Response of Female Blanding's Turtles to Natural Succession in Nesting Areas

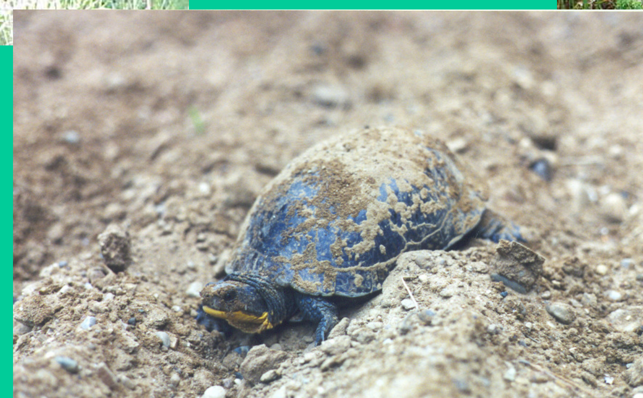
Justin Congdon, Owen Kinney, Roy Nagle,, Todd Quinter, Richard van Loben Sels and Matthew Ossentoski

Data summary: 1975 – 2007

Species	Indiv.	Recaps.	Xrad.	Nests
Painted	6,463	24,623	3,843	2,564
Blanding's	2,074	5,823	1,041	615
Snapping	3,180	4,021	815	1,148
TOTAL	11,717	34,467	5,699	4,327

