

# Cal/Ecotox Exposure Factors for Willow Flycatcher (*Empidonax traillii*)\*

Page 1

Endpoint Type	Endpoint Value	Error	Range	Units	Sex	Life Stage	Location	Note	Reference
Age at Fledging, Metamorphosis, Weaning	12.3	0.1 SE	11-14	d	B	Fledgling	OH	a	1
Body Fat (total or %)	1 (8%) to 2.4 (20%)			g	NR	Adult	NM	b	2
Body Weight - Mean	13.2			g	F	Adult	Lab	c	3
Body Weight - Mean	12.73	1.16 SD		g	NR	Adult	NM	d	2
Body Weight - Mean	12.59	1.13 SD		g	NR	Adult	NM	e	2
Body Weight - Mean	13.07	0.84 SD		g	NR	Adult	NM	f	2
Body Weight - Mean	13.31	1.19 SD		g	NR	Adult	NM	g	2
Body Weight - Mean	12.7	1.2 SD	10.3-15.9	g	NR	Adult	NM	h	2
Clutch or Litter Size			3-4	eggs	F	Adult	Fresno; CA	i	4
Clutch or Litter Size	3.68	0.1 SE	3-5	eggs	F	Adult	OH	j	1
Clutch or Litter Size	3.14	0.1 SE	2-4	eggs	F	Adult	OH	k	1
Clutch or Litter Size	4			eggs/nest	F	Adult	CANADA	l	5
Clutch or Litter Size	3			eggs/nest	F	Adult	CO	m	6
Clutch or Litter Size	review				NR	NR		n	7
Clutches or Litters per year	review				NR	NR		o	7
Dietary Composition	Mollusca (4), Arachnida (19), Isopoda (4), Orthoptera (15), Hemiptera (56), Coleoptera (7), Lepidoptera adult (20), Lepidoptera larvae (10), Diptera adult (188), Hymenoptera adult (9), Hymenoptera larvae (1)				NR	Nestling	CANADA	p	5
Duration of Incubation or Gestation	13.3	0.1 SE		d	B	Embryo	OH	q	1
Duration of Incubation or Gestation	review				NR	NR		r	7
Fledging or Weaning Rate	18%			%	B	Both Adult and Juv.	CO	s	6
Fledging or Weaning Rate	50%				B	Fledgling	Fresno; CA	t	8
Fledging or Weaning Rate	16%				NR	Fledgling	Kern; CA	u	9
Fledging or Weaning Rate	29%				NR	Fledgling	Sierra; CA	v	10
Fledging or Weaning Rate	1.3	1.3 SD	0-3 or 4	fledglings/nest	NR	Fledgling	Sierra; CA	w	10
Fledging or Weaning Rate	1.11			fledglings/nest	NR	Fledgling	NE; OH	x	11
Fledging or Weaning Rate	36.4%				NR	Fledgling	NE; OH	y	11
Fledging or Weaning Rate	56.3%				NR	Fledgling	CO	z	12
Fledging or Weaning Rate	18.2%				NR	Fledgling	CO	aa	12
Hatching Success	75%				B	Hatchling	Fresno; CA	ab	8
Hatching Success			1-2	eggs/nest	NR	Hatchling	Fresno; CA	ac	4
Hatching Success	54.8 %				NR	Hatchling	NE; OH	ad	11
Hatching Success	24/31			eggs hatched/eggs laid	NR	Nestling	Sierra; CA	ae	10
Home Range	review				NR	NR		af	7
Metabolic Rate			52-65	kJ/d	F	Adult	WA	ag	13
Metabolic Rate			54-69	kJ/h	M	Adult	WA	ah	13
Metabolic Rate	0.325			W	NR	Adult	Lab	ai	3

