PACIFIC (WESTERN) POND TURTLE WORKSHOP

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ACKNOWLEDGMENTS

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California Department of Transportation
California Department of Fish and Game
California State Parks
Oregon Department of Fish and Wildlife
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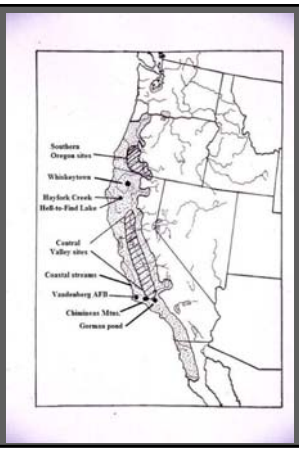
U. S. Fish and Wildlife Service
U. S. Geological Survey

Study Areas



IMPORTANT POINTS

- What are you trying to determine?
- Size does not equal age
- Growth rates & reproduction vary by region
- Water regimes – Mediterranean climate
- Agriculture – cattle and ponds
- Manage for nest and female survival
- Manage populations, not individuals
- Management objectives

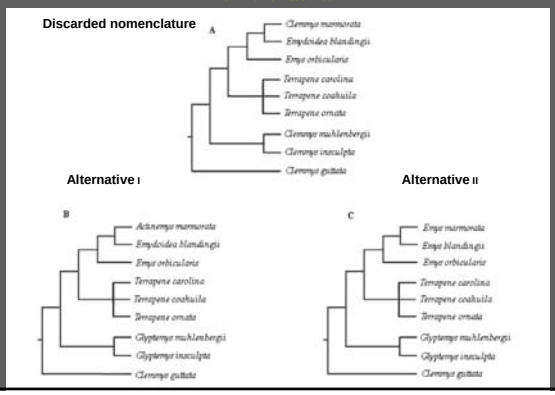
Clemmy marmorata

is now

Actinemys marmorata

TAXONOMY

From Bickham et al. 2007



Variation

Male – Vandenberg AFB, CA

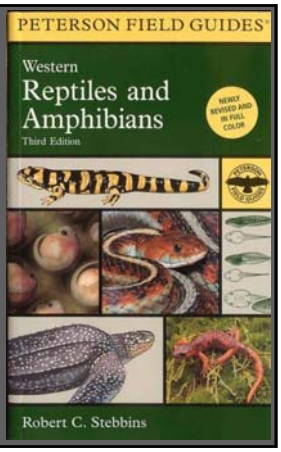
Female – Fresno, CA

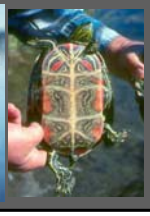
Female – Yoncalla, OR

Male – Goose Lake, Kern County, CA

Identification

Only native freshwater turtle in California, and only western painted turtle in northern Oregon / Washington



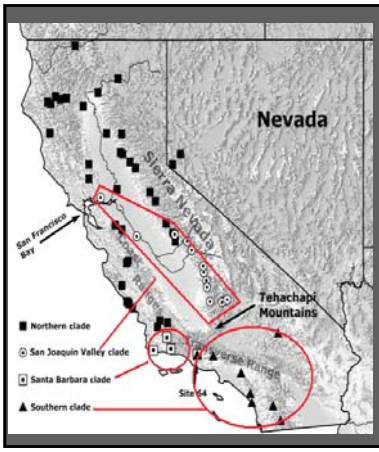


SEXUAL DIMORPHISM

DISTRIBUTION

- Sea Level to about 5500 feet
- Baja California to Washington
- Sierra Nevada / Cascade Mtn. to Coast
- In Southern California, Peninsula / Transverse Ranges to Coast
- Small Populations along Mojave River
- Truckee River Population may be Introduced

