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**0757 Headstarting Turtle Symposium I, Ballroom B, Monday 12 July 2010**

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**Restoration of Western Pond Turtles in the MSCP Region of San Diego, California**

Riparian systems in coastal San Diego have endured heavy impacts from fragmentation, urban development, altered hydrology, invasive species and high intensity wildfires. These systems are home to the western pond turtle which is covered under the San Diego Multi-Species Conservation Plan. This interagency habitat conservation plan was implemented to conserve nearly forty different animal species in the region and even more plant species. The USGS San Diego Field Station and San Diego Zoo are studying the recovery of the western pond turtle in a population heavily impacted by exotic species and altered hydrology. This population has produced gravid females in the wild but no detectable recruitment in recent years. In collaboration with the San Diego Zoo, we are implementing and assessing effectiveness of two management tools by removing invasives from available habitat and headstarting in an effort to increase survival probability. First, we examine the western pond turtle's response to invasives control through capture/recapture rates, age structure of captured turtles and proportion of gravid females observed. Second, we report on the success of captive rearing of eggs harvested from gravid females found in the wild population.

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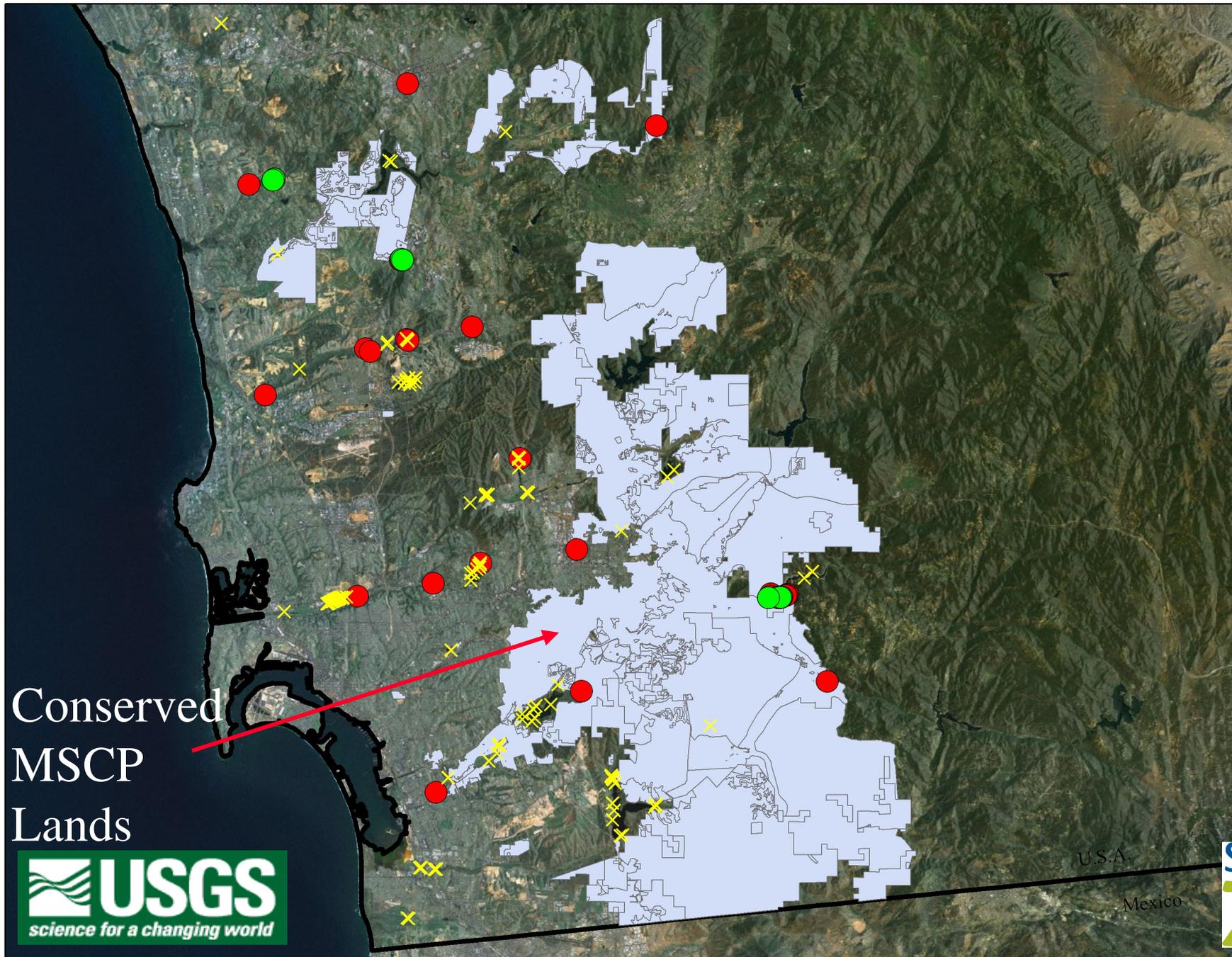
# Restoration of Western Pond Turtles in the MSCP Region of San Diego, California