Exposure Factors for Willow Flycatcher (*Empidonax traillii*)\*

Page 2

Endpoint Type	Endpoint Value	Error	Range	Units	Sex	Life Stage	Location	Note	Reference
Metabolic Rate	0.241			W	NR	Adult	Lab	aj	3
Population Density			2-4	nests	B	Adult	AZ	ak	14
Population Density			2-11	found/yr singing males/yr	M	Adult	AZ	al	14
Surface Area	0.00487			m^2	NR	Adult	Lab	am	3
Survival/ Mortality	see figure in citation				NR	Embryo; Nestling	NE; OH	an	11
Territory Size			650-4131	m^2	B	Adult	Fresno; CA	ao	8
Territory Size	0.10	0.05 SD	0.06-0.2	ha	B	Adult	CO	ap	6
Territory Size	3000	2000 SD	800-7000	m^2	M	Adult	Sierra; CA	aq	10
Territory Size	3,009	153 SE		m^2	M	Adult	CANADA	ar	5
Territory Size	0.5			ha	M	Adult	CO	as	6
Territory Size	review				NR	NR		at	7
Time of Fledging or Metamorphosis	July 15-August 13				B	Adult	Sierra; CA	au	10
Time of Fledging or Metamorphosis	June 29 (earliest fledging) - July 13 (latest fledging)				B	Fledgling	CO	av	6
Time of Fledging or Metamorphosis	review				NR; NR	NR; NR		aw	7
Time of Fledging or Metamorphosis	review				NR; NR	NR; NR		ax	7
Time of Hatching or Parturition	June 30				B	Adult	Sierra; CA	ay	10
Time of Mating/ Laying	mid-June				B	Adult	Sierra; CA	az	10
Time of Mating/ Laying	May 30 (onset)				F	Adult	CO	ba	6
Time of Mating/ Laying	review				NR	NR		bb	7
Time of Migration or Dispersal	August 31				B	Adult	Sierra; CA	bc	10
Time of Migration or Dispersal	early to mid-June				B	Adult	Sierra; CA	bd	10
Time of Migration or Dispersal	mid-August (onset), September 16 (date of last capture)				NR	Adult	NM	be	2
Time of Migration or Dispersal	mid-May (onset), June 8 (date of last capture)				NR	Adult	NM	bf	2
Time of Migration or Dispersal	May 15				B	NR	CA	bg	15
Time of Migration or Dispersal	review				NR	NR		bh	7
Time of Nesting	May-August				B	Adult	Fresno; CA	bi	8
Time of Nesting	June 2-July 10				B	Adult	AZ	bj	14
Time of Nesting	June 1				B	Adult	AZ; CA	bk	15
Time of Nesting	review				NR	NR		bl	7

Notes

- a N=82 chicks; Toledo, Wooster, OH
- b total fat mass in birds with 8% or 20% fat-free body mass; N=8-42 captures per habitat type; spring, fall; Rio Grand Nature Center (35deg07'N, 106deg41'W); Bosque del Apache National Wildlife Refuge (33deg48'N, 106deg52'W); Based on estimated fat-free mass of 11.9 g.
- c mean body weight during breeding season; N=5 birds; collection location George E. Hudson Biological Reserve, Whitman County
- d mean body weight of extimus subspecies; N=34 captures; spring; Rio Grand Nature Center (35deg07'N, 106deg41'W); Bosque del Apache National Wildlife Refuge (33deg48'N, 106deg52'W)
- e mean body weight of brewsteri subspecies; N=33 captures; spring; Rio Grand Nature Center (35deg07'N, 106deg41'W); Bosque del Apache National Wildlife Refuge (33deg48'N, 106deg52'W)
- f mean body weight of traillii subspecies; N=7 captures; spring; Rio Grand Nature Center (35deg07'N, 106deg41'W); Bosque del Apache National Wildlife Refuge (33deg48'N, 106deg52'W)
- g mean body weight of adastus subspecies; N=9 captures; spring; Rio Grand Nature Center (35deg07'N, 106deg41'W); Bosque del Apache National Wildlife Refuge (33deg48'N, 106deg52'W)
- h mean body weight of all birds (subspecies not separated); N=84; spring, fall; Rio Grand Nature Center (35deg07'N, 106deg41'W); Bosque del Apache National Wildlife Refuge (33deg48'N, 106deg52'W); Body weight did not vary with capture date during spring and fall.