Range-wide Distribution

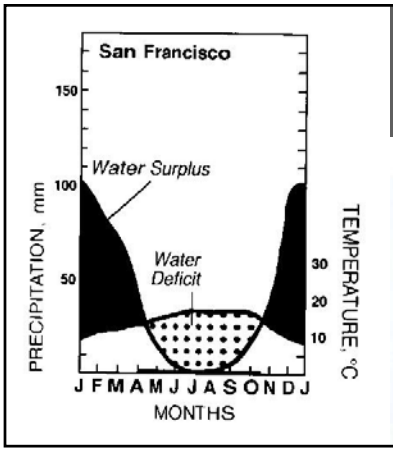


Genetic Subgroupings of *A. marmorata*

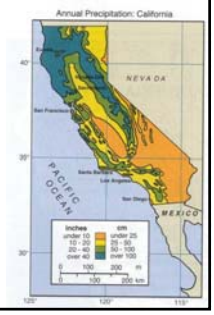
from Spinks and Schaffer 2005

MEDITERRANEAN

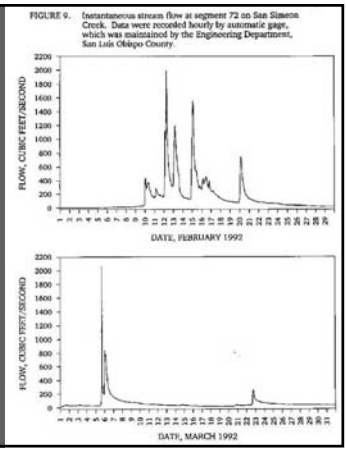
CLIMATE



Rainfall & Temperature



Stream Flow Extremes



Low & High Flows

San Simeon Creek

Rarity of Ponds in Pre-European California

Impacts of Creek Versus Pond Living on Life History

HABITATS

Coastal Lagoons

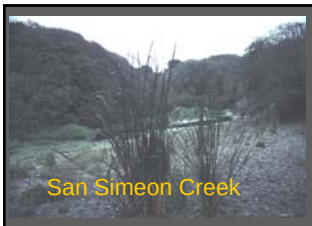
San Simeon - Summer

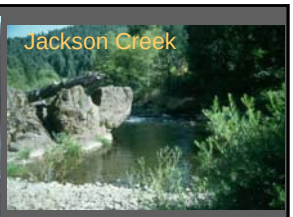
San Simeon - Fall

San Simeon - Winter

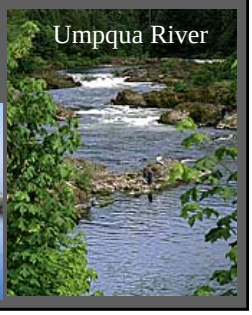
San Simeon - Spring

Annual Coastal Creeks





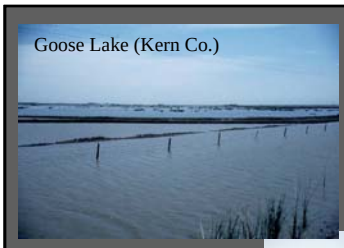
Perennial Rivers

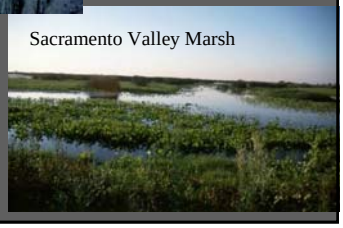


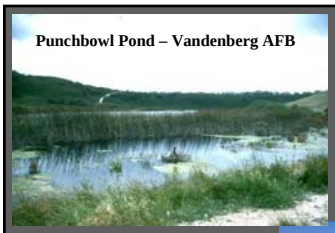
Natural Ponds Are Rare

Dune (Slack) Pond

Central Valley "Natural" Wetlands





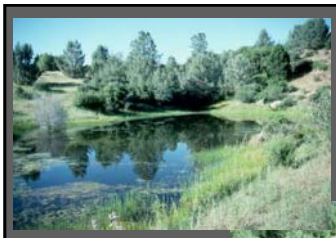


Man-made Ponds Are Common

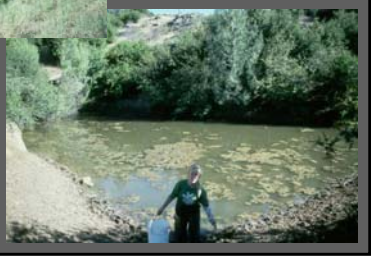
Agricultural and Urban Development

Roadside ditch – Klamath Basin

Whiskeytown Reservoir



Sierra Ponds (man-made)



Wastewater (& nutrients!) Storage

Sewage treatment ponds at Fresno with hundreds of *A. marmorata*

Percolation Pond

Cows (& dung!) Are Important

Dammed Stock Ponds Are Important

Stock Pond Structure

Although humans have destroyed and altered much natural habitat, they have also created habitat

Net Gain or Loss?

Habitats Summary

- Most areas with water – habitat generalist
- Annual & perennial aquatic habitats
- Natural rivers, creeks, streams, lakes, marshes, ponds, mud holes
- Man-made stock ponds, sewage storage and percolation ponds, canals, and reservoirs
- Pond structure, including depth and basking sites important
- Creek structure, including pools and upland habitats important

ECOLOGY

- Eat aquatic arthropods, fish, carrion, and some vegetation (algae mostly).
- Nutrients – livestock & human!
- Thermoregulate (bask) on rocks, logs, algal mats, mud banks, sand to warm up.
- Wary of disturbances and dive into deep water or under banks and vegetation to escape.
- Active March – October mostly (all year in Southern California?)
- May leave water for uplands to avoid adversity