1. find nesting turtles, locate and flag location of the nest

2. take body temps, monitor fate of nest

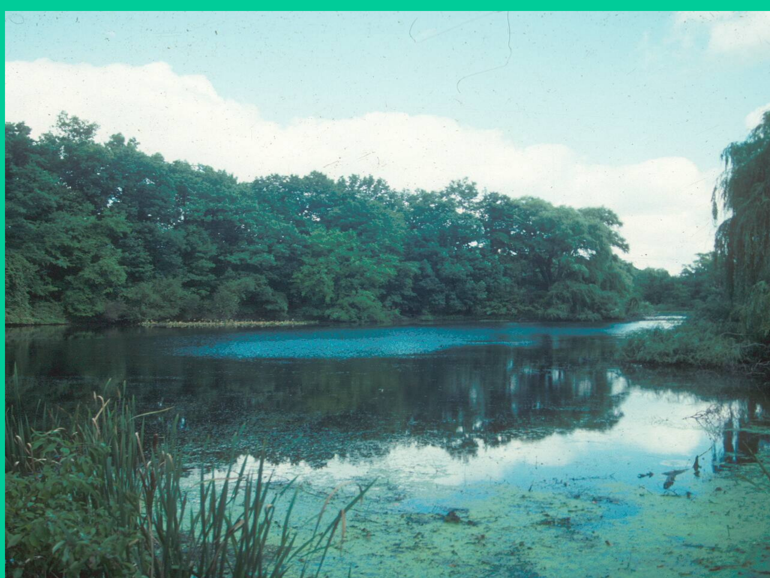


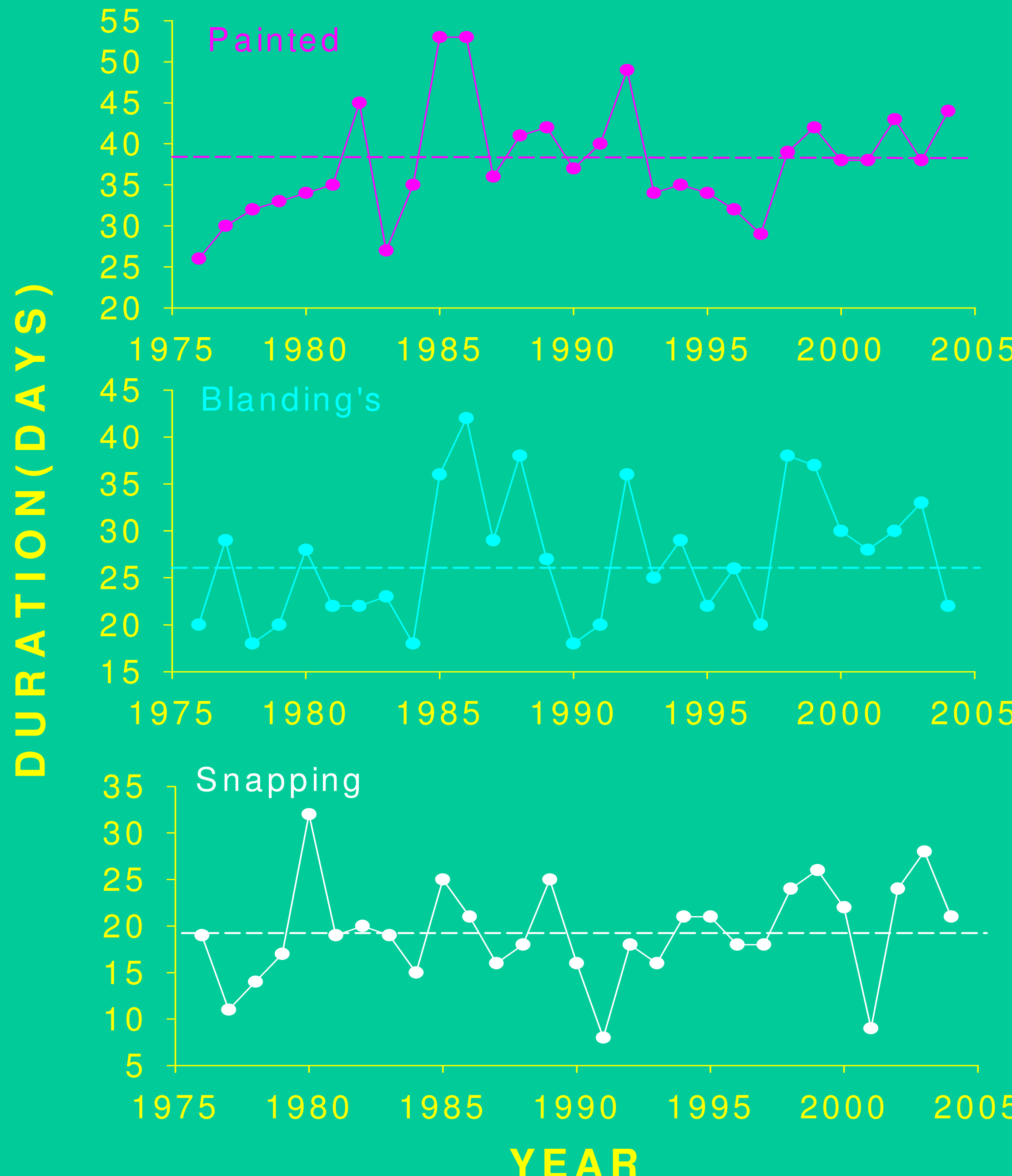
3. in fall and spring capture, & mark hatchlings at nests, fences, and in shallow water

