



# Chapter 3: Caspian Tern Management at Alternative Colony Sites Outside the Columbia River Basin

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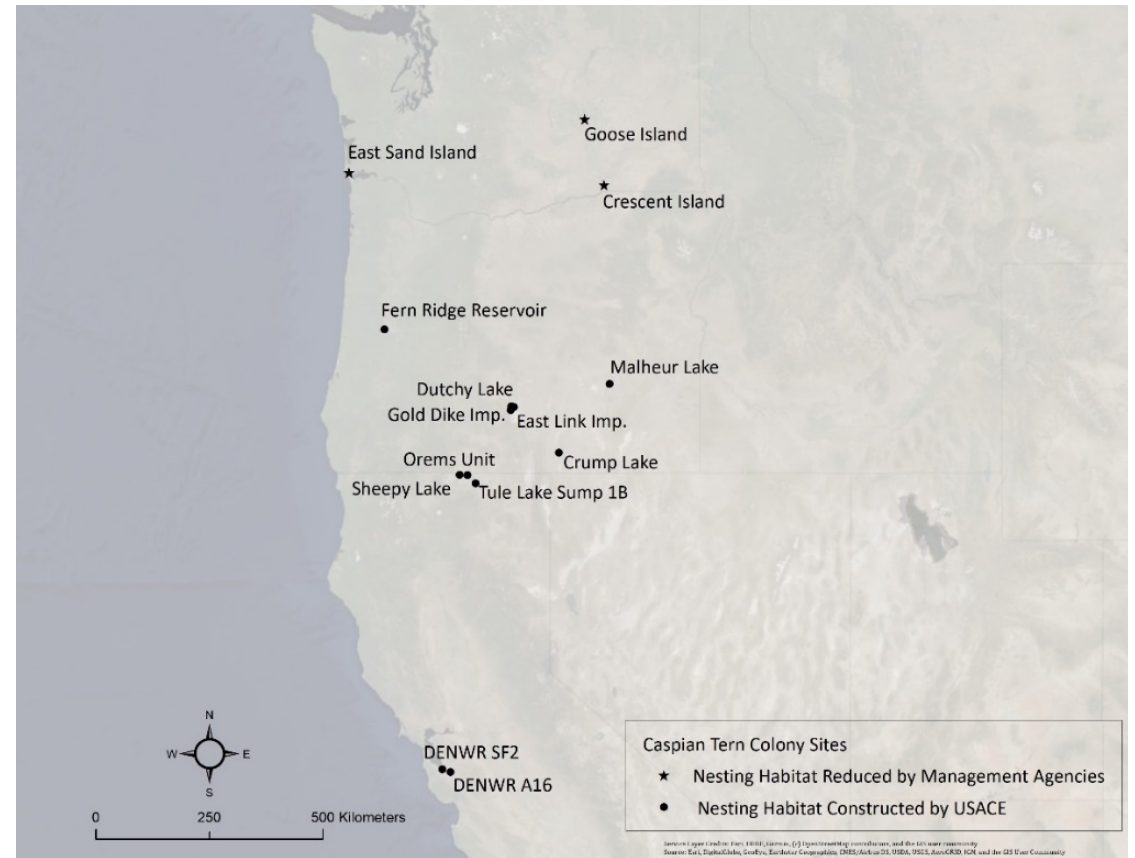
**RTR**<sup>2</sup>  
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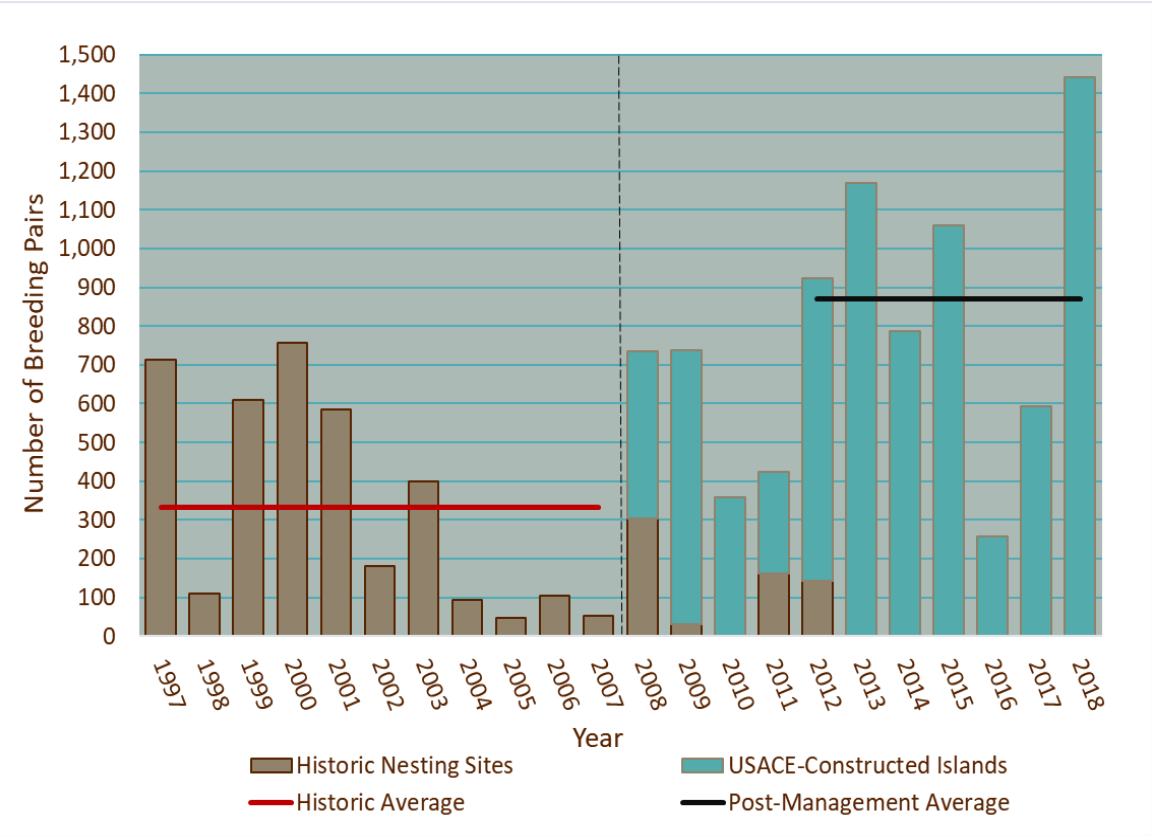