REPRODUCTION

Capture to Assess Reproduction

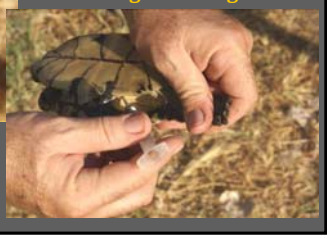
Palpation to Determine if Gravid

X-Radiographs to Count Eggs

Marking for Subsequent Individual Identification

Filing marginal scutes

Inserting a PIT tag

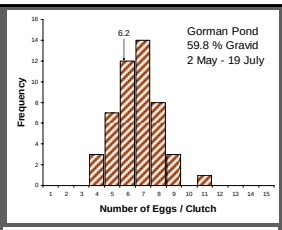


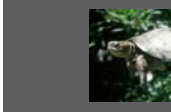
Regional Comparison of Reproduction

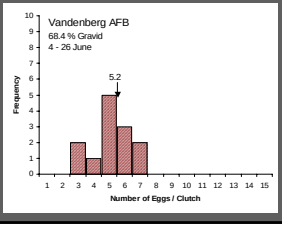
- Greater clutch size in north, smaller to south

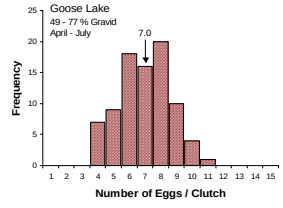
- Oregon/Washington: means of 6.5 – 10.0 eggs/clutch
- Central Valley: 7.0 – 8.5 eggs/clutch
- Coastal California: 4.9 – 5.7 eggs/clutch
- Southern California: 4.5 – 6.5 eggs/clutch