## Exposure Factors for Willow Flycatcher (*Empidonax traillii*)\*

### Page 3

i	range of clutch sizes; N=6 nests; Sierra National Forest
j	mean first clutch size; N=31 nests; Toledo, Wooster, OH
k	mean clutch size in re-nests; N=29 nests; Toledo, Wooster, OH
l	first clutch size in 13/14 females observed; N=14 females; Badenoch Swamp, 14 km SE of Guelph (69 deg, 32'N, 80 deg, 13' W)
m	mean clutch size; N=3 nests; mid-May-July; Colorado River
n	N=NR
o	N=NR
p	numbers of food items delivered to nestlings fitted with neck ligatures; N=333 food items collected; Badenoch Swamp, 14 km SE of Guelph (69 deg, 32'N, 80 deg, 13' W)
q	N=28 nests; Toledo, Wooster, OH
r	N=NR
s	percent of nests that fledged at least one young; N=17 nest attempts (in 5 sample years); mid-May-July; Colorado River; Nest failures due to cowbird nest parasitism and unknown causes.
t	proportion of nestlings known or believed to have fledged; N=8 nests; Sierra National Forest
u	Percent of nests that fledged young; N=19 nests; Jun-Aug; Kern River Preserve; 68% of nests failed due to brown-headed cowbird nest parasitism
v	total egg-to-fledgling success rate; N=5 nests; Perazzo Meadows, Lacey Valley (32 km NW of Truckee)
w	average number of fledglings per nest; N=11 nests; Perazzo Meadows, Lacey Valley (32 km NW of Truckee)
x	mean fledglings in nests of known numbers of eggs; N=89 nests; Wooster, Toledo, OH; Fremont, NE
y	percent of young fledged of total eggs laid; N=272 eggs, 91 nests; Wooster, Toledo, OH; Fremont, NE
z	percent of unparasitized nests with at least one fledgling; N=16 nests; Illinois River, Arapahoe National Wildlife Refuge (elev. 2,500 m)
aa	percent of parasitized nests with at least one fledgling; N=11 nests; Illinois River, Arapahoe National Wildlife Refuge (elev. 2,500 m)
ab	hatching success among total eggs laid; N=8 nests; Sierra National Forest
ac	range of hatching success; N=6 nests; Sierra National Forest
ad	percent of eggs hatched of total eggs laid; N=272 eggs, 91 nests; Wooster, Toledo, OH; Fremont, NE
ae	total number of eggs hatched relative to estimate of total eggs laid; N=11 nests; Perazzo Meadows, Lacey Valley (32 km NW of Truckee); Causes of nest failure include destruction of nest, weather, brown-headed cowbird parasitism.
af	N=NR
ag	total daily energy expenditure; N=2-6 birds per breeding phase; Condition=breeding; Hudson Biological Reserve; Based on calculation using the basal metabolic rate measured at night for the Acadian Flycatcher (0.638 kJ/hr). See citation for variation of daily energy expenditure within different breeding phases.
ah	total daily energy expenditure; N=2-4 birds per breeding phase; Condition=breeding; Hudson Biological Reserve; Based on calculation using the basal metabolic rate measured at night for the Acadian Flycatcher (0.638 kJ/hr). See citation for variation of daily energy expenditure within different breeding phases.
ai	predicted daytime basal metabolic rate; N=NR; collection location George E. Hudson Biological Reserve, Whitman County
aj	predicted night time basal metabolic rate; N=NR; collection location George E. Hudson Biological Reserve, Whitman County
ak	population density in a 360 km riparian corridor as indicated by active nest counts; N=6 sampling yrs; May-Jun; Colorado River, Grand Canyon National Park; numbers reflect found nests, not necessarily all present nests
al	population density in a 360 km riparian corridor as indicated by song counts; N=6 sampling yrs; May-Jun; Colorado River, Grand Canyon National Park
am	estimated area of the external plumage surface (geometrical approximation) of 13.2 g bird; N=NR
an	figure showing percent survival over time of eggs and nestlings; N=272 eggs, 91 nests; Wooster, Toledo, OH; Fremont, NE
ao	range of territory sizes during the breeding season; N=15 birds; Sierra National Forest
ap	breeding territory size; N=7 pairs; mid-May-July; Colorado River
aq	average territory size of paired males based on observed perch locations; N=8 territories; Perazzo Meadows, Lacey Valley (32 km NW of Truckee)
ar	mean territory size based on observed perch sites and territorial disputes; N=61 observation periods; Condition=breeding; Badenoch Swamp, 14 km SE of Guelph (69 deg, 32'N, 80 deg, 13' W)
as	territory size of unpaired male; N=1; mid-May-July; Colorado River
at	N=NR
au	dates on which first and last young fledged; N=11 nests; Jul; Perazzo Meadows, Lacey Valley (32 km NW of Truckee)
av	dates of earliest and latest recording fledging; N=17 nest attempts (in 5 sample years); mid-May-July; Colorado River
aw	N=NR
ax	N=NR
ay	time by which first eggs hatched; N=11 nests; Jun; Perazzo Meadows, Lacey Valley (32 km NW of Truckee)
az	time by which first eggs laid; N=11 nests; Jun; Perazzo Meadows, Lacey Valley (32 km NW of Truckee)
ba	date when first eggs found; N=17 nest attempts (in 5 sample years); mid-May-July; Colorado River
bb	N=NR
bc	date by which last fall migrants departed; N=NR; Aug; Perazzo Meadows, Lacey Valley (32 km NW of Truckee)

