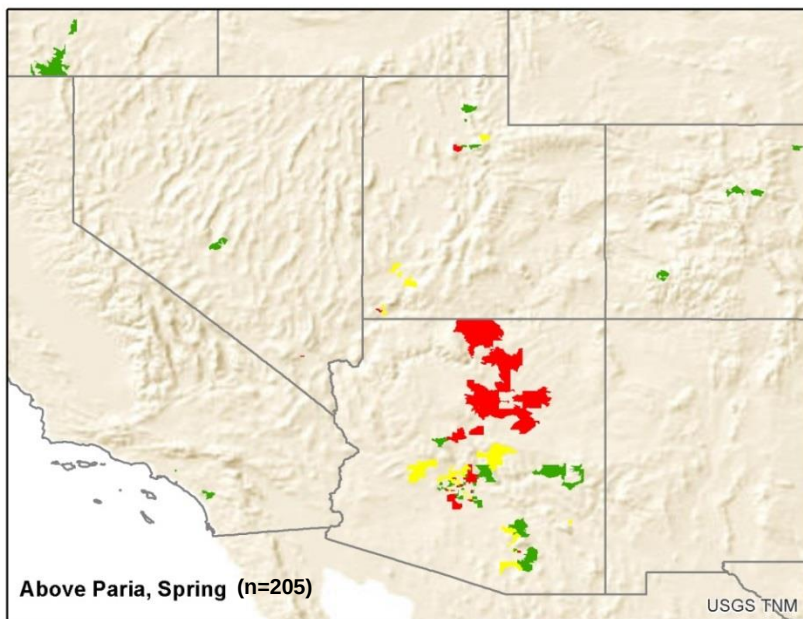
Average Annual Trips

- 1
- 1 – 3
- 3 – 50

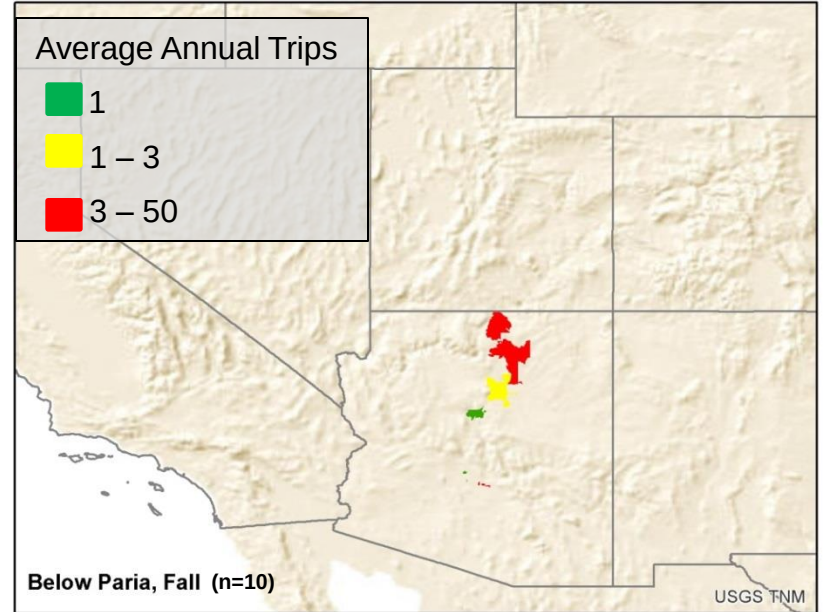