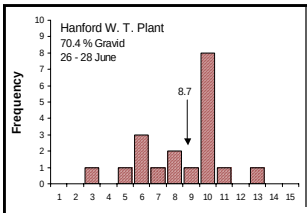
Clutch Size

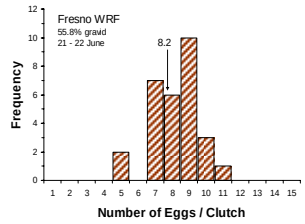




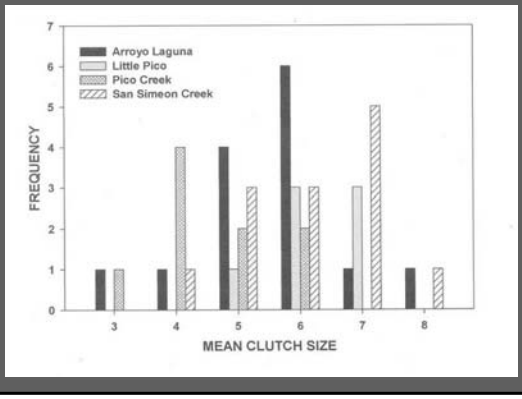




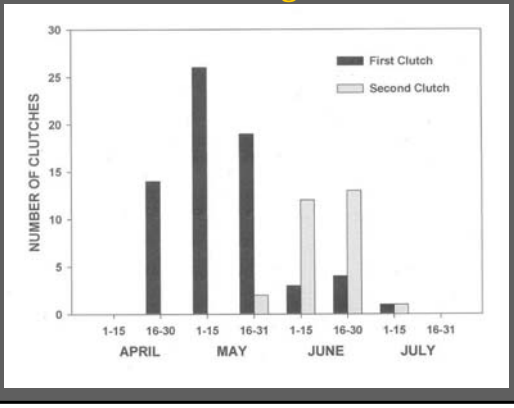




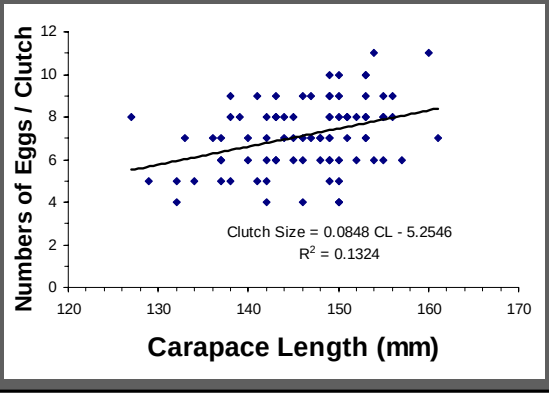
Local Variation in Clutch Size



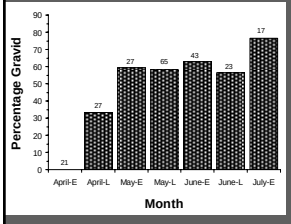
Double Clutching Per Year

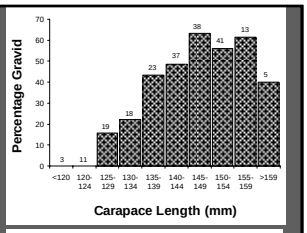


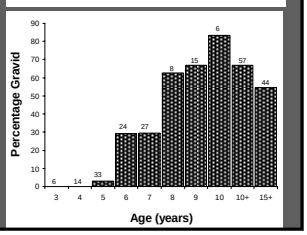
Goose Lake



Example of Month, Size, and Age of Reproduction

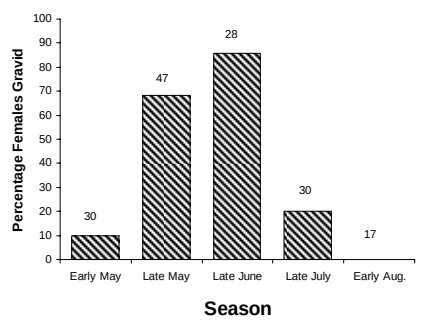






Goose Lake
(400' elevation)

High Elevation Delays Start of Reproduction



Gorman pond
(3700' elevation)

Reproduction Summary

- Sexual maturity at 5 – 6 years (Central Valley), probably older in north
- Reproductive in late April – July (August?) in most areas and some double clutch
- Nest in sunny areas within 5 – 100 m (sometimes up to 2 km) of water
- Incubation times 75 – 100 days
- Young hatch in late Fall or overwinter and hatch in early spring of following year

POPULATION BIOLOGY

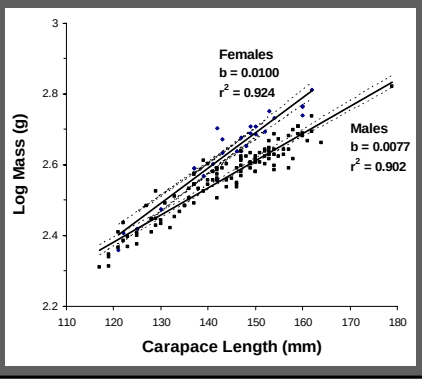
Size Classes
(These are not age classes!)

Adult - ≥ 120 mm Carapace Length

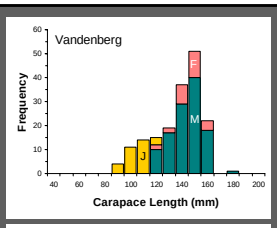
Juvenile - < 120 mm CL

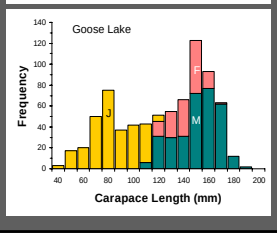
Hatchling – just hatched (25–35 mm CL)