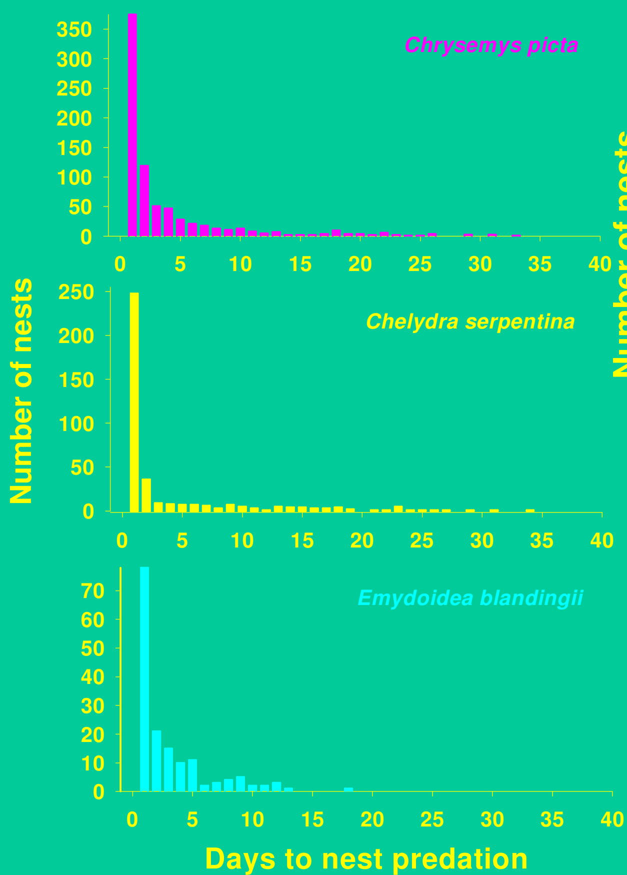
Nesting season

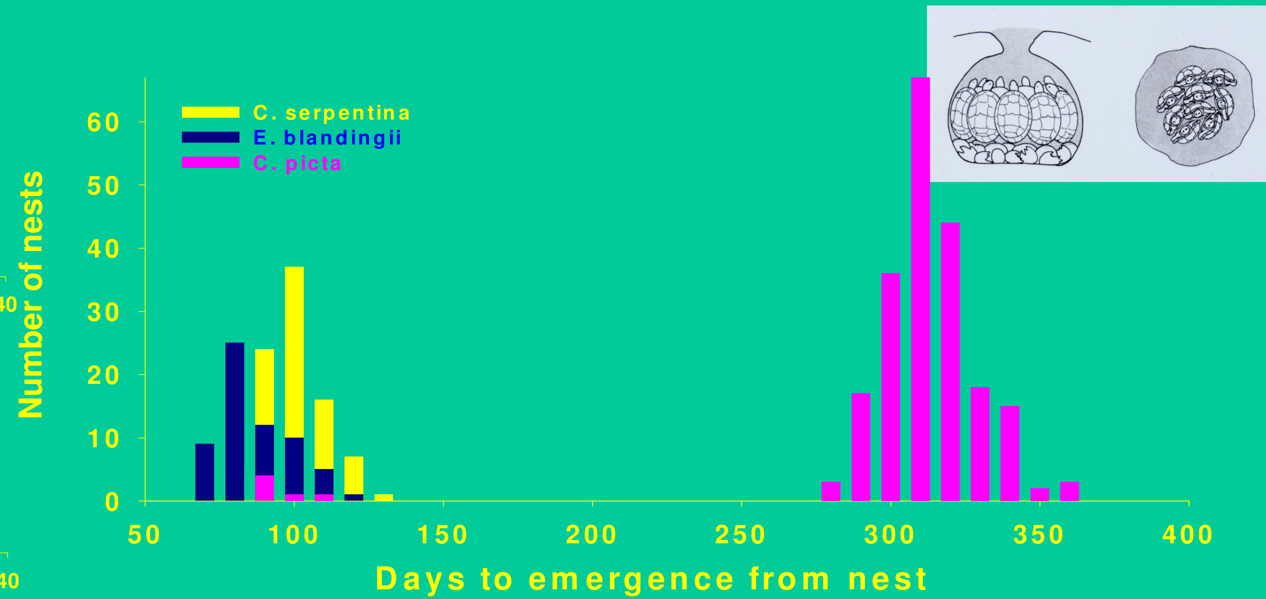
1. Six to eight people.
2. Duration 30 - 54 days.
3. Each day begins at 0600 h and ends between 2200 h – midnight – or later.
4. The EM fence (1.3 km) was walked every 20 – 30 min.
5. All nesting areas searched once an hour.

