Santa Cruz Long-Toed Salamander Field Studies 1998-2009

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Santa Cruz Long-Toed Salamander Field Studies 1998-2009 Outline

I) Seascape Uplands Preserve
   a. History
   b. Monitoring Program
   c. Seascape Uplands Pond 1
   d. Bonita Pond (Pond 3)
   e. Uplands Pond 2

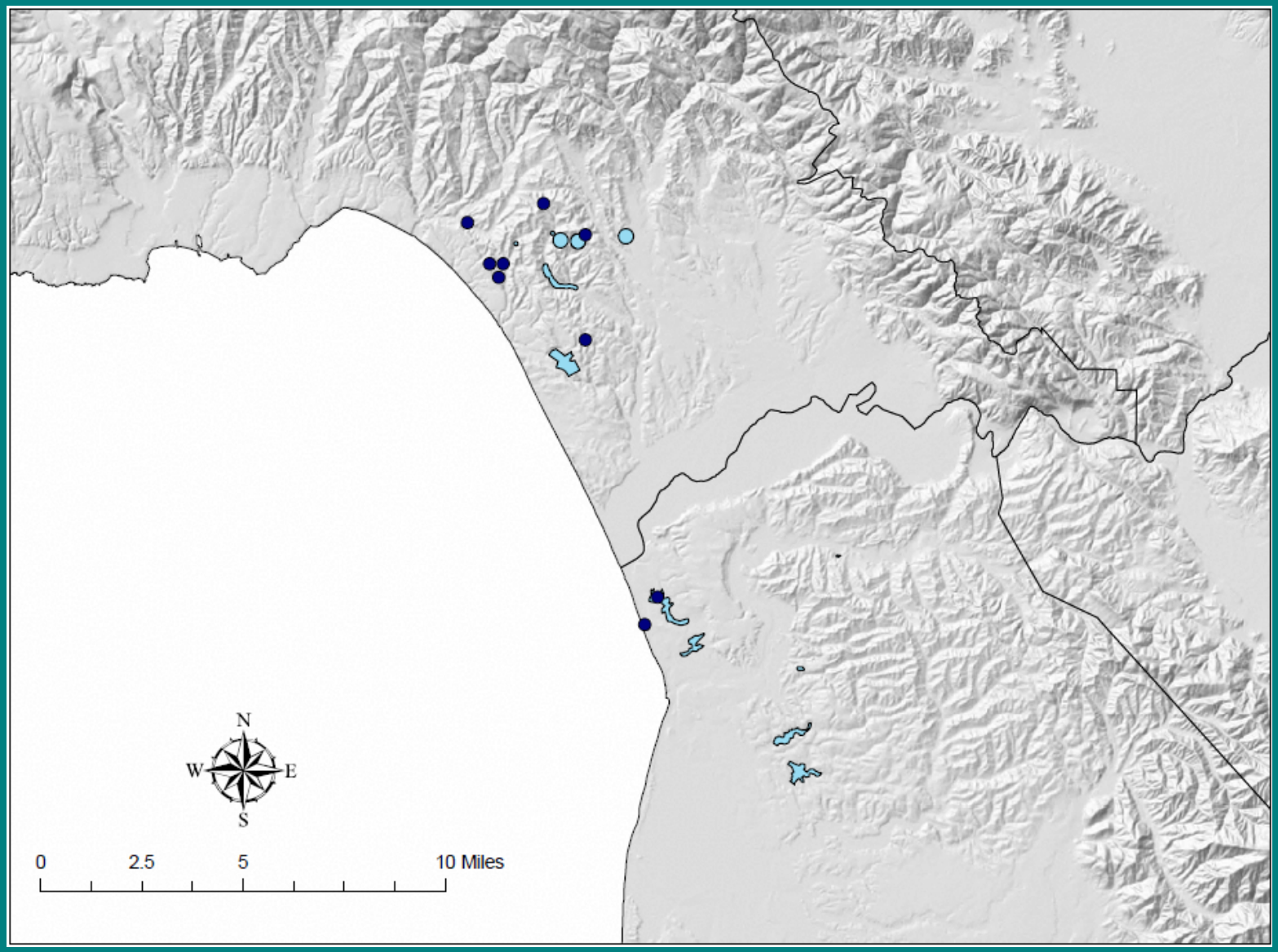
II) Studies at Other Breeding Sites
   a. Valencia Lagoon
   b. Buena Vista Pond
   c. Millsap Pond
   d. Tucker Pond
   e. McClusky Slough
   f. Zmudwoski Pond

III) Upland Trapping
   a. Seascape Uplands
   b. Willow Canyon

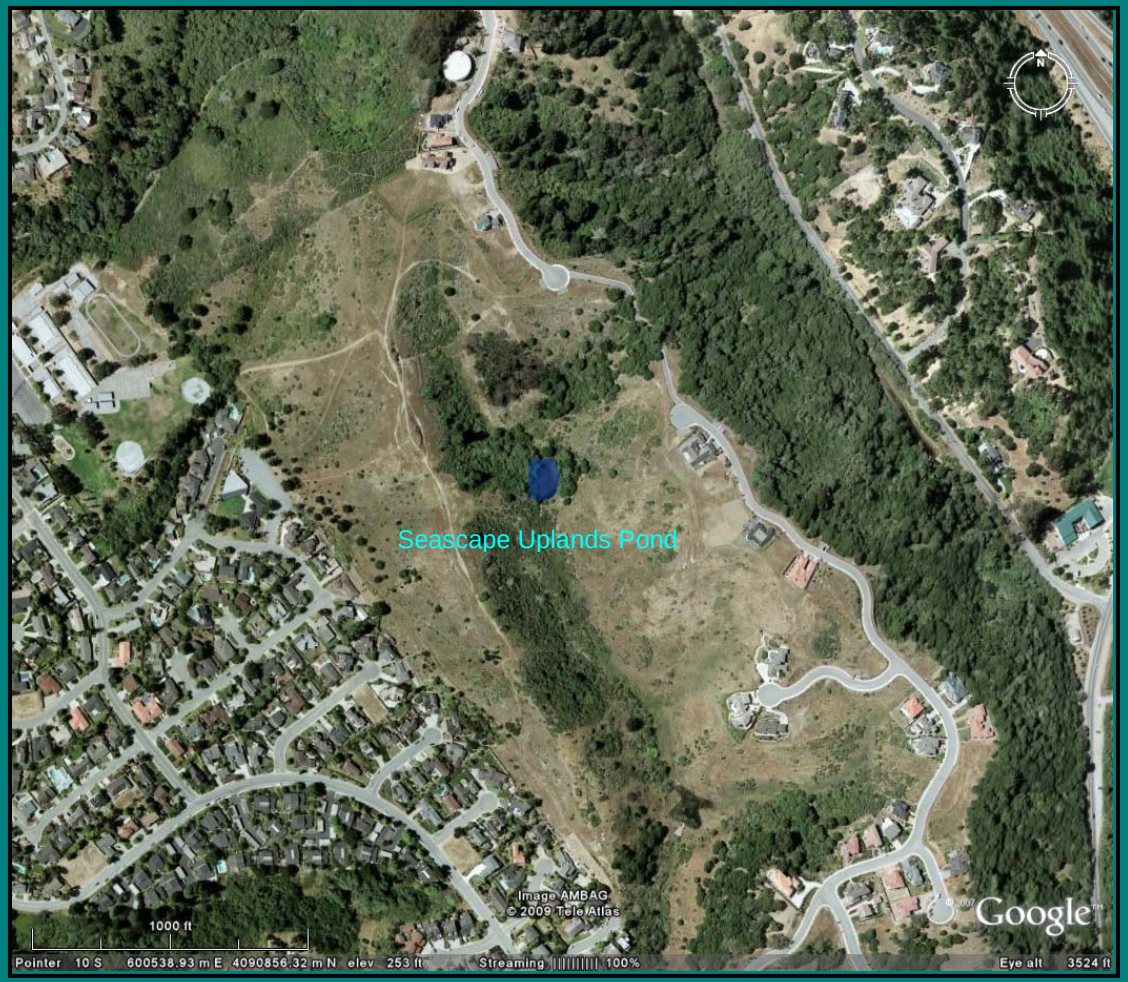
IV) Management and Monitoring Implications