Weight – Length: Vandenberg

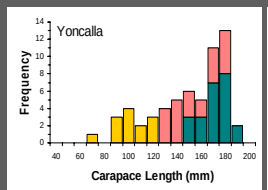


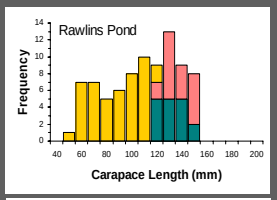
Size Structure

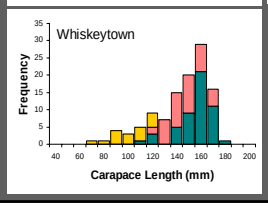


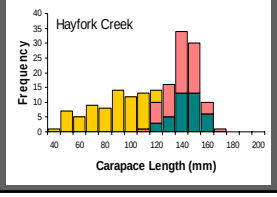


Size Structure





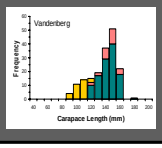


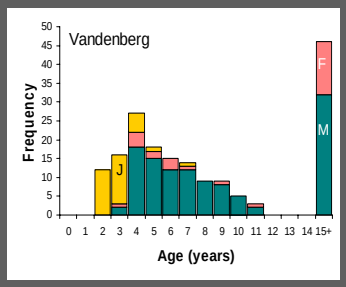


Scute Annuli Used to Estimate Age of Juveniles

Age Structure

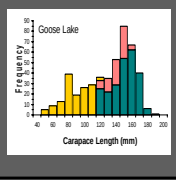
Vandenberg AFB

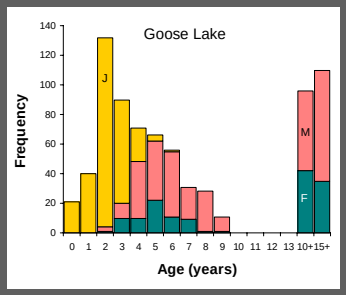




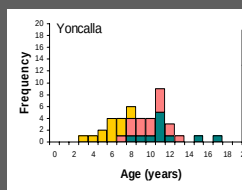
Age Structure

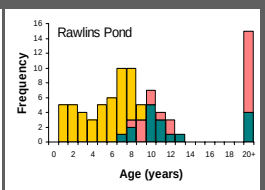
Goose Lake

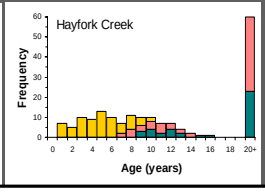




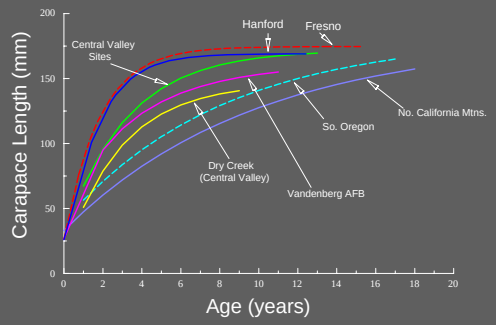
Age Structure





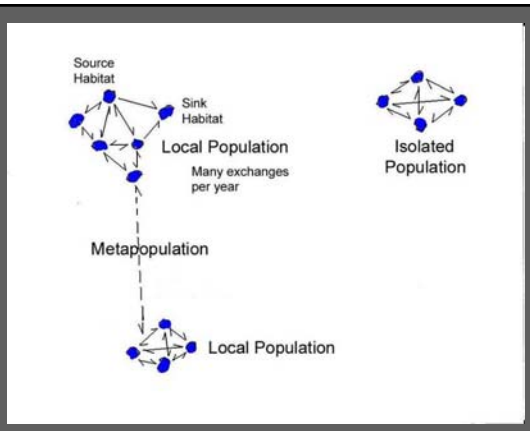


Growth Comparison



POPULATION MODEL

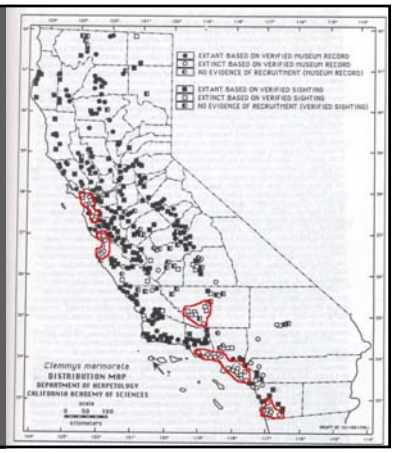
- METAPOPULATION--Two or more local populations rarely linked by migrating individuals
- ISOLATED POPULATION--A local population not exchanging individuals with any other local population
- LOCAL POPULATION--Turtles in habitats linked by the regular exchange of individuals



Extinction Sequence

- Metapopulation linkages are broken, creating isolated local populations
- Local populations lose mosaic of local habitats
- Local populations go extinct

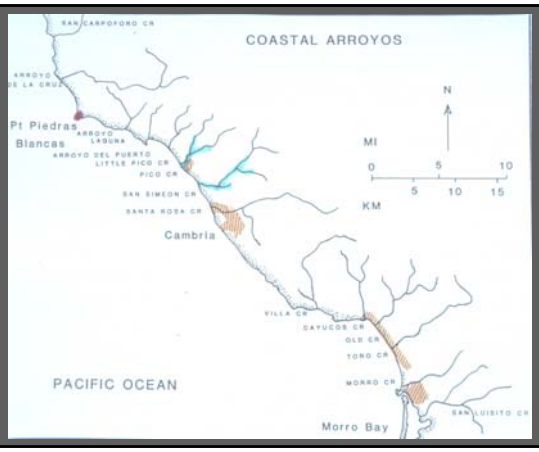
Local Extinctions



Isolated populations will not persist without management

MOVEMENTS

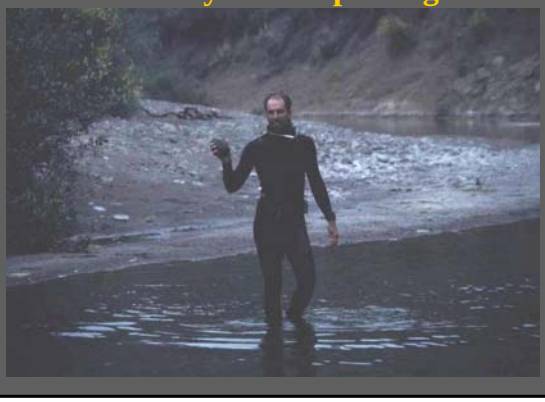
Basking, Breeding, and Avoiding Adversity



Radio Transmitter Attachment

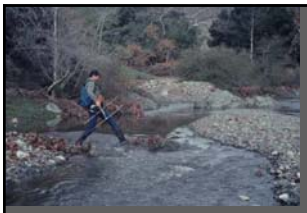
One of Several Possible Configurations

Difficulty of Recapturing



The Stealth Move…

Why Did Solar Transmitters Fail?