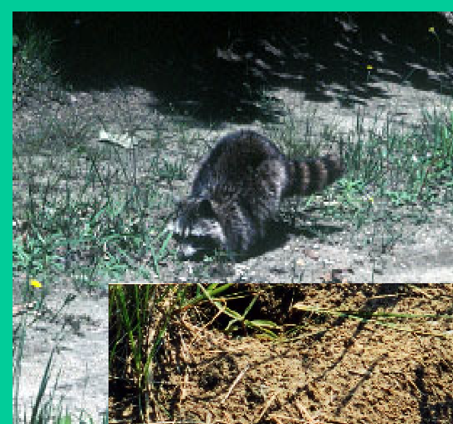
Over the past 32 nesting seasons, we walked > 40,000 km (~3 X the diameter of Earth at the equator)

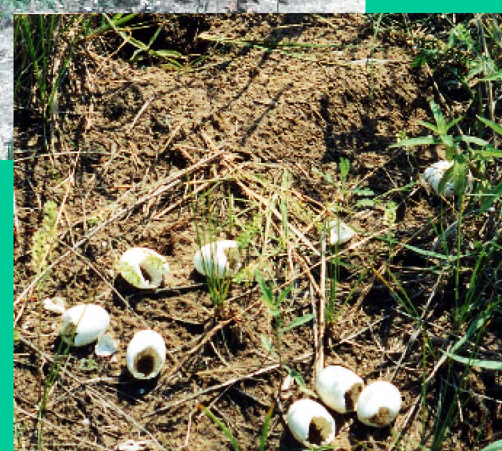



Painted
Blanding's
Snapping
DURATION(DAYS)
YEAR
1975
1980
1985
1990
1995
2000
2005









Mean nest survivorships	
Painted	21.1 %
Blanding's	21.8 %
Snapping	19.8 %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inter 42°27'24.57" N 84°00'29.15" W elev 900 ft
Streaming |||||||||| 100%
Eye alt 1392

“The Michigan Nest Survivorship Rules”