Santa Cruz Long-Toed Salamander Life Cycle

Santa Cruz Long-Toed Salamander Range



Seascape Uplands Pond

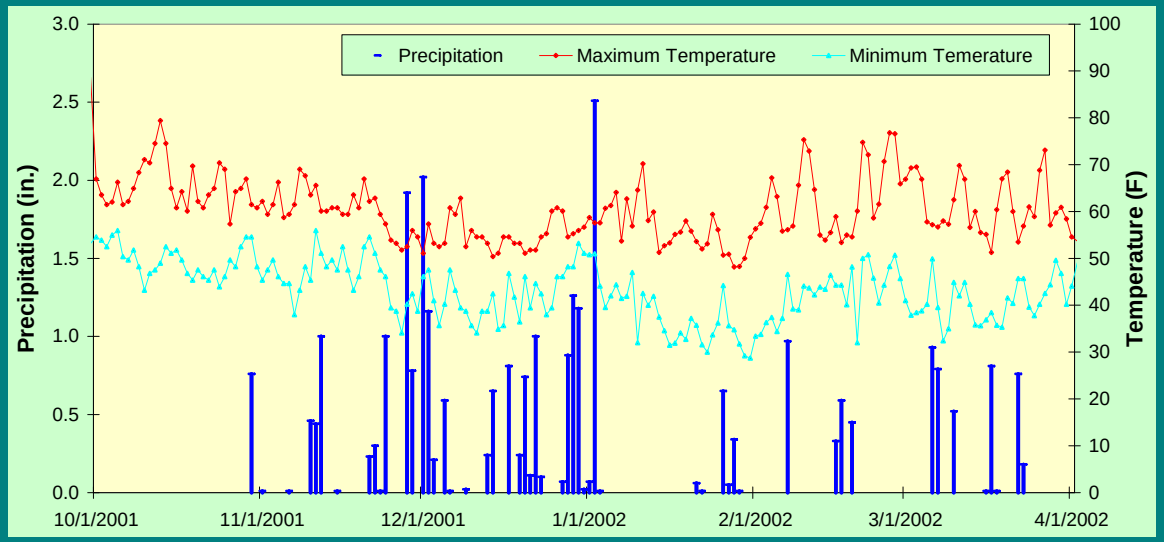


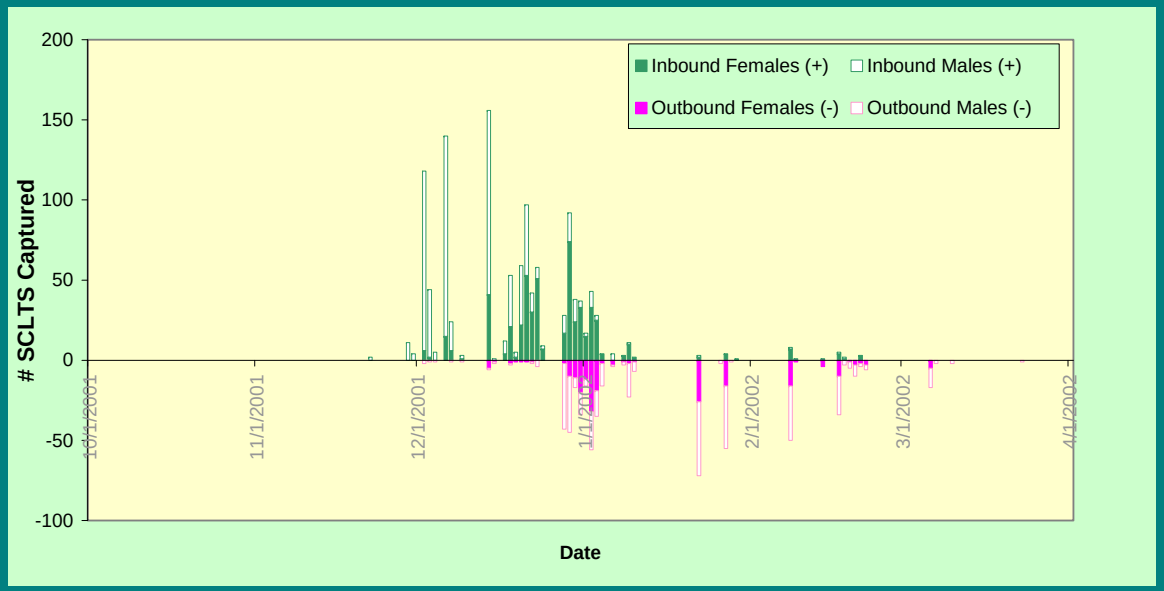
- SCLTS discovered in 1974 in permanent pond
- Berm breached in 1976, creating seasonal pond
- Ruth Study 1986-87; Breeding adult population estimate 1,468 ± 60
- HCP Approved; CNLM takes title in 1998
- Long-Term SCLTS Monitoring Program
- Two mitigation ponds; road tunnels built in 1999
- Both mitigation ponds colonized within 3 years
- Population varied between ~1000 and ~3000 adults over 10 years

Seascape Uplands SCLTS Long-Term Monitoring

- Study Design Considerations
  - Track Adult Population Trends
  - Measure Larval Growth & Abundance
  - Minimize impacts of study on SCLTS & other species
  - Minimize Cost
- Drift-Fence/Pitfall Trapping
  - Partial enclosure of pond with drift-fencing (~75%)
  - Traps open only during rains & 1 night following
  - Traps opened 1st Fall rains through April – reduced based on results of 1st 6 years
  - Single toe clipped; Lincoln-Peterson estimator used
- Aquatic Sampling
  - First 5 years only
  - Sample every 2 weeks between mid-April and July
  - Measure 25 larvae on each occasion
  - Quantify larvae on 100 ft^2 plots
  - Level of effort reduced after 6 years to presence/ absence

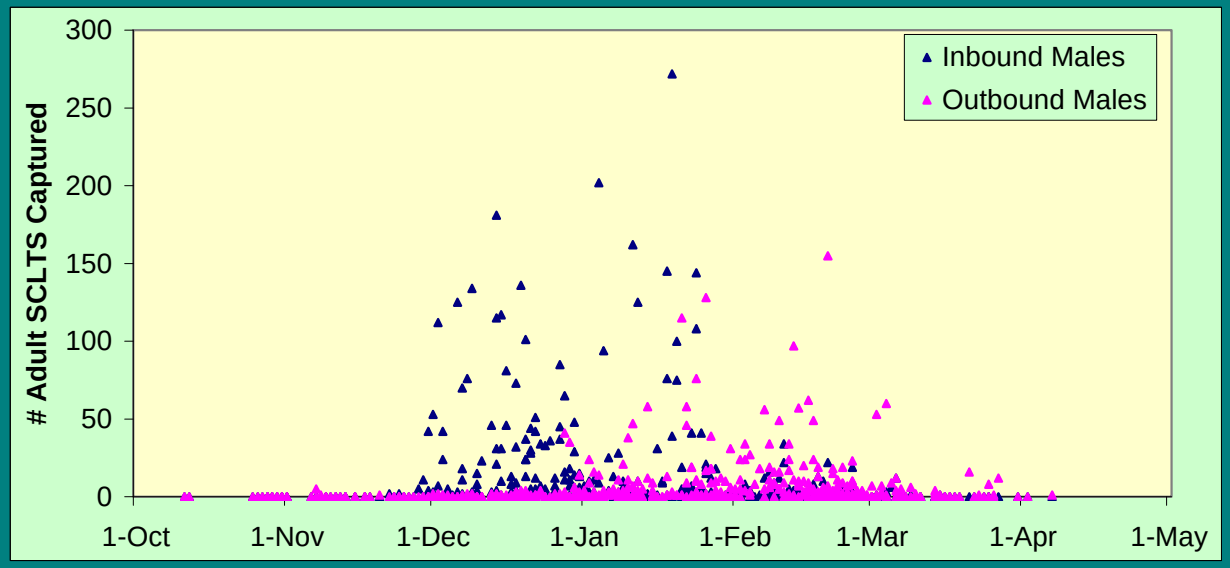
Seascape Uplands Pond
SCLTS Adult Activity