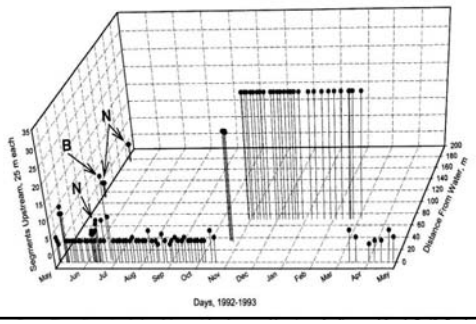
Radiotracking –
Creeks
Ponds
Uplands

Traveling in Upland Habitats Is Risky

Most Turtles in Ponds
DO NOT
Move Far From Water

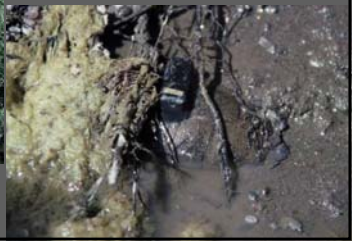
Female Use of Uplands in Time & Space

Basking, Nesting, and Avoiding Adversity



Typical Solar Basking Site

Basking in Floating Algae in Creek



Terrestrial Basking

Movements to Uplands for Nesting

- Open Sun
- Low Vegetation
- South Facing Slope

Riparian

Glade

Arroyo Laguna

Riparian

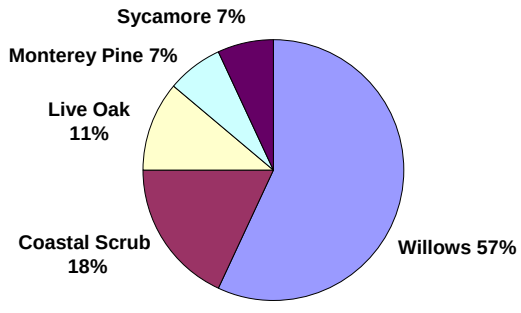
Glade

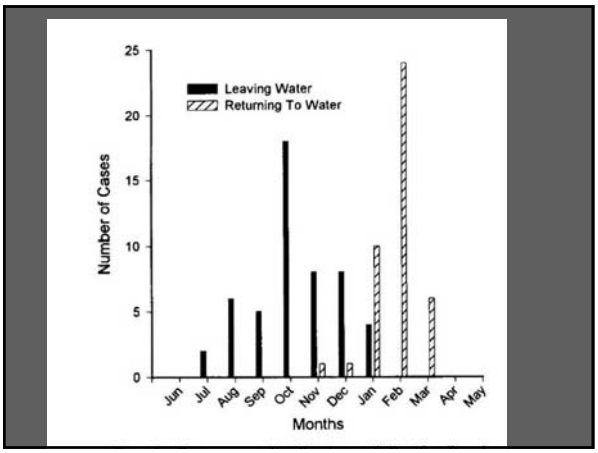
Pico Creek

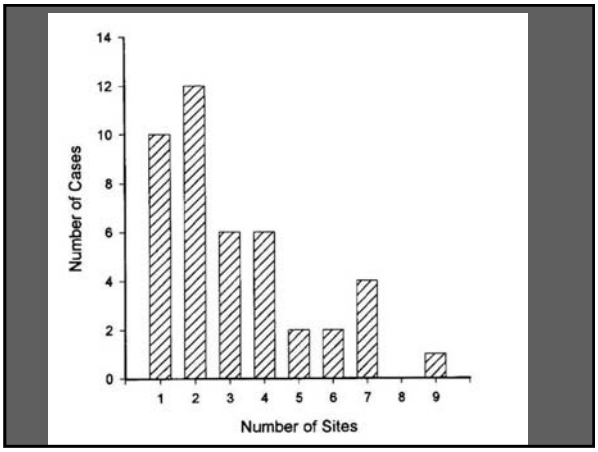
Movements to Uplands to Escape Adversity (Refuging)