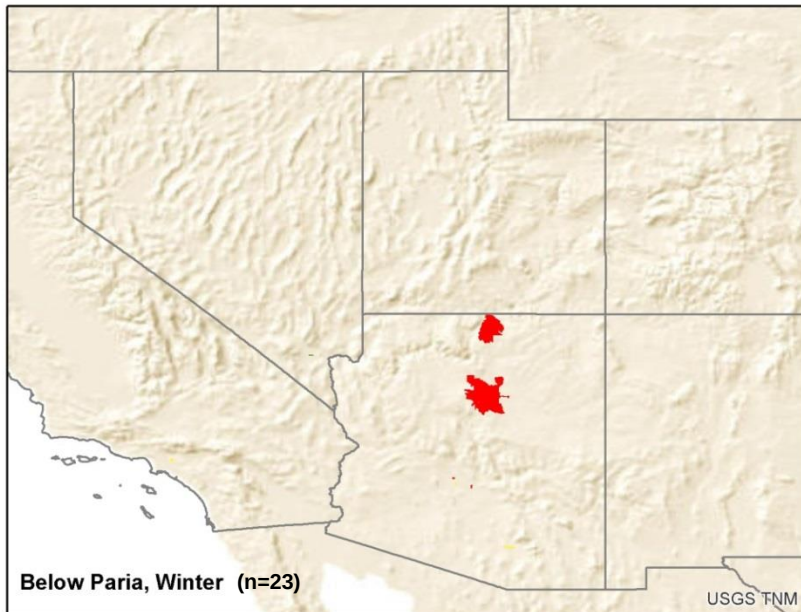
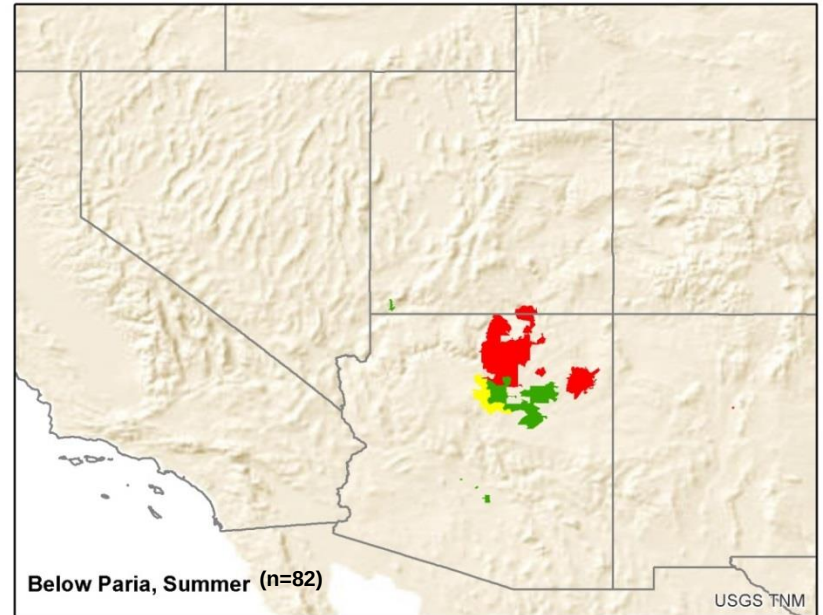
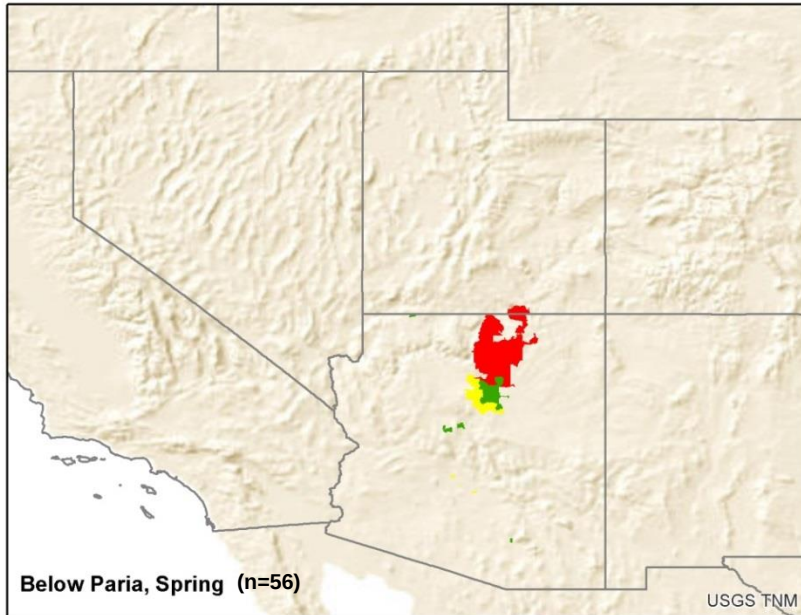
Non-guided Visitation by Season