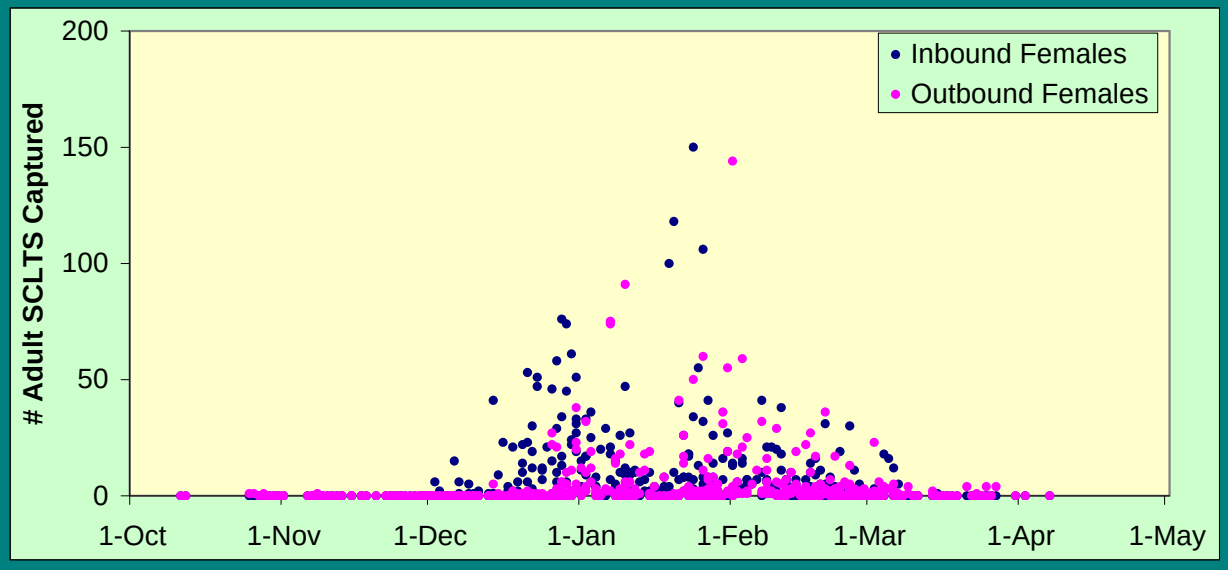




- Data from 2001-02 – typical of adult SCLTS activity pattern during average or above-average rainfall
- Males arrive prior to females; depart after
- No SCLTS activity past mid-March, even with rains
- Fewer outbound adults than inbound – consistent with other studies

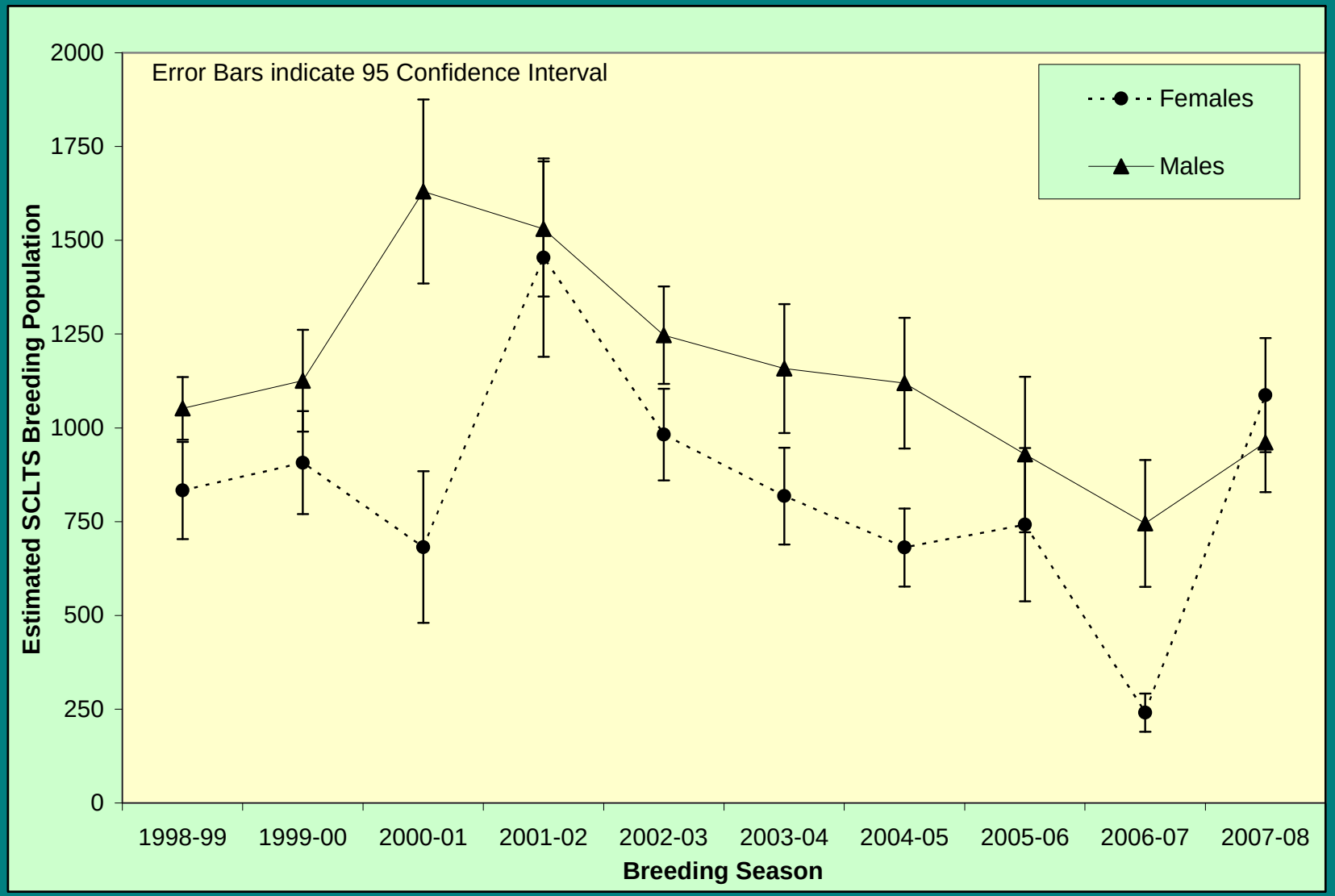
Seascape Uplands Pond
SCLTS Adult Activity 1998-2008