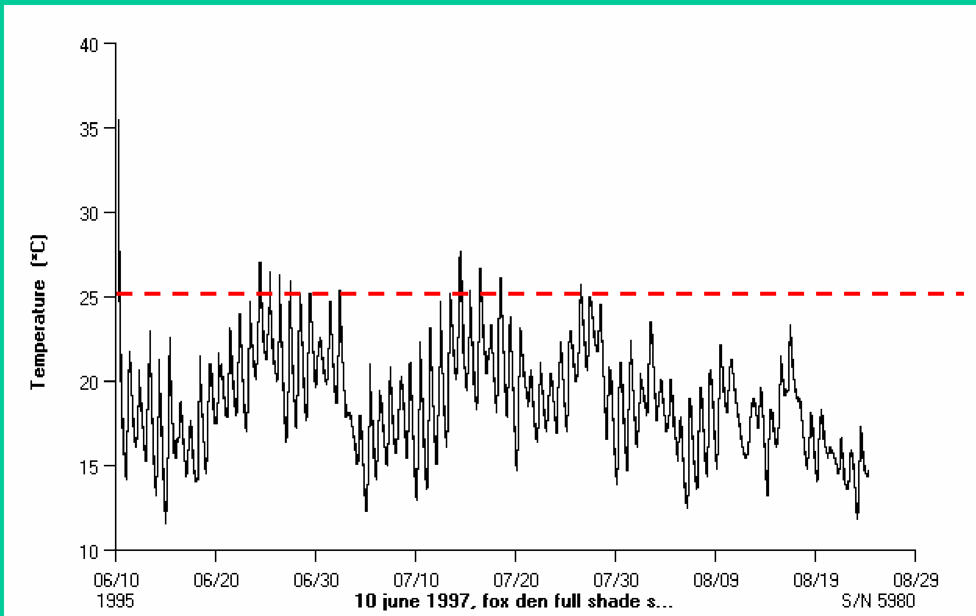
Full sun = OK

Partial shade = OK

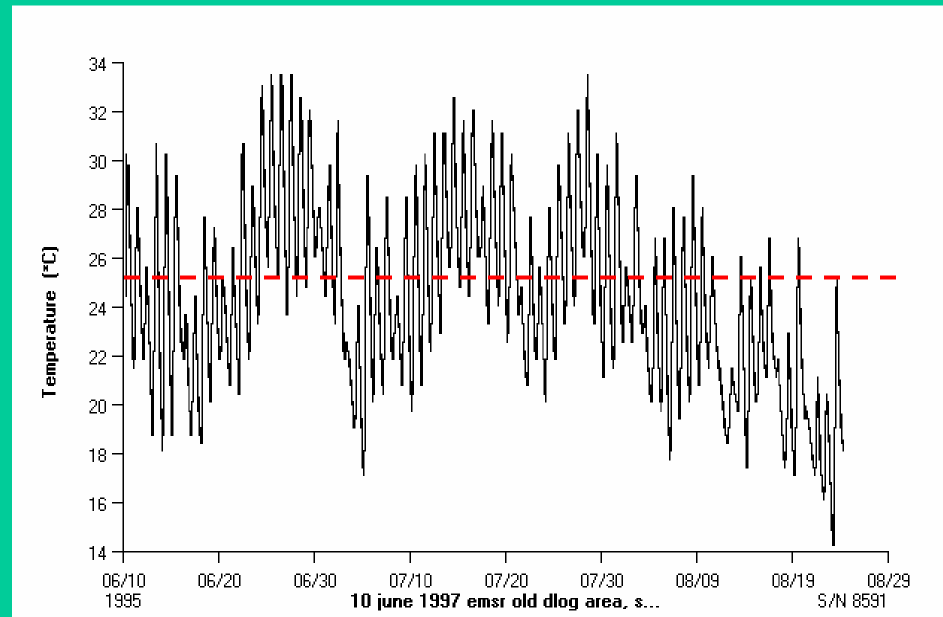
Partial sun = MARGINAL

NO SUN = NO SURVIVAL