## Exposure Factors for Willow Flycatcher (*Empidonax traillii*)\*

### Page 4

bd timing of arrival of spring migrants; N=NR; Jun; Perazzo Meadows, Lacey Valley (32 km NW of Truckee)  
be fall migration; N=42 captures; fall; Rio Grand Nature Center (35deg07'N, 106deg41'W); Bosque del Apache National Wildlife Refuge (33deg48'N, 106deg52'W)  
bf spring passage; N=42 captures; spring; Rio Grand Nature Center (35deg07'N, 106deg41'W); Bosque del Apache National Wildlife Refuge (33deg48'N, 106deg52'W)  
bg date of earliest arrival of spring migrants; N=NR; spring; see citation for review of migration data  
bh N=NR  
bi inclusive of pairing through departure from nesting territory; N=15 birds; Sierra National Forest  
bj estimated length of breeding season (period when eggs or young are in the nest); N=6 sampling yrs; May-Jun; Colorado River, Grand Canyon National Park  
bk estimated beginning of nesting based on historic egg collections; N=187 dated egg sets; coastal southern CA; Colorado River; upper San Pedro River, AZ; egg collection dates range from May 24 to July 30  
bl N=NR

### References

- 1 Holcomb, Larry C. 1972. Traill's flycatcher breeding biology. *Nebr. Bird Rev.* 40(3):50-68.
- 2 Yong, Wang, and Deborah M. Finch. 1997. Migration of the willow flycatcher along the middle Rio Grande. *Wilson Bull.* 109(2):253-268.
- 3 Walsberg, Glenn E. and James R. King. 1978. The energetic consequences of incubation for two passerine species. *Auk.* 95:644-655.
- 4 Valentine, Bradley E., Thomas A. Roberts, Stephen P. Boland and A. Peter Woodman. 1988. Livestock management and productivity of willow flycatchers in the central Sierra Nevada. *Trans. West. Sect. Wildl. Soc.* 24:105-114.
- 5 Prescott, David R.C. and Alex L.A. Middleton. 1988. Feeding-time minimization and the territorial behavior of the willow flycatcher (*Empidonax traillii*). *Auk.* 105:17-28.
- 6 Sogge, Mark K., Timothy J. Tibbitts, Jim R. Petterson. 1997. Status and breeding ecology of the southwestern willow flycatcher in the Grand Canyon. *West. Birds.* 28:142-157.
- 7 Sogge, Mark K., Robert M. Marshall, Susan J. Sferra, and Timothy J. Tibbitts. National Park Service, U.S. Department of the Interior. May. 1997. A southwestern willow flycatcher natural history summary and survey protocol. 42 pp p.
- 8 Stafford, Michael D. and Bradley E. Valentine. 1985. A preliminary report on the biology of the willow flycatcher in the central Sierra Nevada. *Cal-Neva Wildl.* 66-77.
- 9 Harris, John H. 1991. Effects of brood parasitism by brown-headed cowbirds on willow flycatcher nesting success along the Kern River, California. *West. Birds.* 22:13-26.
- 10 Flett, Mary Anne and Susan D. Sanders. 1987. Ecology of a Sierra Nevada population of willow flycatchers. *West. Birds.* 18:37-42.
- 11 Holcomb, Larry C. 1972. Nest success and age-specific mortality in Traill's flycatchers. *Auk.* 89:837-841.
- 12 Sedgwick, James A. and Fritz L. Knopf. 1988. A high incidence of brown-headed cowbird parasitism of willow flycatchers. *Condor.* 90:253-256.
- 13 Ettinger, Amelia O. and James R. King. 1980. Time and energy budgets of the willow flycatcher (*Empidonax traillii*) during the breeding season. *Auk.* 97:533-546.
- 14 Brown, Bryan T. 1988. Breeding ecology of a willow flycatcher population in Grand Canyon, Arizona. *West. Birds.* 19:25-33.
- 15 Unitt, Philip. 1987. *Empidonax traillii* extimus: An endangered subspecies. *West. Birds.* 18:137-162.

\*Cal/EPA, OEHHA and the University of California Regents are not responsible for damages of any kind resulting from the use of or reliance on information in this report. Users are encouraged to consult the original data. Updated: February 1999.