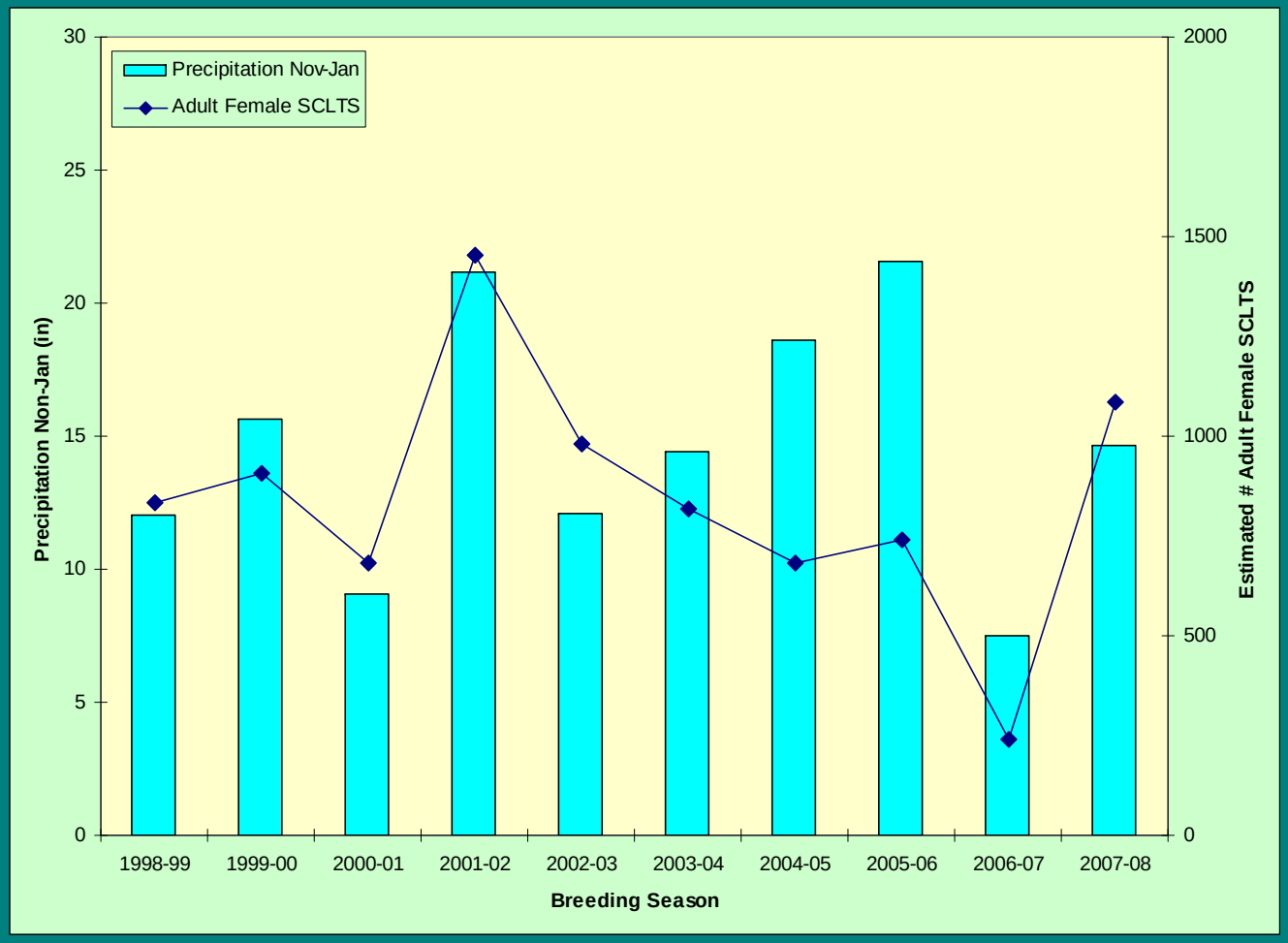


- Males arrive prior to Females
- Males active at pond for longer period (Males Avg. 34 days; Females Avg. = 17 days (Ruth 1989)
- Most SCLTS activity at pond between 1 December – 15 March

Seascape Uplands Pond Population Monitoring 1998-2008

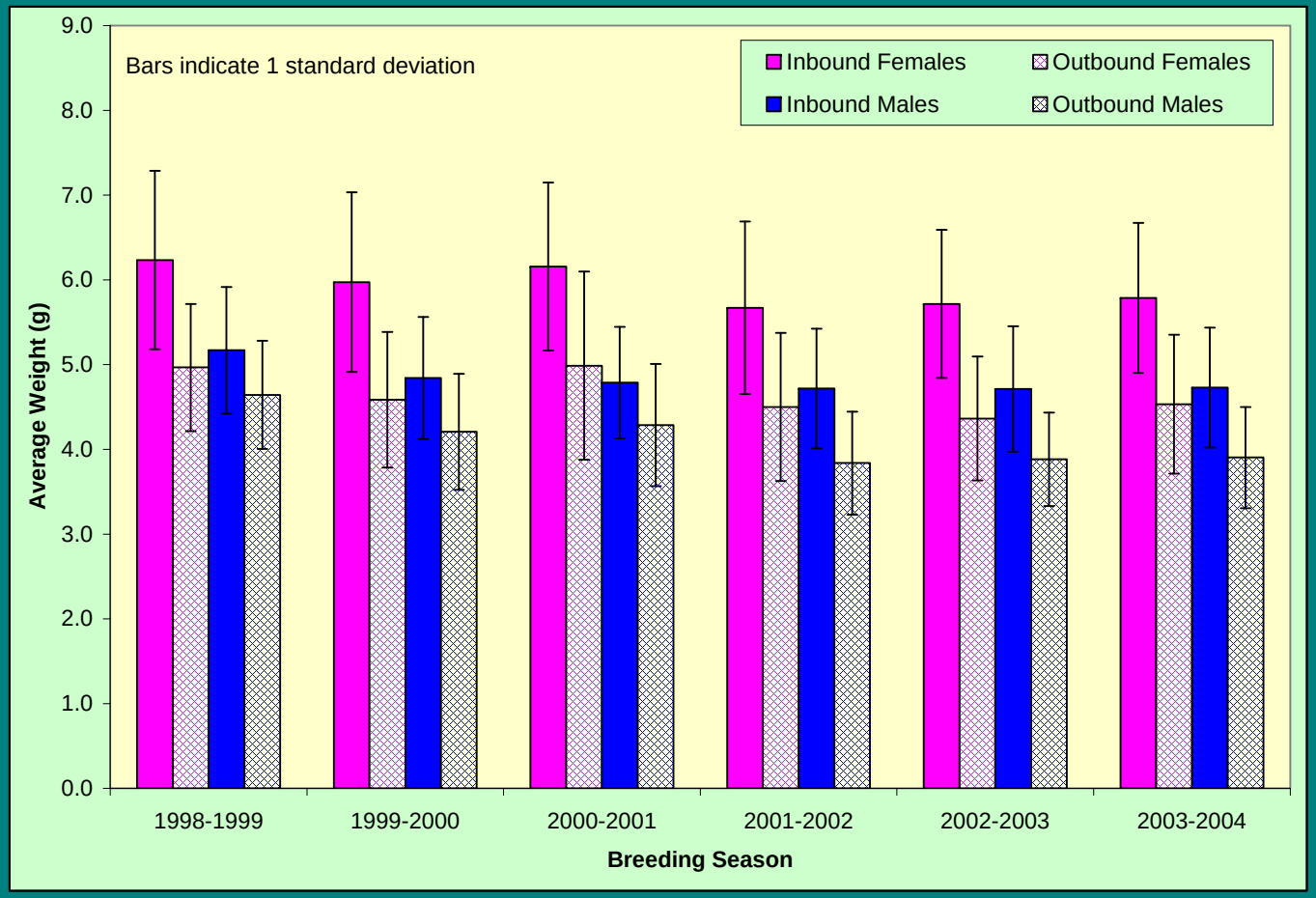


Seascape Uplands Pond - Effect of Rainfall on Breeding Migration



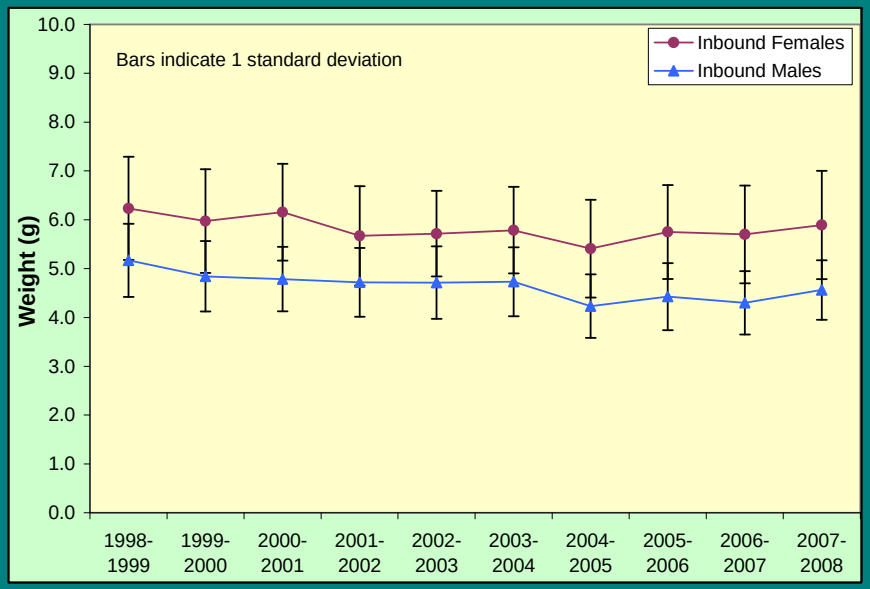
- Rainfall between November and January most critical for SCLTS breeding migration
- Females more likely than males to forego breeding in below-average rain years