Christopher W. Brown, Thomas C. Owens  
and Robert N. Fisher

# San Diego Multi-Species Conservation Plan (MSCP)

- Adopted March 18, 1997
- Plan to conserve nearly 40 animal species (and even more plants)
- Habitat conservation plan linked to USFWS (Section 10)
  - Allows for management of non-listed species
- Includes western pond turtle (*Emys marmorata*) (WPT)





Conserved  
MSCP  
Lands



U.S.A.  
Mexico



MSCP  
Area  
~900mi<sup>2</sup>

Turtle  
Records

- Historic
- Recent Females
- x Recent Exotic Turtles

# WPT in the MSCP region

- USGS began monitoring MSCP turtles in 2002
- No detectable recruitment at any study sites
- One gravid female at only one site: Sycuan Peak Ecological Reserve

Potential deterrents to recruitment...

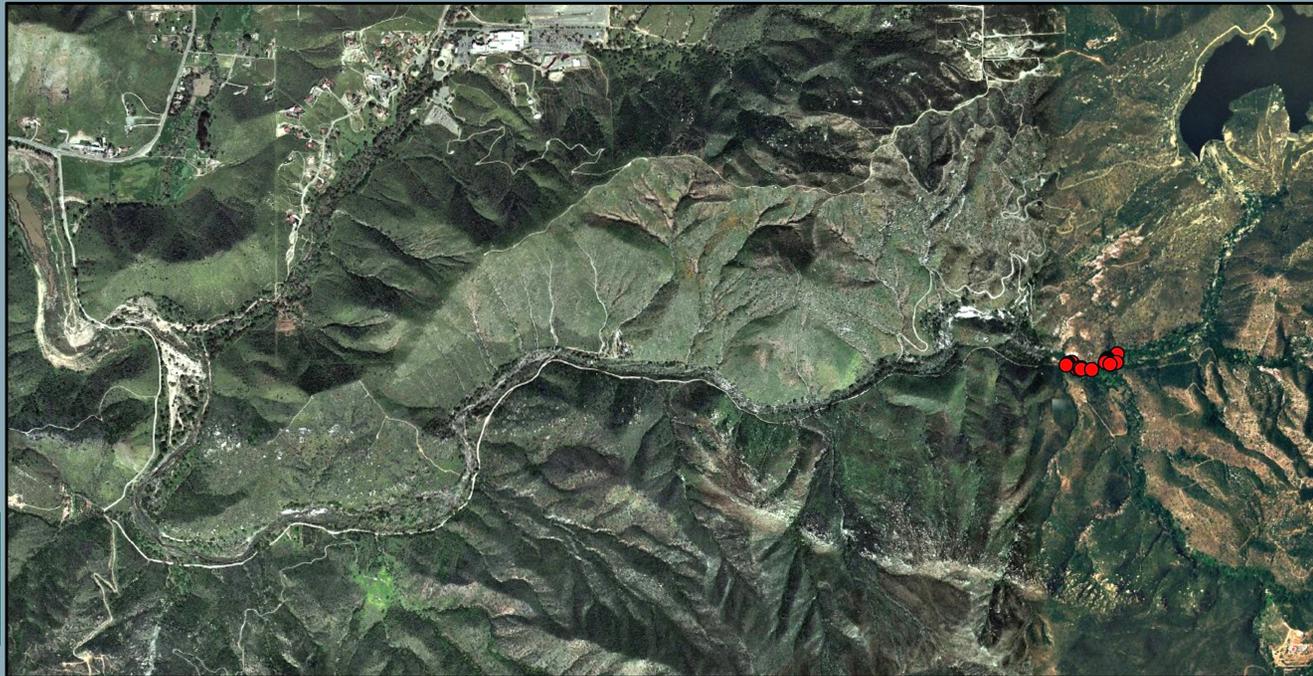
-Exotics -Roads -Fishing/Hunting -Public Access (dogs, traffic, etc.)