General Location	Colony Location	State	Area of Nesting Habitat (acre)	Area of Effective Nesting Habitat (acre)	Year Constructed
Willamette Valley	Fern Ridge Reservoir	Oregon	1.0	1.0	2008
Warner Valley	Crump Lake	Oregon	1.0	1.0	2008
Summer Lake Wildlife Area	East Link Impoundment	Oregon	0.5	0.5	2009
Summer Lake Wildlife Area	Dutchy Lake	Oregon	0.5 <sup>a</sup>	0.5 <sup>a</sup>	2009
Tule Lake NWR	Tule Lake Sump 1B	California	2.0	1.35	2009
Summer Lake Wildlife Area	Gold Dike Impoundment	Oregon	0.5	0.5	2009
Lower Klamath NWR	Orems Unit	California	1.0 <sup>b</sup>	0.2 <sup>b</sup>	2009
Lower Klamath NWR	Sheepy Lake	California	0.8 <sup>c</sup>	0.8 <sup>c</sup>	2010
Malheur NWR	Malheur Lake	Oregon	1.0	1.0	2012
Don Edwards NWR	Pond A16	California	0.69 <sup>d</sup>	0.69 <sup>d</sup>	2015
Don Edwards NWR	Pond SF2	California	1.26 <sup>e</sup>	1.26 <sup>e</sup>	2015