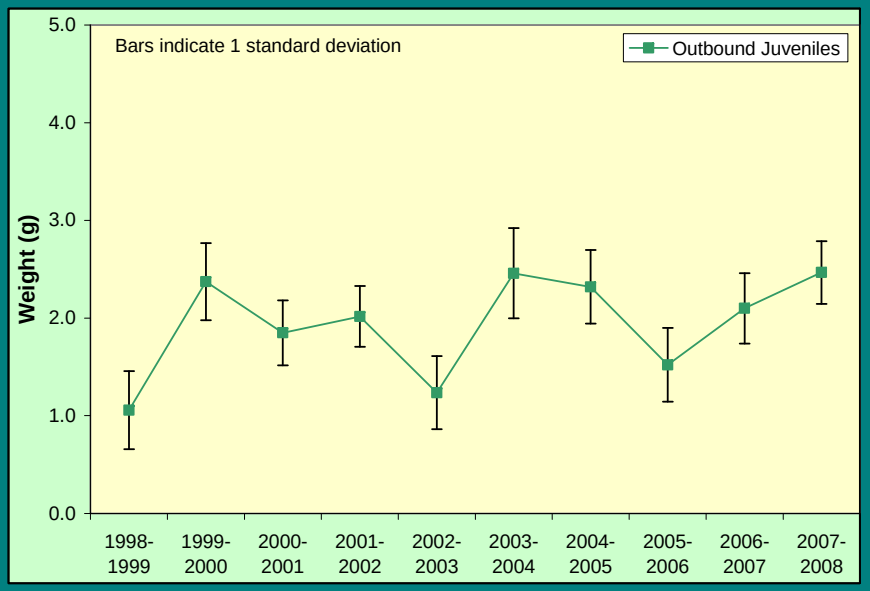
Seascape Uplands Pond SCLTS Measurement Data - Inbound Versus Outbound Adults



- Both sexes lose significant mass while at pond; especially females
- Effect is consistent year to year
- Need to distinguish when providing measurement data

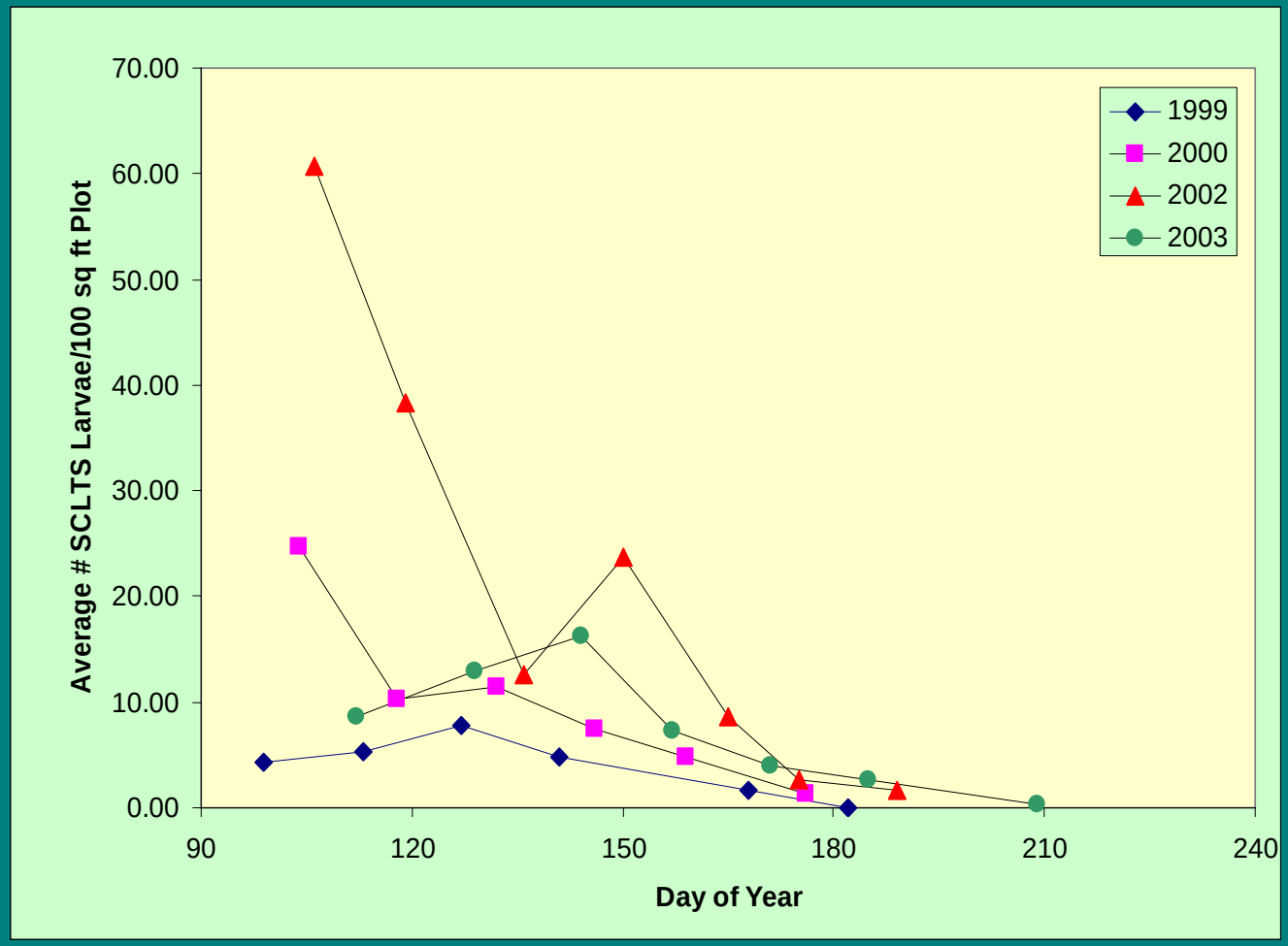
Seascape Uplands SCLTS Measurement Data 1998-2008





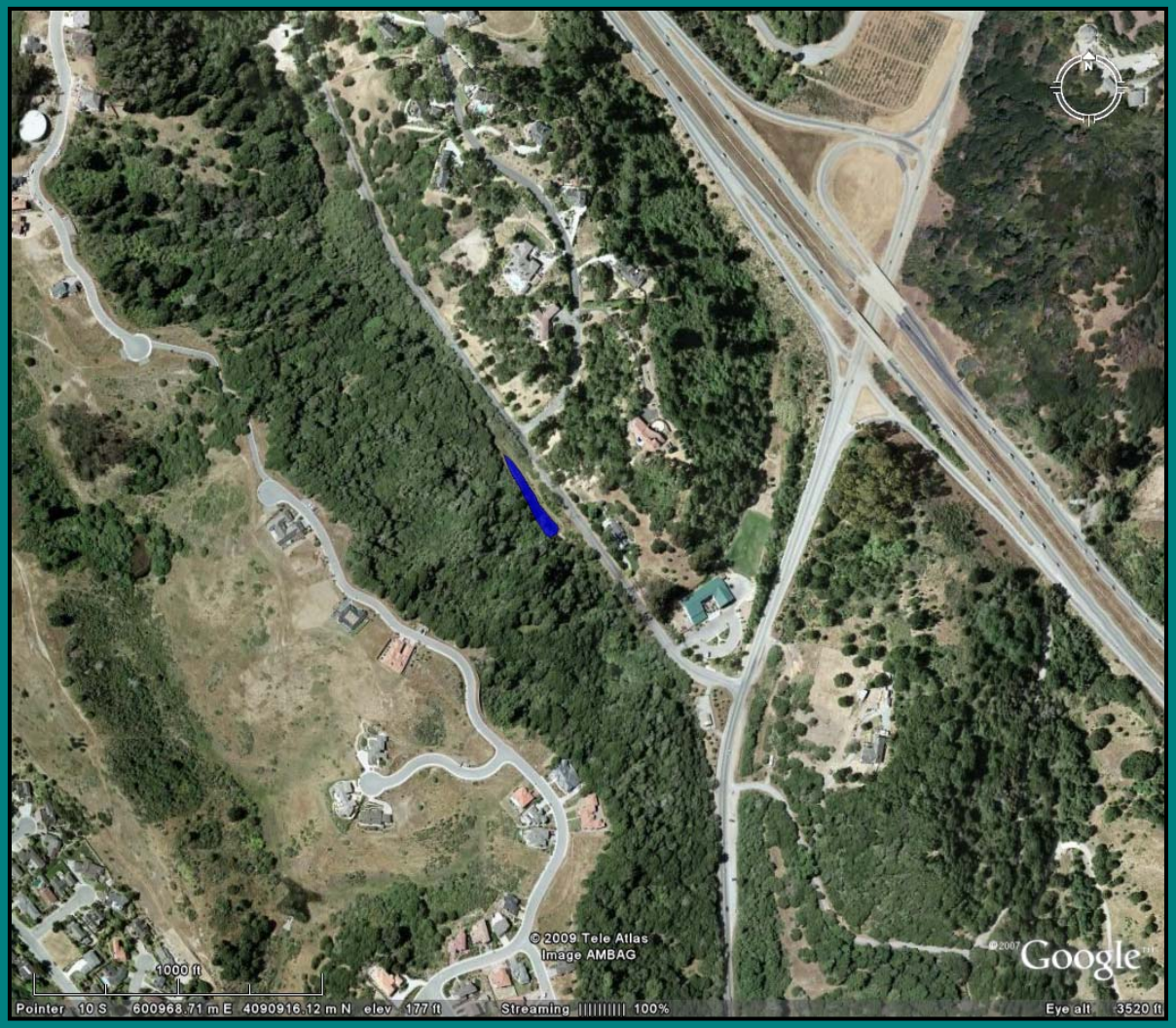
- Little year-to-year change in mass (or length) of adults
- Significant year-to-year variation in mass (and length) of emerging juveniles
- Lower size at transformation = lower survivorship?
- Years with lowest juvenile mass were years with highest numbers of juveniles