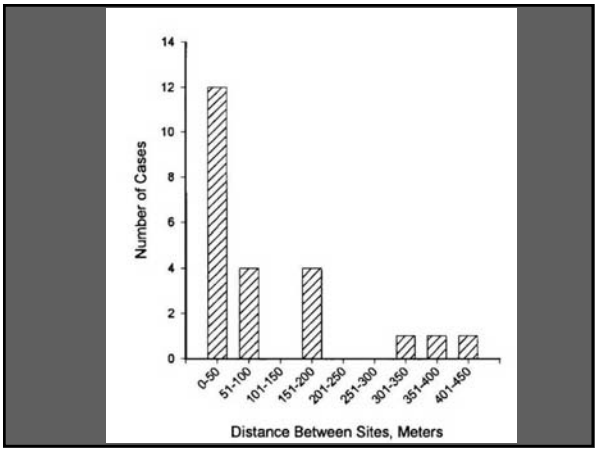
- Avoiding too much or too little water
- Not near water
- North-facing slope
- Well vegetated

Habitat at Refuge Sites









Upland Use Summary Statistics

Upland Use	No. Individuals	No. Sites	Mean (+/- S.D.) Distance to Water, m	Range Distance to Water, m	Range or Mean (+/- S.D.) at Site, days	Maximum Elevation from Creek, m
Basking	9	28	4.5 (3.0)	0.5-12.0	1-5	4.5
Refuging	28	43	49.7 (54.8)	8.0-280.0	111.0 (44.3)	38.0
Nesting	8	12	28.3 (18.9)	9.5-80.0	1-3	17.5

Movement Corridors

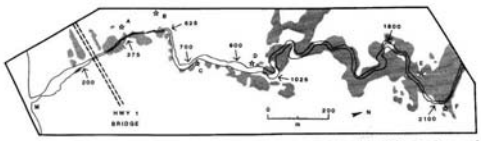
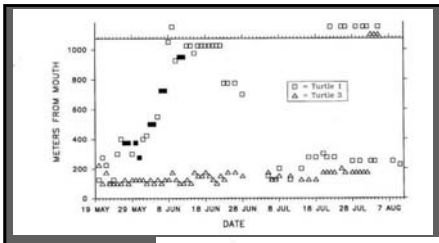
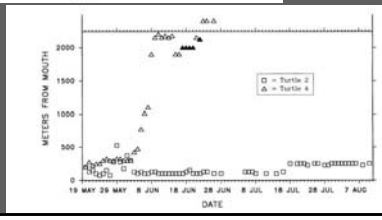


FIG. 2—Arroyo Laguna-Oak Knoll Creek, illustrating path of stream bed (parallel solid lines) and extent of closed-canopy riparian woodland (shaded). Distances from mouth of arroyo (M) are in meters (arrows). Stars show turtle overnight sites outside the stream bed: A = turtle 1, 26 May 1989; B = turtle 1, 2 June 1989; C = turtle 1, 5 June 1989; D = turtle 1, 10 June 1989; E = turtle 4, 16 and 18 June 1989; F = turtle 4, 21 June 1989.





BUT,
Most Turtles in Ponds

DO NOT

Make Long Moves
Into Uplands

THREATS

- Urban Influences
- Agricultural Influences
- Exotic Predators
- Natural Predators
- Contaminants & Disease

Urban Impacts

Bridges & Culverts

Road-killed Turtles

Water Regimes & Barriers

Agricultural Impacts

Cattle & Vegetation

Exotic Predators (bullfrog a sham?)

Introduced Centrarchid Fishes – Bluegill & Largemouth bass

Hatchling eastern turtles not eaten in experiments:

Semlitsch and Gibbons. 1989. Copeia 1989:1030-1031.
Britson and Gutzke. 1993. Copeia 1993:435-440.

Native Predators

Nest Predation

Raccoon
or Skunk?