A total 8.3 acres of Effective Nesting Habitat constructed by 2015



# USACE-constructed colony sites in the southern Oregon, northeastern California (SONEC) region



**Estimated Peak Number of Breeding Pairs**

Year	Willamette Valley	Warner Valley	Summer Lake Wildlife Area			Lower Klamath NWR		Tule Lake NWR	Malheur NWR	Annual Total
	Fern Ridge Res.	Crump Lake	Dutchy Lake	East Link Impoundment	Gold Dike Impoundment	Sheepy Lake	Orems Unit	Tule Lake Sump 1B	Malheur Lake	
2008	0	430	NA	NA	NA	NA	NA	NA	NA	<b>430</b>
2009	0	690	8	7	NA	NA	NA	NA	NA	<b>705</b>
2010	0	71	0	29	NA	258	NA	NA	NA	<b>358</b>
2011	0	35	0	2	0	188	2	34	NA	<b>261</b>
2012	0	115	0	10	4	212	NA	207	232	<b>780</b>
2013	0	223	NA	21	0	316	NA	79	530	<b>1,169</b>
2014	0	1	NA	22	0	520	NA	109	134	<b>786</b>
2015	0	3	NA	27	0	336	NA	545	148	<b>1,059</b>
2016	--	27	NA	22	0	95	NA	100	14	<b>258</b>
2017	--	26	NA	27	0	245	NA	274	21	<b>593</b>
2018	--	86	NA	70	0	238	NA	627	420	<b>1,441</b>
2019	--	--	NA	--	--	~220	--	~205	--	--

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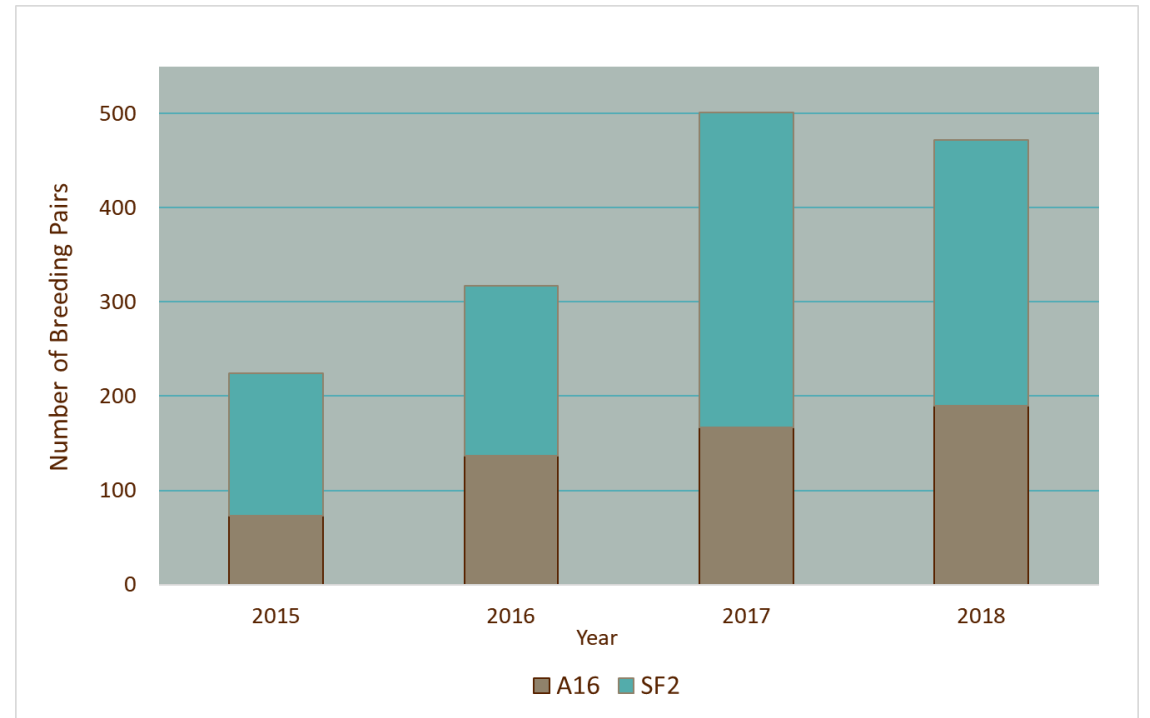
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# Don Edwards San Francisco Bay National Wildlife Refuge

Nesting habitat at the SF2 salt pond, DENWR



Caspian terns nesting on USACE-enhanced islands in Ponds A16 and SF2, DENWR



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- The diet of Caspian terns nesting on USACE-constructed islands in the SONEC region consisted mainly of native and introduced species of minnows, not salmonids