SCLTS Larval Monitoring
Seascape Uplands Pond



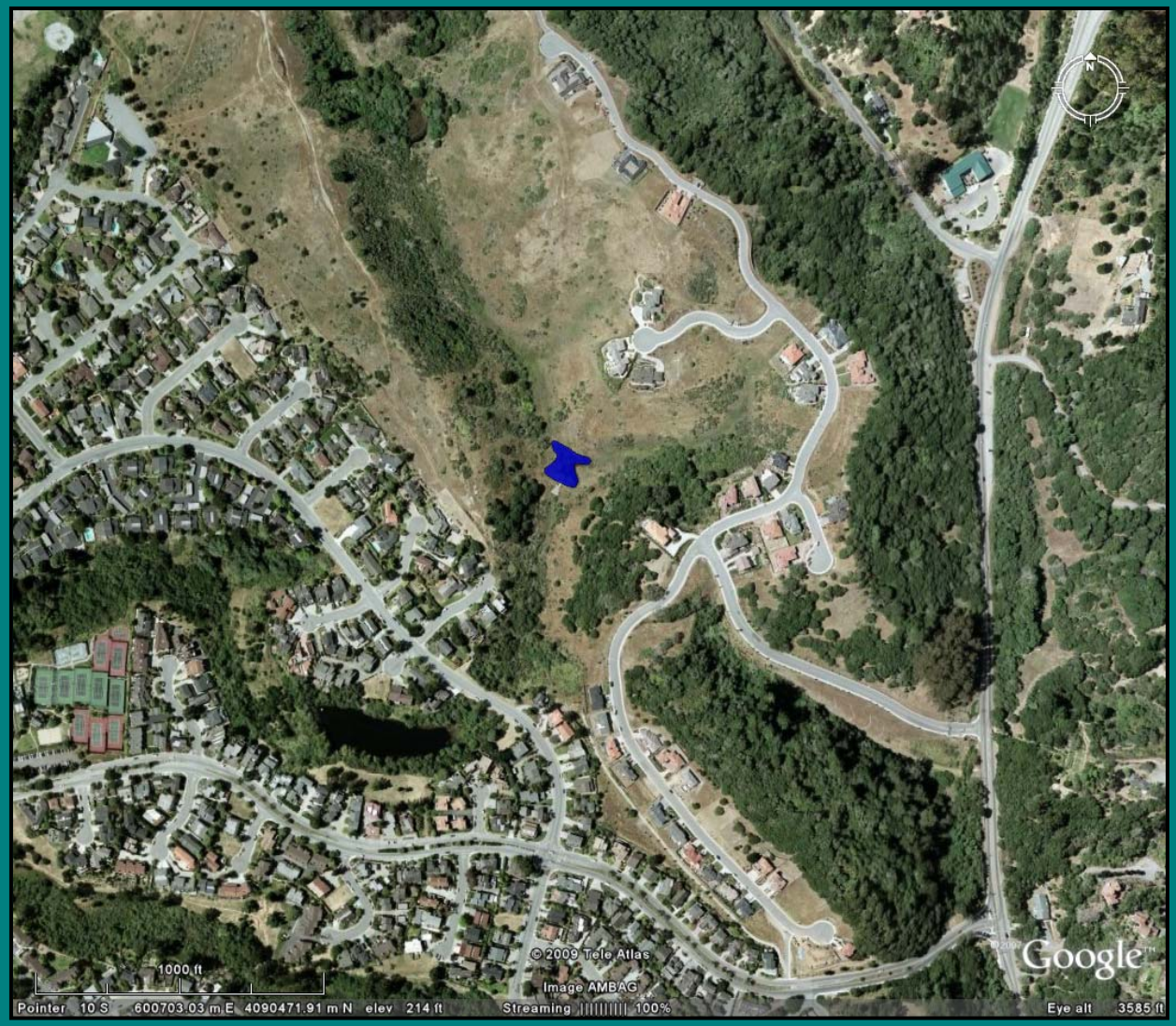
- Larval density greatest in April & May
- Larvae can persist through July if water available; but usually transform by end of June
- Vegetation changes over time (and between sites) affect rate of capture
- Time-constrained sampling probably better

Bonita Pond (Seascape Uplands Pond 3)



- Constructed in 1999
- Designed to be ephemeral; holds water year-round
- Colonized by SCLTS in 1999-2000
- Estimated population increased steadily from 311 ± 50 in 2002-03 to 1,242 ± 186 in 2007-08
- Adjacent high-quality over-summering habitat
- Bonita Road source of mortality

Seascape Uplands Pond 2



- Constructed in 1999
- Designed to be seasonal; holds water year-round
- SCLTS colonized in 2001-2002
- Population estimate in 2007-08 was 351 + 124
- Relatively low larval abundance – some unhealthy