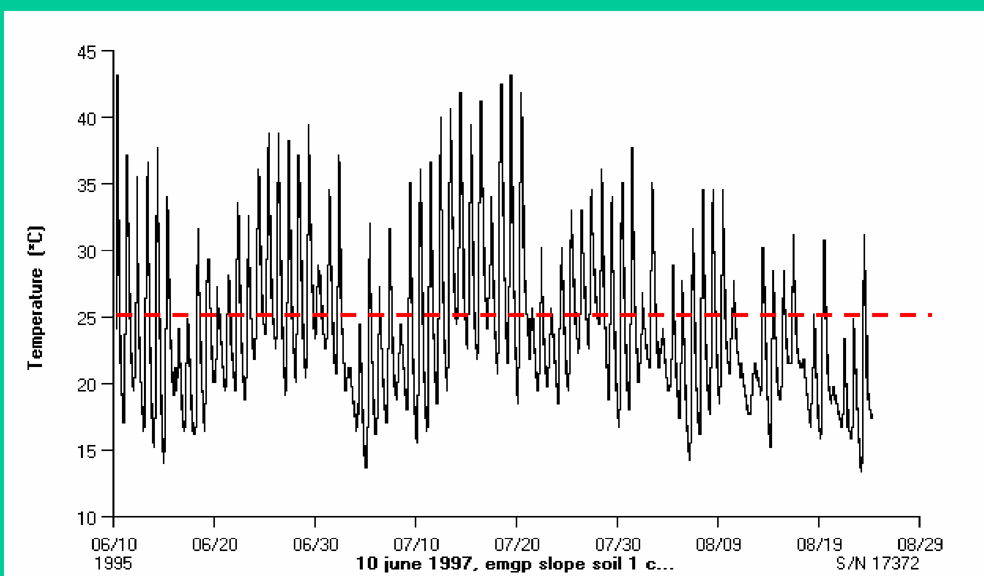
Full shade



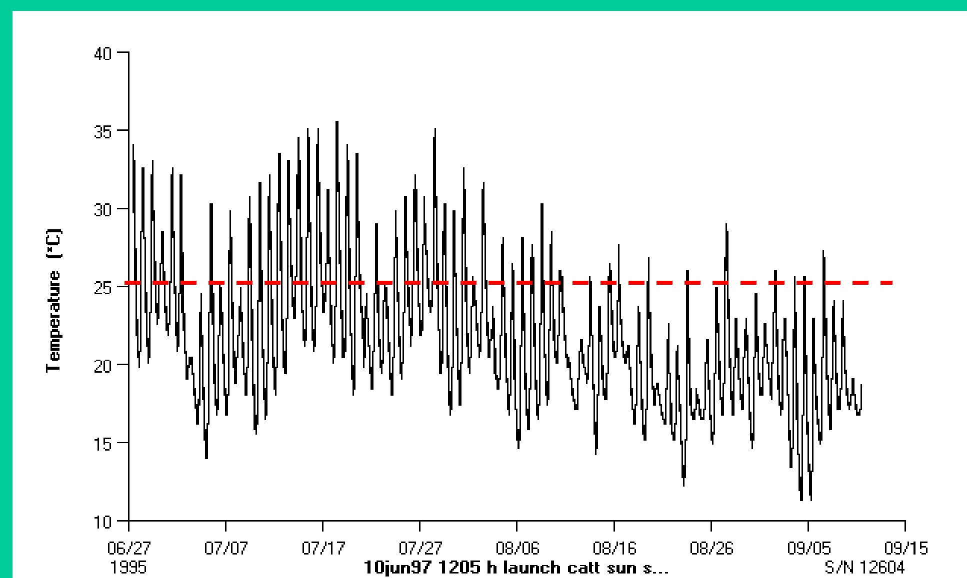
Full sun



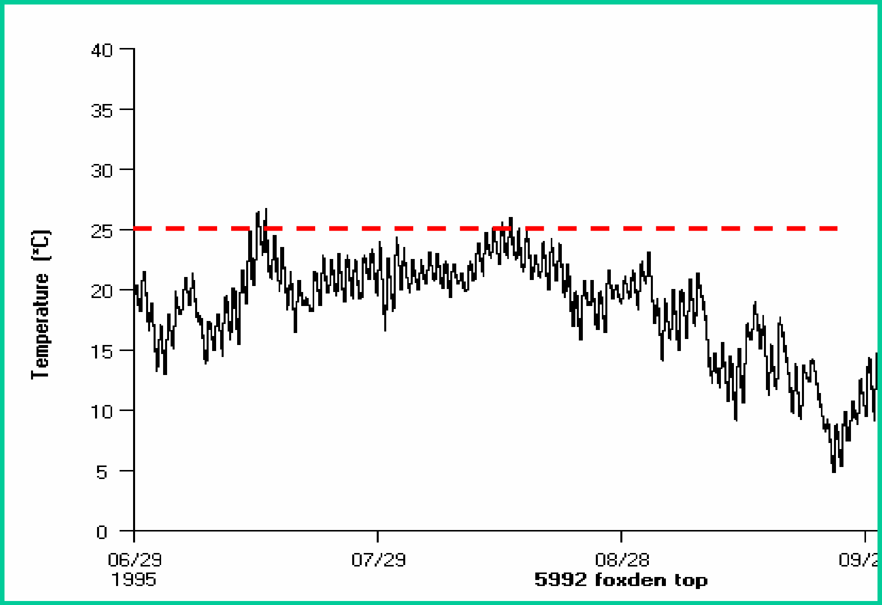
Full sun (south slope)