# Can We Restore WPT in Urban San Diego?

## --Sycuan Peak Ecological Reserve--

- Can harvest eggs from females for head starting
  - CDFG Reserve—Restricted access and multi-agency collaboration
  - Discrete ponds—Easier for trapping and exotics control
  - Can use as starter population for Otay watershed (now protected)
- As good as it gets in MSCP--



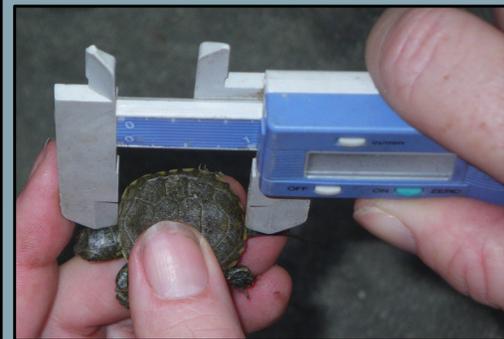
# Trapping Methods

- 1.5' single-fingered hoop trap (15-20)
  - Baited (mackerel or sardines) in morning on day 1
  - Checked daily in mornings, refreshing bait as needed
  - Closed on morning of day 5
- Galvanized 16.5" minnow traps (3-9)
- Seines and dip nets



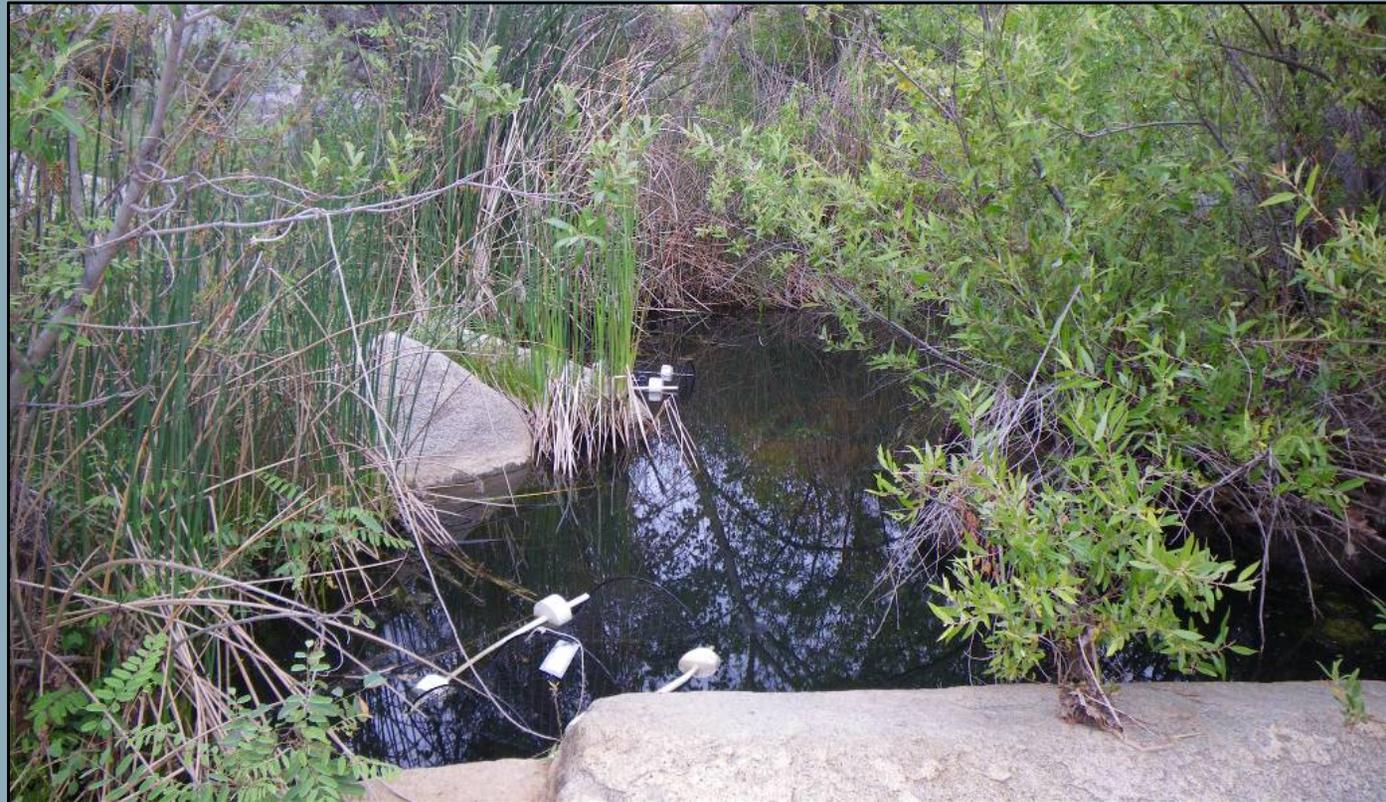
## Turtle Processing

- Weigh and measure, count annuli
- Examine for general health, injuries, damage
- Check for previous markings/IDs
- Implant PIT tags and take tissue from new captures



# 2009 Western Pond Turtle Trapping

- 4 main pools
- 15-20 hoop traps (water level driven)
- 6 Surveys (5 day trapping sessions)
- 41 WPT captures of 24 individuals
- All adults, 10:14 females : males
- Only 8 new WPT  
(16 from 2002-3)
- 2 gravid females  
(only 1 fertile)



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# Invasive Removal and Maintenance

- 2009: removed crayfish, sunfish, bullfrogs and African clawed frogs until none were detected
- 2010: Early spring-no detections of exotic species at primary turtle ponds

Late spring-2 adult bullfrogs detected and removed from site

No invasives detected during most recent survey



# Spring 2010 Western Pond Turtle Trapping

- 2 surveys at same pools (post invasives removal)
- 3 gravid females detected and taken to SD Zoo (all fertile)
- 2 New WPT
  - One young adult WPT (105mm) detected in first Spring survey
  - One juvenile WPT (68mm) detected during last survey
  - Youngest 2 WPT detected in MSCP region in 8 yrs

↑  
**WPT  
Activity**



# Collecting Gravid Females

- Captured females were examined to determine reproductive status
  - Radiograph/Physical Examination (Palp)
- Gravid females were kept in **quarantine** at San Diego Zoo for egg harvesting



# Nesting/Egg Laying

- One clutch laid naturally
- Others induced with Oxytocin
- Given supportive fluids and Ca
- Females returned to site after recovery