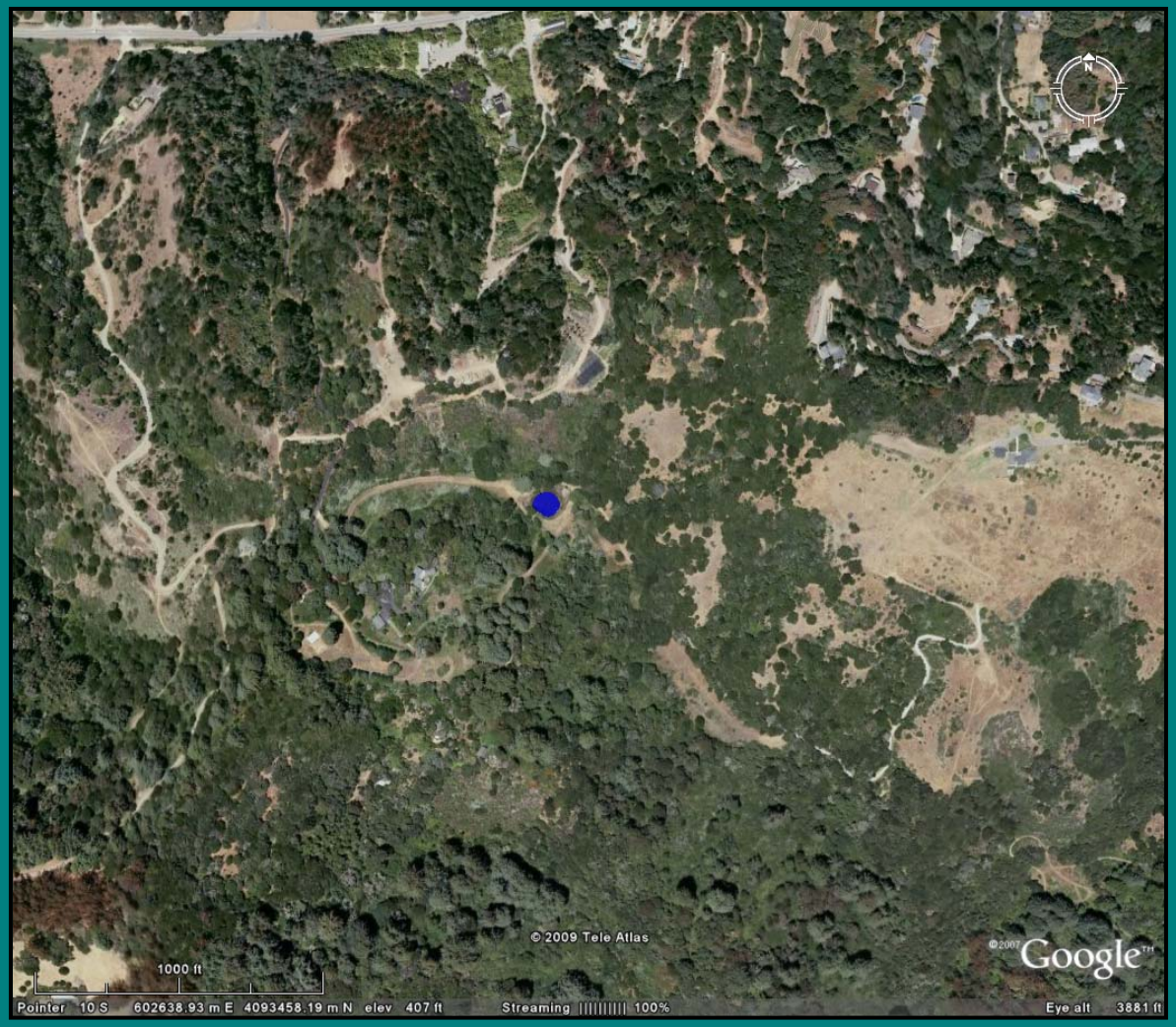
Valencia Lagoon

- Type locality for subspecies (1954)
- Originally 1.1 acre freshwater wetland
- Drained in 1969 for Highway 1
- Population estimate in 1977-78 (Reed 1979) was 2,583 ± 120
- Population estimate in 2007-08 (Biosearch 2008) was 734 ± 149
- SCLTS breeding in both mitigation pond and drainage channel
- Highway 1 barrier to movements; Bonita Road source of mortality

Millsap Pond

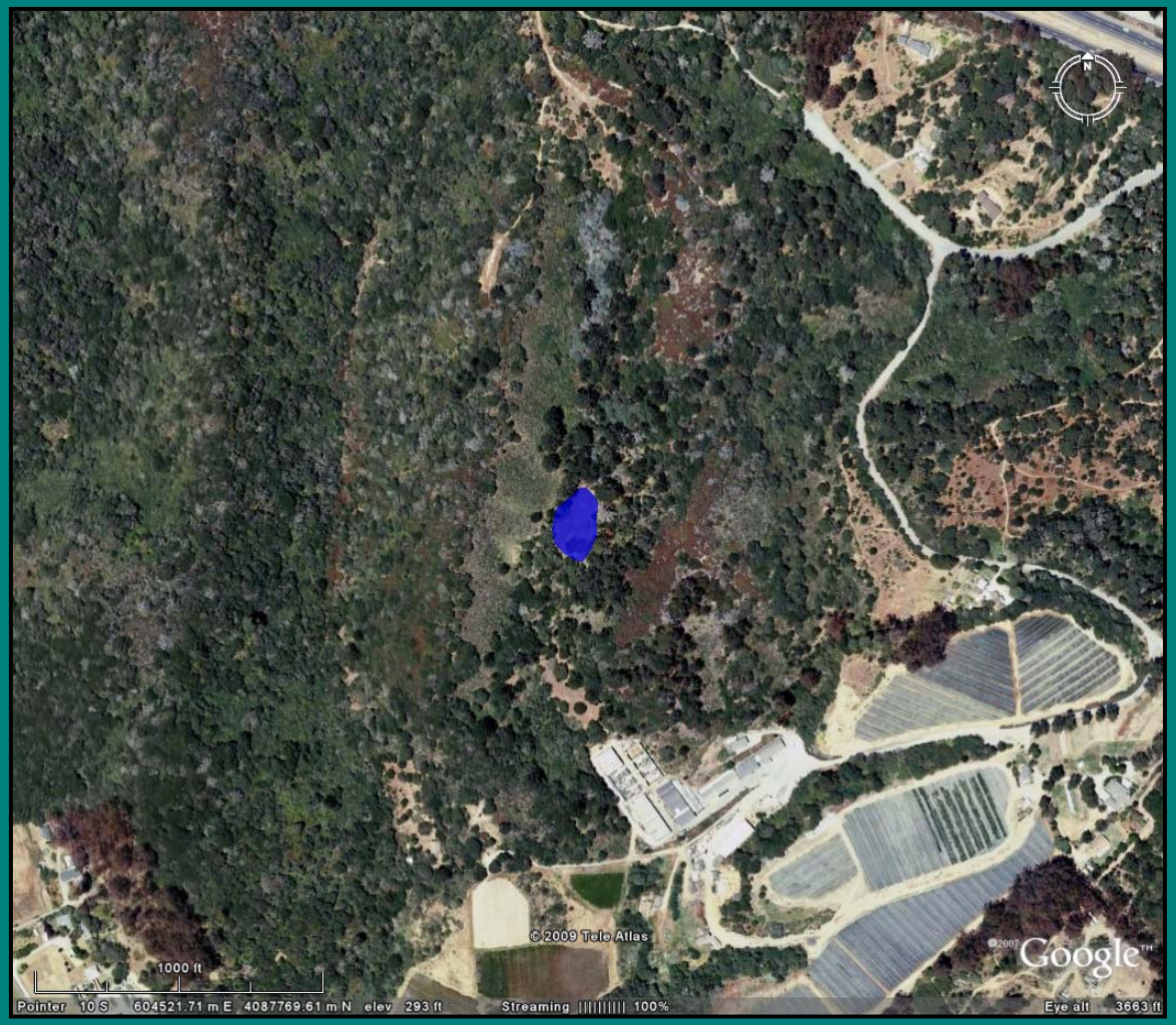
- In Calabasas Complex
- Population Estimate 2000-2001 = 197 ± 16
- SCLTS found up to ~200 m from pond in upland traps in 2004-05 (Bland 05)
- Suitable uplands in vicinity
- Pond size is limiting factor
- Effects of Eucalyptus canopy?
- California red-legged frog also present

Tucker Pond



- In Calabasas Complex
- Population Estimate (Bland 2001) 1,062 ± 38
- HCP approved 2007
- Conservation Easement granted to CNLM
- No SCLTS larvae present in 2007 (goldfish) or 2008 (drought)
- Bullfrogs & rough-skinned newts present
- Pond drained past 2 years
- SCLS larvae in 2009
- Population estimate will be repeated in 2010-11

Buena Vista Pond



- In Ellicott-Buena Vista Complex
- Managed by USFWS
- California tiger salamander also present
- 2008-09 SCLTS Breeding Adult Population Estimate was 775 ± 380; study done in below-average rain year
- Pond not holding water well even in wet years
- Monterey Pine, Eucalyptus

McClusky Slough

- In McClusky Slough Complex
- Only ~15% of slough perimeter trapped – methods not comparable to other sites.
- 2001-2002: 33 adult & 53 juvenile SCLTS trapped; few recaptures
- Adults significantly smaller than other populations
- Upland habitat is limiting factor
- California red-legged frog also present

Zmudowski Pond

- In McClusky Slough Complex
- 2001-2002: 10 adult & 6 juvenile SCLTS trapped; no recaptures
- Most captured in southeast corner near only available willow habitat
- Adults significantly smaller than other populations
- Upland habitat is limiting factor
- Salinity 0.5 ppt