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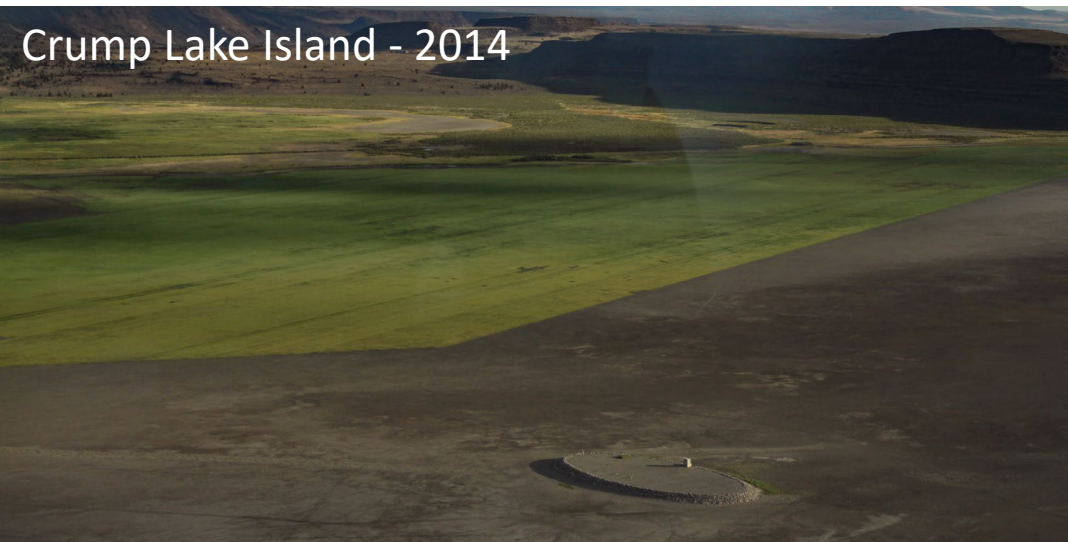
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    - About 6,000 breeding pairs of Caspian terns were displaced by the two Plans, but the USACE-constructed islands can accommodate only 2,000–2,500 breeding pairs
    - Anthropogenic climate change and frequent and persistent drought in the western United States will impact tern nesting and foraging habitat throughout the SONEC region







## Limiting Factors

Limiting Factor	Year									Average
	2008 (n=1)	2009 (n=3)	2010 (n=7)	2011 (n=7)	2012 (n=8)	2014 (n=7)	2015 (n=7)	2016 (n=7)		
Water Allocation or Drought	0.00	0.00	0.43	0.29	0.13	0.14	0.57	0.57	0.29	<b>0.24</b>
Vegetation Encroachment	0.00	0.00	0.50	0.60	0.86	0.83	0.67	0.50	0.50	<b>0.50</b>
Space Competition w/ Gulls	0.00	0.33	0.50	0.33	0.29	0.33	0.33	0.33	0.33	<b>0.31</b>

Limiting Factor	Year									Average
	2008 (n=1)	2009 (n=3)	2010 (n=7)	2011 (n=7)	2012 (n=8)	2013 (n=7)	2014 (n=7)	2015 (n=7)	2016 (n=7)	
Nocturnal Avian Predators	0.00	0.00	0.25	0.33	0.29	0.50	0.50	0.33	0.00	<b>0.24</b>
Nocturnal Mammalian Predators	0.00	0.00	0.00	0.00	0.14	0.17	0.33	0.50	0.17	<b>0.15</b>
Gull Predation on Eggs or Chicks	1.00	0.67	0.75	0.50	0.43	0.50	0.50	0.50	0.50	<b>0.59</b>
Low Forage Fish Availability	0.00	0.67	0.50	0.40	0.43	0.40	0.80	0.80	0.20	<b>0.47</b>