Above Paria Visitation by Season



Below Paria Visitation by Season



Average Annual Trips

- 1
- 1 – 3
- 3 – 50

Statistical Model*

Table 2: Zero-truncated negative binomial model results (estimated regression coefficients) for the number of angling trips per year by angler type for the Lees Ferry trout fishery (2012-2014).

	Aggregate Model	Guided at Access Point	Non-guided at Access Point	Walk-in Above Paria	Walk-in Below Paria
Constant	-1.566***	-0.055	-2.932***	-2.083**	0.889
Travel Cost	-0.005***	-0.007***	-0.007***	-0.004***	-0.015***
Substitute^a	-13.566***	-9.842**	-6.637**	-18.913***	6.253
Income	-0.009***	-0.007***	-0.003	-0.018***	-0.029***
Age	0.232***	0.480***	0.209**	0.173	-0.623
Catch-per-Unit-Effort	0.172***	0.159***	0.147***	0.185***	0.178
Fly gear	0.184***	-0.339**	0.362***	0.459*	0.467
Highway 89	0.196***	0.205	0.246***	0.285*	-1.207***
Summer	0.504***	-0.391*	-0.058	0.999***	0.768***
Fall	0.059	0.320**	0.043	0.171	0.437
Winter	-0.029	0.820***	0.007	0.122	0.540*
Summer interaction^b	-0.002***	-	-	-	-
Fall interaction^b	0.001	-	-	-	-
Winter interaction^b	0.002***	-	-	-	-
Alpha (α)	21.621***	11.610***	67.142*	38.813	18.128*
Expected annual trips	2.39	1.45	3.73	2.93	4.53
Sample size	2,189	863	820	335	171

^a The substitute coefficient is the change in annual trips relative to a percentage change alternative trout angling opportunities

^b Interaction terms are season (summer, fall, winter)*(travel cost)