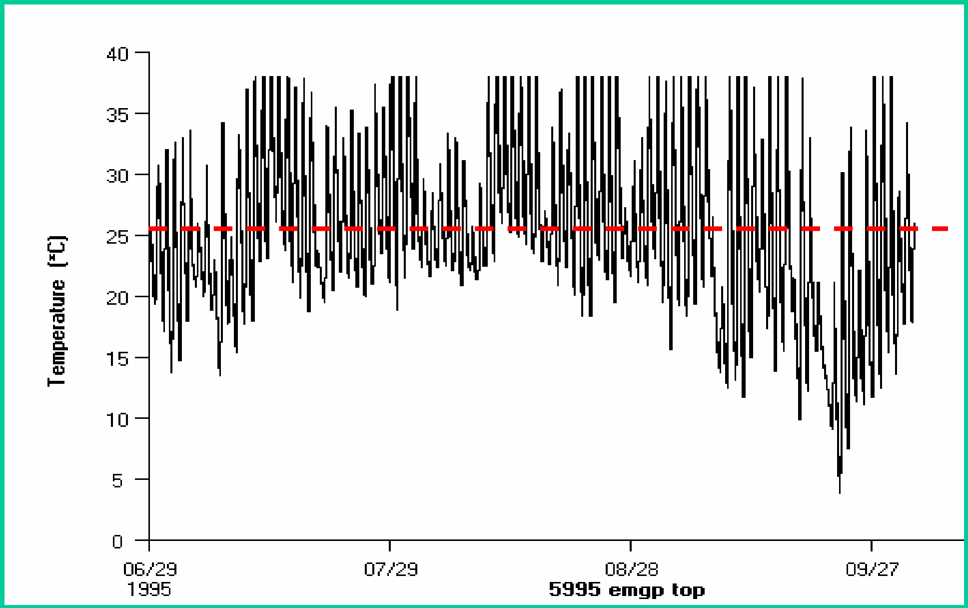
Partial sun (south slope)



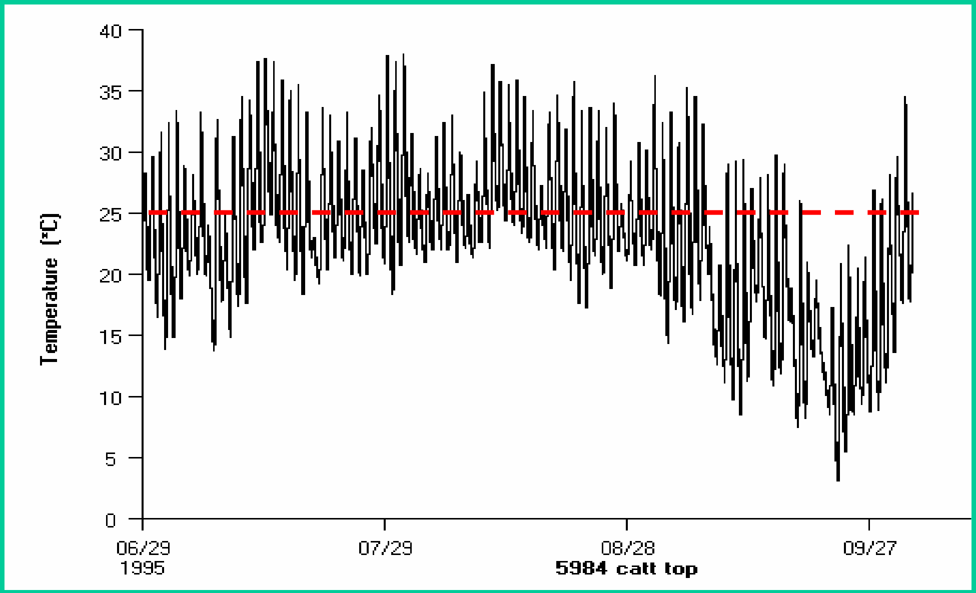
Full shade



Full sun (south slope)



Minimal shade (flat)