# Predator Control

Colony Location	Species Removed	2008	2009	2010	2011	2012	2013	2014	2015	2016 <sup>a</sup>	Total
Crump Lake	California Gull	7				23	8			1	39
	Ring-billed Gull	3				13	4			4	24
East Link Impoundment	California Gull	--						4	4		8
	Ring-billed Gull	--						9	11		20
Gold Dike Impoundment	Raccoon	--	--	--	--					5	5
Sheepy Lake	California Gull	--	--	2	42	9	8	9			70
	Ring-billed Gull	--	--		3	1		1			5
Tule Lake Sump 1B	California Gull	--	--	--		1	1		1		3
	Ring-billed Gull	--	--	--		1	2	1	6	6	16
	Great Horned Owl	--	--	--	2		2	2	1		7
	Raccoon	--	--	--			1	8	6	8	23
Malheur Lake	California Gull	--	--	--	--	4	8	6	3		21
	Ring-billed Gull	--	--	--	--	5	5	3	8		21



# Diet



## Crump Lake

Year	Prey Type				
	Tui Chub	Catfish spp.	Crappie spp.	Unidentified Minnow	Other
2008 (n = 2,915)	59.9%	22.8%	15.5%	0.0%	1.8%
2009 (n = 3,611)	81.3%	4.6%	13.4%	0.0%	0.7%
2010 (n = 455)	11.6%	9.0%	77.8%	0.0%	1.5%
2011 (n = 1,617)	26.2%	14.0%	56.5%	0.3%	3.3%
2012 (n = 1,671)	18.9%	38.7%	39.5%	0.0%	2.9%
2013 (n = 1,542)	48.4%	21.9%	25.7%	0.1%	4.0%
<b>Average (2008–2013)</b>	<b>41.0%</b>	<b>18.5%</b>	<b>38.1%</b>	<b>0.1%</b>	<b>2.4%</b>