*p<0.1, **p<0.05, ***p<0.01

***Preliminary data, do not cite**

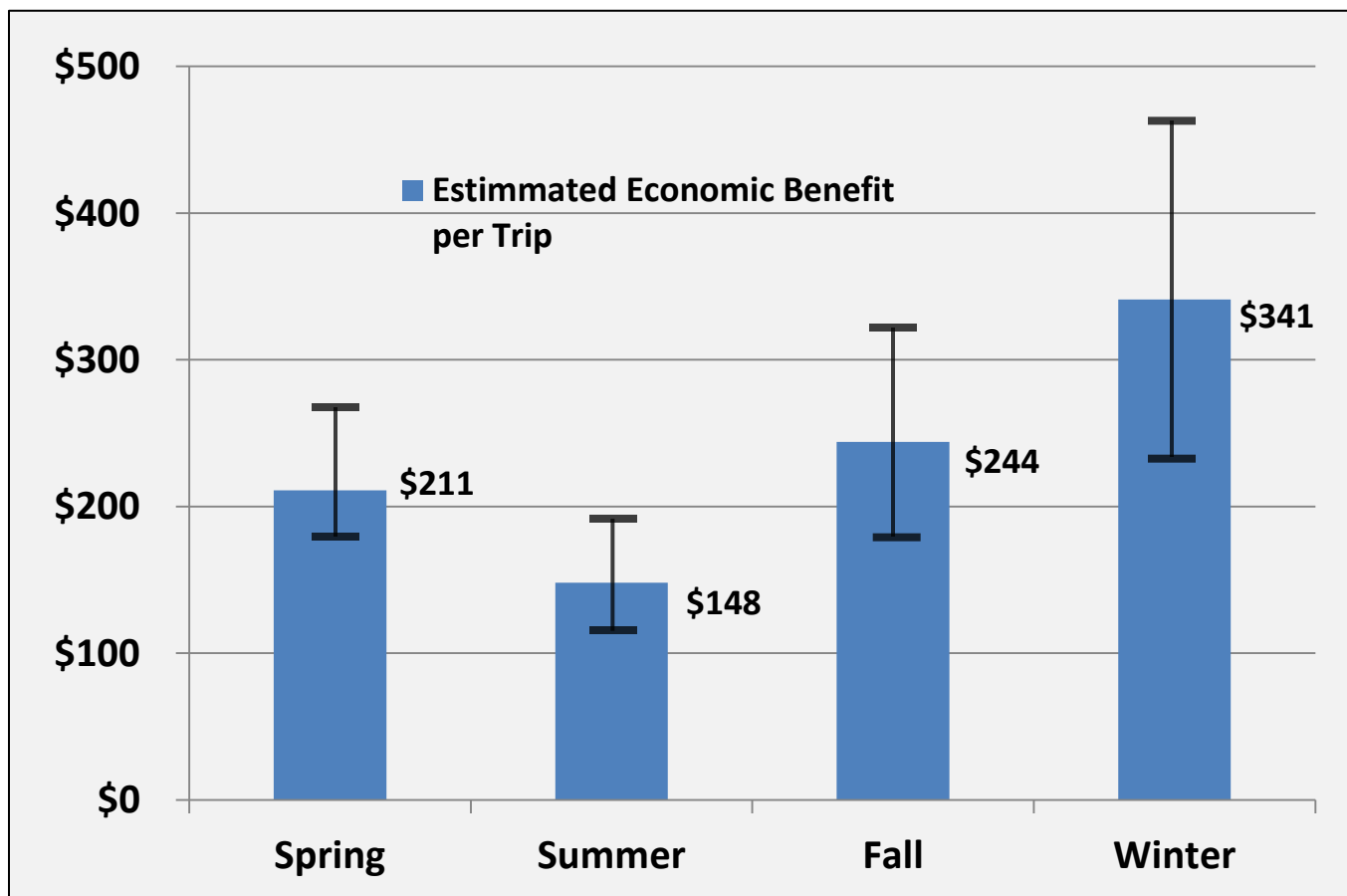
Determinants of Demand*

-  Travel Cost  Annual Trips
-  Substitutes  Annual Trips
-  Income  Annual Trips
-  Age  Annual Trip

Economic Benefit Estimates*

- Average economic benefit per trip
 - \$**221** per trip
- Richards and Wood (1985)
 - \$**632** - \$**889** per trip for non-trophy and trophy anglers, respectively
- Bishop et al. (1987)
 - \$**225** - \$**281** per trip for fluctuating and constant flows, respectively