Agricultural Chemicals

MANAGEMENT

Predator
Control

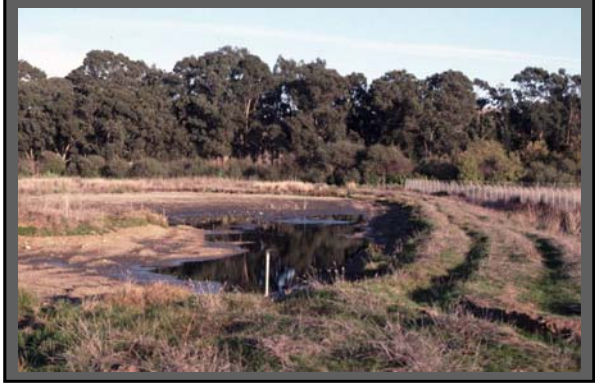
Nest Site Exclosures

Mesh Size

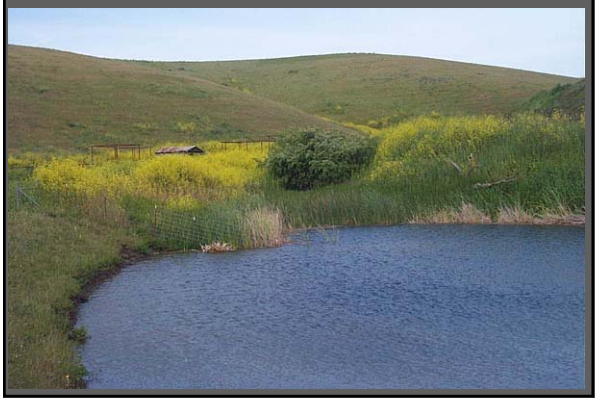
Water Regimes And Vegetation

Managing Ponds for Turtles

Constructed Pond - Failed



Cattle Exclosure for Habitat Diversity



Golf Course Ponds – Missed Opportunities?

Uplands

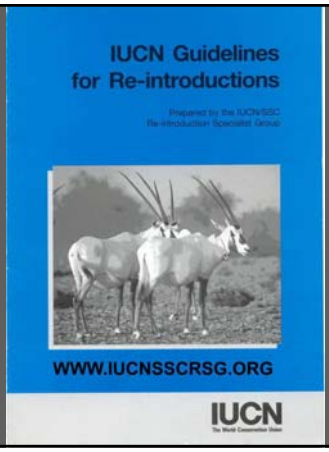
Buffer Zones

MOVING TURTLES - DEFINITIONS

- Translocation
- Re-introduction (including head-start)

Re-enforcement (including rescue)

- Introduction



Planning Turtle Translocations

- Aims & Objectives
- Multidisciplinary Approach
- Pre-project Activities
- Socio-economic & Legal Requirements
- Planning, Preparation, & Release Stages
- Post-release Activities

Head Start Programs

- In theory, raising turtles until they are large enough to avoid predation by most numerous predator should increase numbers of turtles.
- Turtle eggs either obtained from captive adults or nest dug up, or hatchlings found in wild.
- Accelerate growth of turtles by feeding rich diet.
- Release large-sized juveniles to natural site.

Examples of Head Start Programs

- Washington - 3 sites with releases since 1991:
  - 296 turtles released at Klickitat sites (64% recaptured in 2003)
  - 141 turtles released at Skamania site (40% recaptured in 2003)
  - 137 turtles released at Pierce NWR (43% recaptured in 2003)
- Oregon – turtles released near Corvallis in 1994.
- Oregon – Army Corps released turtles near reservoir west of Eugene 1993 - 2002.
- California – UC Davis, 33 turtles released into arboretum waterway from 1996-1998: 21 recaptured by 2001.
- California – Kern River Preserve project started in 2006.
- California – CSU Sonoma project started in 2007.

Critique of Head Starting Turtles

- Is there really a problem for hatchling survival? Bullfrogs and bass probably not an issue.
- Reducing populations of nest predators may be more beneficial.
- Are any diseases being introduced into native population?
- Habitat protection and enhancement may be more cost effective.

Site Assessment

- **Western Pond Turtles may occur in any body of water, but:**
- **Size: smaller bodies of water contain proportionally more turtles than large bodies**
- **Depth: shallower (1-2 m) better habitat than deep (> 2 m) water**
- **Structures: logs and rocks provide good basking sites, although shoreline and vegetation mats are also used as basking sites**

Survey Protocols

- Presence/Absence: visual surveys for 15 min. recording number seen every 5 minutes.
- Trend Assessment: visual surveys for 35 min. recording maximum number seen every 5 min. Report maximum number seen in 35 min. Visit site 3 times a year.

Managing Aquatic Habitats for

Western Pond Turtles

and

California Red-legged Frogs

RESEARCH METHODS

- **Presence-absence & abundance**
- **Populations structure**
- **Population dynamics**
- **Movements, habitat use, mortality**

EQUIPMENT

- Waders
- Wet suit
- Float tubes
- Binoculars
- Traps & nets
- Radio receivers & transmitters
- Marking & tagging equipment

EQUIPMENT SUPPLIERS

- Cabela's
- Ben Meadows
- Forestry Suppliers
- Bass Pro
- Memphis Net & Twine
- Nylon Net Company
- Biomark
- Holohil Systems
- Wildlife Materials
- Communications Specialists

RESEARCH NEEDS

- Effect of Exotic Predators
- Translocation & Head Start Success
- Success of Nest Exclosures
- Reproduction Across the Range

IMPORTANT POINTS

- Size does not equal age
- Growth rates & reproduction vary by region
- Water regimes – Mediterranean climate
- Agriculture – cattle and ponds
- Manage for nest and female survival
- Manage populations, not individuals
- Management objectives

BIBLIOGRAPHY