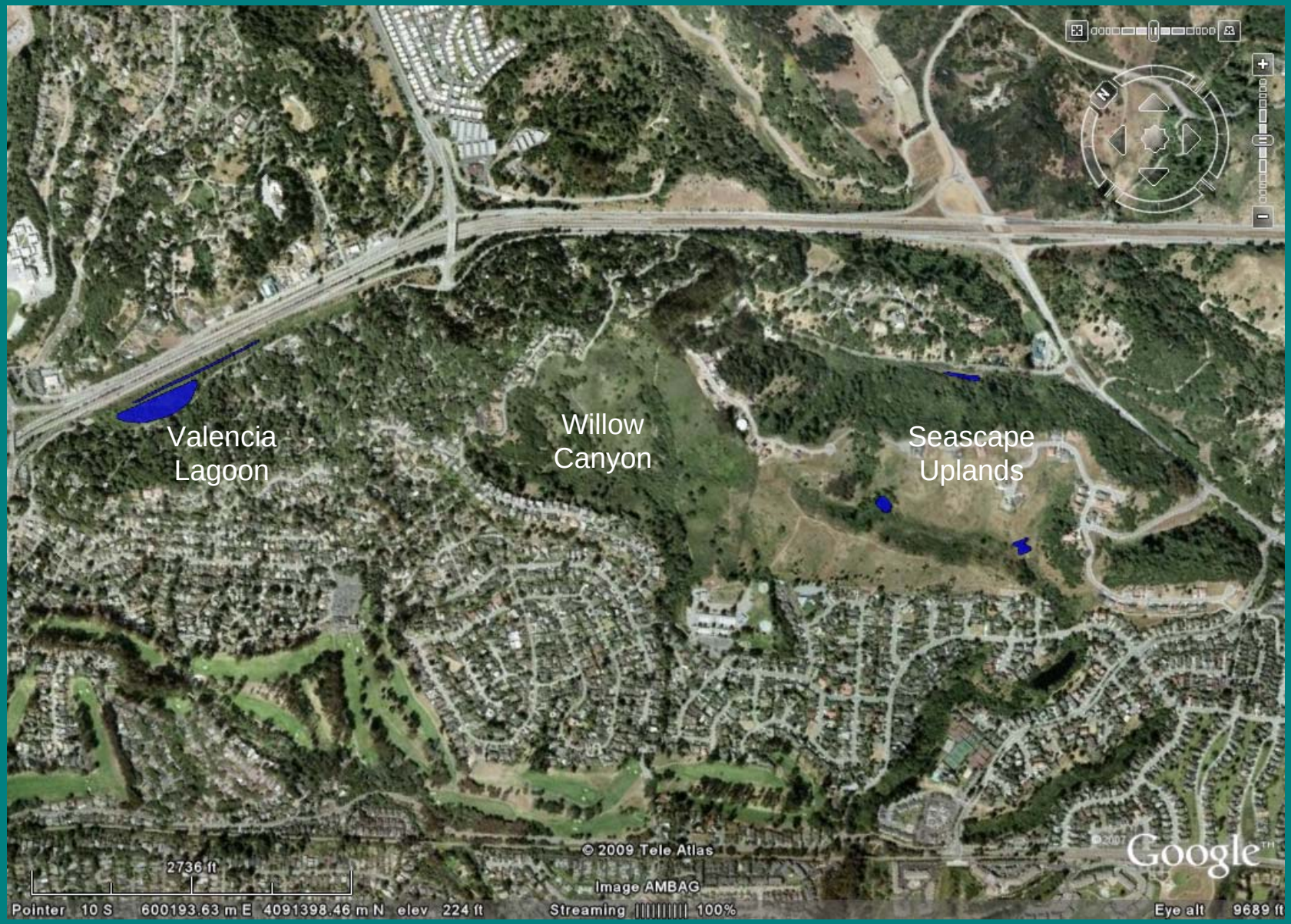
Upland Trapping - Seascape Uplands

- Ruth (1989) demonstrated SCLTS move >1000 meters
- New road built across known migratory route in 1998 – documented source of take
- 6 road tunnels built - untested for SCLTS
- Migrating SCLTS marked along fence in 2000-01
- Only 4 of 44 (9%) marked adults passed through tunnels
- Need to test again to see if population has adapted

Upland Trapping - Willow Canyon

- Drift-fence ¼ mile from Seascape Uplands Pond to investigate use of Willow Canyon
- Willow Canyon Upland Fence 2001-2002 Estimated Adult Population = 886 ± 51
- Seascape Uplands Pond 2001-2002 Estimated Adult Population = 2,927 ± 289
- ~ 26-36 % of Seascape Uplands Pond Adults Migrated from/to Willow Canyon in 2001-2002

Valencia-Seascape Complex



Santa Cruz Long-Toed Salamander Population Studies Summary

Breeding Complex Breeding Pond [Source]	Year	% Permiter Sampled	Date Peak Male Arrival	Date Peak Female Arrival	Est. # Females	95% CI	Est. # Males	95% CI	Est. # Adults	95% CI	Sex Ratio M:F
Valencia-Seascape Complex											
Valencia Lagoon[1]	1977-78	100							2583	120	1.01
Valencia Lagoon[1]	1978-79	100							1355	98	0.99
Valencia Lagoon[4]	2007-08	80	4-Jan	26-Jan	405	100	327	117	734	149	0.67
Seascape Pond[2]	1986-87	100	2-Jan	13-Feb					1468	60	2.00
Seascape Pond[4]	1998-99	66	19-Jan	20-Jan	833	130	1052	83	1833	131	1.26
Seascape Pond[4]	1999-00	66	18-Dec	24-Jan	907	137	1126	136	2041	193	1.24
Seascape Pond[4]	2000-01	66	11-Jan	24-Jan	682	202	1630	245	2310	310	2.39
Seascape Pond[4]	2001-02	66	6-Dec	29-Dec	1454	264	1530	180	2927	289	1.05
Seascape Pond[4]	2002-03	75	14-Dec	28-Dec	982	122	1247	130	2234	178	1.27
Seascape Pond[4]	2003-04	75	20-Dec	30-Dec	818	129	1158	172	1983	214	1.42
Seascape Pond[4]	2004-05	75	9-Dec	31-Dec	681	104	1119	174	1794	195	1.64
Seascape Pond[4]	2005-06	75	19-Dec	23-Dec	742	204	929	207	1683	290	1.25
Seascape Pond[4]	2006-07	75	13-Dec	11-Feb	241	51	745	169	950	152	3.09
Seascape Pond[4]	2007-08	75	4-Jan	26-Jan	1087	152	961	132	2074	204	0.88
Bonita Pond[4]	2002-03	75	14-Dec	10-Jan	152	37	156	33	311	50	1.03
Bonita Pond[4]	2003-04	75	20-Dec	30-Dec	159	34	261	90	399	76	1.64
Bonita Pond[4]	2004-05	75	9-Dec	1-Jan	233	62	358	86	597	105	1.54
Bonita Pond[4]	2005-06	75	19-Dec	23-Dec	241	82	441	92	686	122	1.83
Bonita Pond[4]	2006-07	75	13-Dec	27-Dec	273	84	396	105	674	135	1.45
Bonita Pond[4]	2007-08	75	4-Jan	4-Jan	584	130	637	129	1242	186	1.09
Seascape Pond 2[4]	2007-08	75	4-Jan	26-Jan	128	58	205	122	351	124	1.60
Calabasas Complex											
Millsap Pond[4]	2000-01	80	11-Jan	11-Feb	37	11	61	11	98	16	1.65
Tucker Pond[3]	2000-01	100			465	22	506	37	1062	38	1.23
Ellicott-Buena Vista Complex											
Buena Vista Pond[4]	2008-09	80	22-Jan	16-Feb	403	263	345	254	775	380	0.85
McClusky Slough Complex											
McClusky Slough[4]	2001-02	15	na	na	16*	na	16*	na	32*	na	1.00
Zmudowski Pond[4]	2001-02	50	na	na	6*	na	4*	na	10*	na	0.67

Source:
1 - Reed, 1981
2 - Ruth, 1989
3 - Bland, 2001
4 - Laabs & Allaback, 1998-2009

* - number captured, too few recaptures for population estimate

Santa Cruz Long-Toed Salamander Field Studies 1998-2009

Management and Monitoring Implications

1. Both aquatic and upland habitats need protection
2. Variety of upland habitats used; large-scale movements across grassland & scrub habitats
3. Both seasonal and permanent wetlands used; Permanent ponds have potential for introduced predators & other factors
4. Natural variability in population size - Seascape Uplands Pond SCLTS population ranged between ~1,000 and ~3,000 breeding adults over 10-year period
5. Few natural breeding sites remain; most sites modified
6. Mitigation Ponds can be successful – ideally seasonal and adjacent to upland habitat
7. Rainfall total important for SCLTS breeding migration, but timing equally important; November to January rainfall critical
8. Pitfall trapping studies should extend from 1 December to 15 March