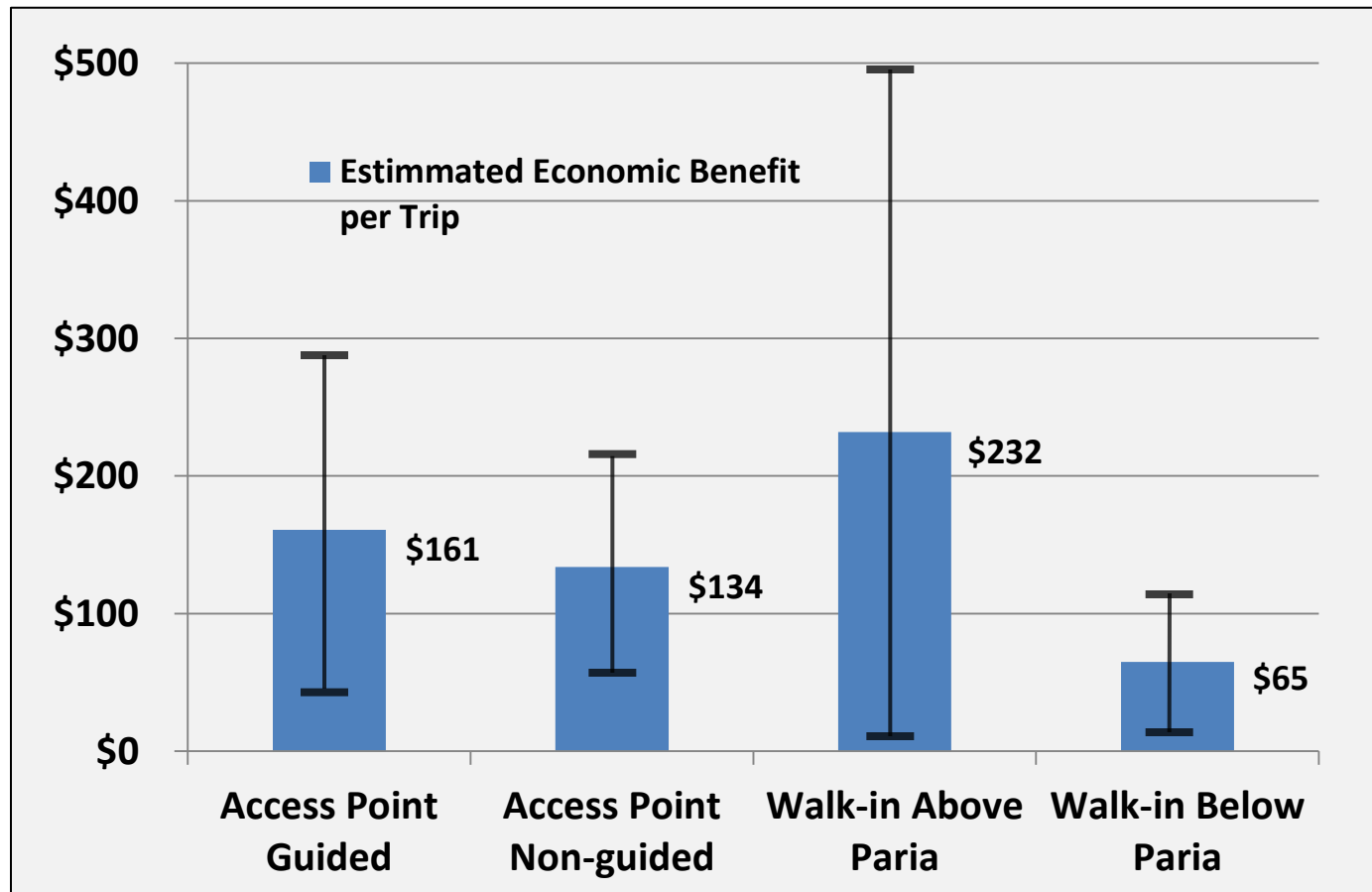
Seasonal Economic Benefits*



Bootstrapped aggregate model seasonal benefit estimates at Lees Ferry with confidence intervals at the 95% level (2014 dollars)

***Preliminary data, do not cite**

Economic Benefits by Area*



Bootstrapped angler user type benefit estimates at Lees Ferry with confidence intervals at the 95% level (2014 dollars)

***Preliminary data, do not cite**

Conclusion

- Demand for angling at Lees Ferry varies by access location and season
- Future research
 - River flows
 - Fishery quality
 - Regional economy



Ongoing Research

- Angler stated preference survey
- Whitewater floater stated preference survey
 - Private
 - Commercial



- Acknowledgements
 - AGFD staff Pilar Wolters, Michael Mishler, Damon Peterson, Jackson Pickett, Robin Osterhoudt, Mike Anderson, Kristy Manuell and Steve Harding
 - GIS analysis by Thomas Gushue with USGS; manuscript comments provided by Scott VanderKooi and Leslie Richardson with USGS

- Questions

- lbair@usgs.gov

928-556-7362