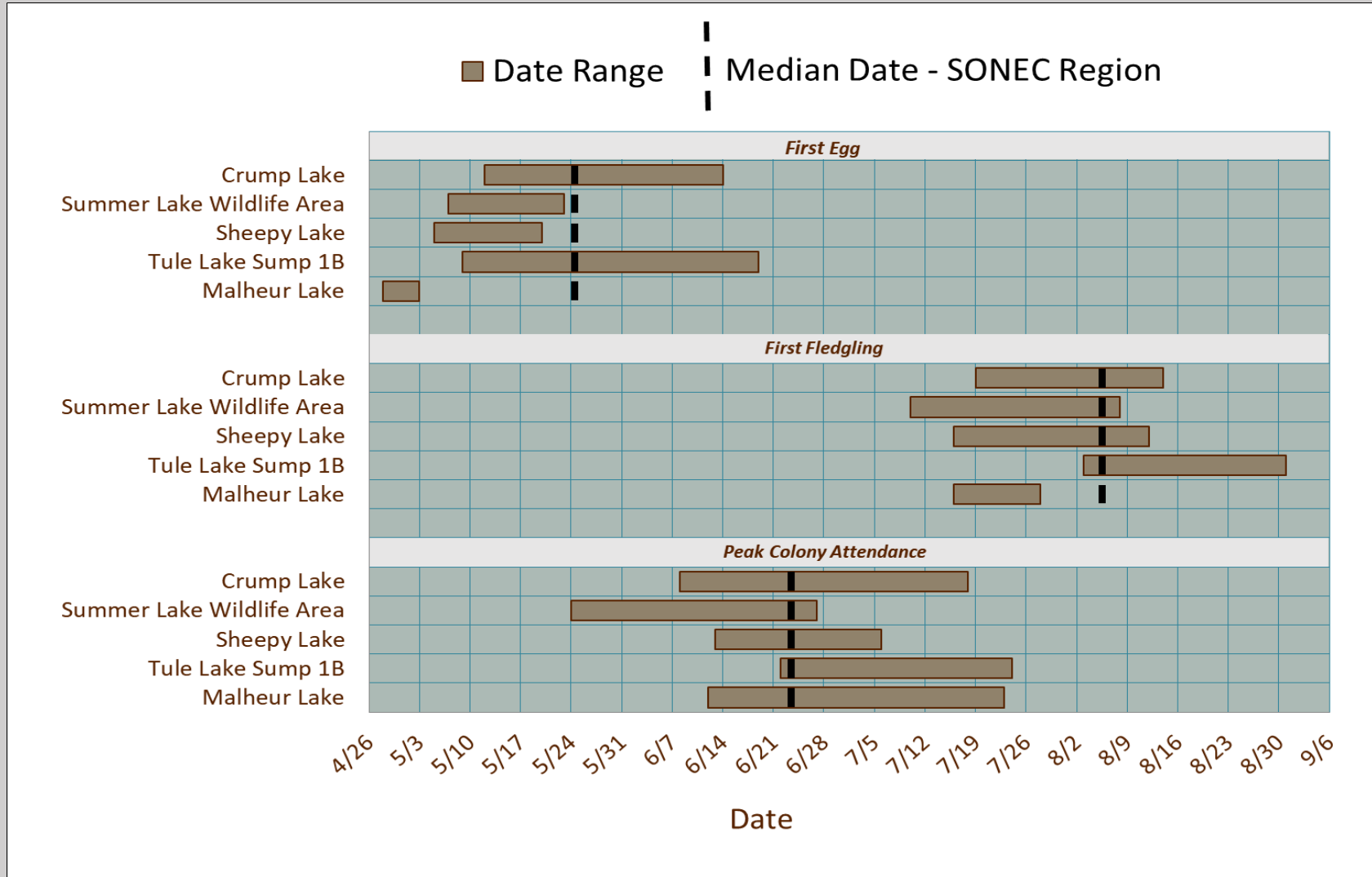
## Sheepy Lake

Year	Prey Type					
	<i>Gila</i> spp.	Fathead Minnow	Sunfish and Bass	Perch spp.	Unidentified Minnow	Other
2010 (n = 1,351)	67.7%	10.7%	9.1%	4.4%	3.6%	4.5%
2011 (n = 1,945)	50.1%	17.6%	11.8%	14.5%	3.1%	2.8%
2012 (n = 1,208)	72.4%	8.5%	12.8%	3.9%	0.0%	2.4%
2013 (n = 1,469)	74.6%	6.9%	2.0%	10.8%	4.4%	1.3%
2014 (n = 657)	71.2%	17.2%	3.0%	3.5%	2.3%	2.7%
<b>Average (2010–2014)</b>	<b>67.2%</b>	<b>12.2%</b>	<b>7.8%</b>	<b>7.4%</b>	<b>2.7%</b>	<b>2.7%</b>

## Malheur Lake

Year	Prey Type					
	Tui Chub	Common Carp	Bullhead spp.	Salmonid spp.	Unidentified Minnow	Other
2012 (n = 2,738)	54.3%	31.0%	7.3%	0.6%	3.2%	3.5%
2013 (n = 2,456)	56.4%	30.0%	7.5%	0.7%	2.2%	3.3%
2014 (n = 1,520)	27.7%	68.1%	0.7%	1.6%	0.2%	1.6%
2015 (n = 618)	14.4%	68.3%	0.5%	1.0%	14.6%	1.3%
<b>Average (2012–2015)</b>	<b>38.2%</b>	<b>49.4%</b>	<b>4.0%</b>	<b>1.0%</b>	<b>5.0%</b>	<b>2.4%</b>

# Chronology





# Nesting Success

Estimated Nesting Success (young raised/breeding pair)								
Year	Warner Valley	Summer Lake Wildlife Area			Lower Klamath NWR		Tule Lake NWR	Malheur NWR
	Crump Lake	Dutchy Lake Impoundment	East Link Impoundment	Gold Dike	Sheepy Lake	Orems Unit	Tule Lake Sump 1B	Malheur Lake
2008	0.34	NA	NA	NA	NA	NA	NA	NA
2009	0.09	0.63	1.00	NA	NA	NA	NA	NA
2010	0.00	NA	0.10	NA	0.65	NA	NA	NA
2011	0.43	NA	0.00	NA	0.11	0.00	0.03	NA
2012	0.43	NA	0.00	0.00	0.68	NA	0.00	0.84
2013	0.27	NA	0.14	NA	0.37	NA	0.00	0.14
2014	0.00	NA	0.55	NA	0.07	NA	0.60	0.11
2015	0.00	NA	0.41	NA	--	NA	0.17	0.01
2016 <sup>a</sup>	0.00	NA	0.00	NA	--	NA	C	--