# Egg Incubation

- 5:1 Vermiculite:Water
  - Very dry by most standards
  - Typically 1:1 or 2:1
  - Chosen based on early data from study
    - Geist et al, in prep
- Incubated at 28° C for 105 to 126 days
- Mean egg mass- 11g
- Mean egg length- 37.6mm
- Mean egg width- 20.5mm



# Egg Incubation

2009

- 2 Gravid females
  - 1 clutch of 5 fertile eggs
  - 1 clutch of 3 infertile eggs
- All 5 fertile eggs produced juveniles

2010 (so far...)

- 3 Gravid females
  - 1 clutch of 5 eggs (at least 4 appear fertile)
  - 1 clutch of 3 eggs (1 fertile, 2 lost during nesting)
  - 1 clutch of 3 eggs (1 fertile, 2 lost during laying)
- Total of 6 fertile eggs incubating



# Hatchlings (2009)

- Mean weight- 6g
- Mean carapace length- 28.6mm
- Mean carapace width- 26.8mm



# Feeding

- Crickets, earthworms, Phoenix Worms
- Turtle brittle
- Turtle gel  
(blended carrots, greens, turtle brittle, omnivore primate biscuits)
- Fish (infrequently)

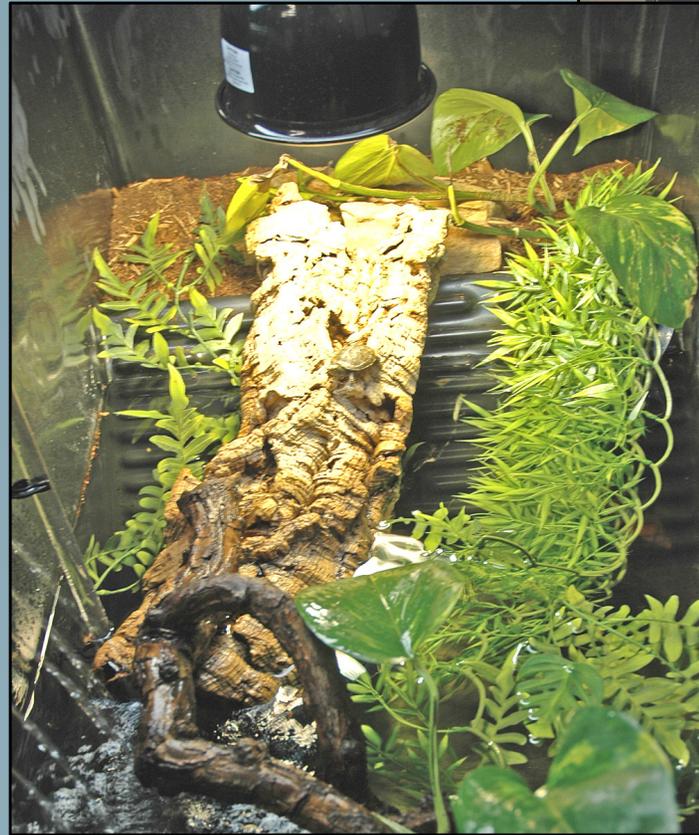


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# Juvenile Care

- New facility for raising juvenile turtles
- Currently 5 healthy juvenile turtles hatched Oct-Nov, 2009
- Mass: 24-32g (~5x hatchling wt)
- Length: 24-28mm
- Width: 22-26mm



# Discussion

- Reduction of invasive species at best WPT site in MSCP
- Successful egg harvesting and incubation from wild population
- Initial positive response in WPT activity potentially to invasives reduction
- Long term commitment for restoration of WPT in MSCP



# Future Activities

- Plan to monitor population to determine if increased activity continues with invasives control
- Continue to develop captive population for breeding and eventual release (4-8 yrs)
- Examine potential restoration sites in MSCP region—Otay Watershed now being conserved



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