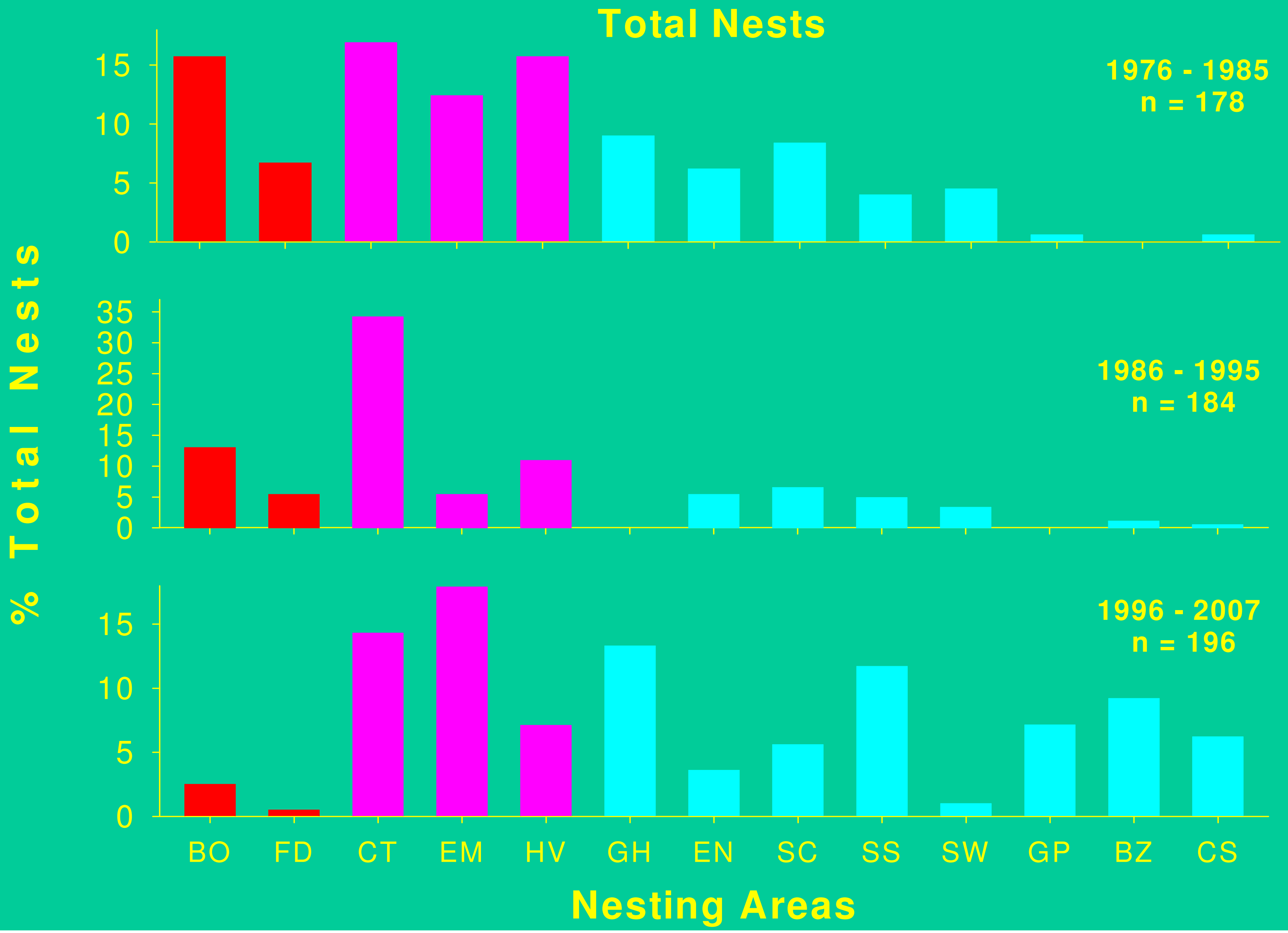
nests observed in FoxDen and BlowOut 1976 - 2007

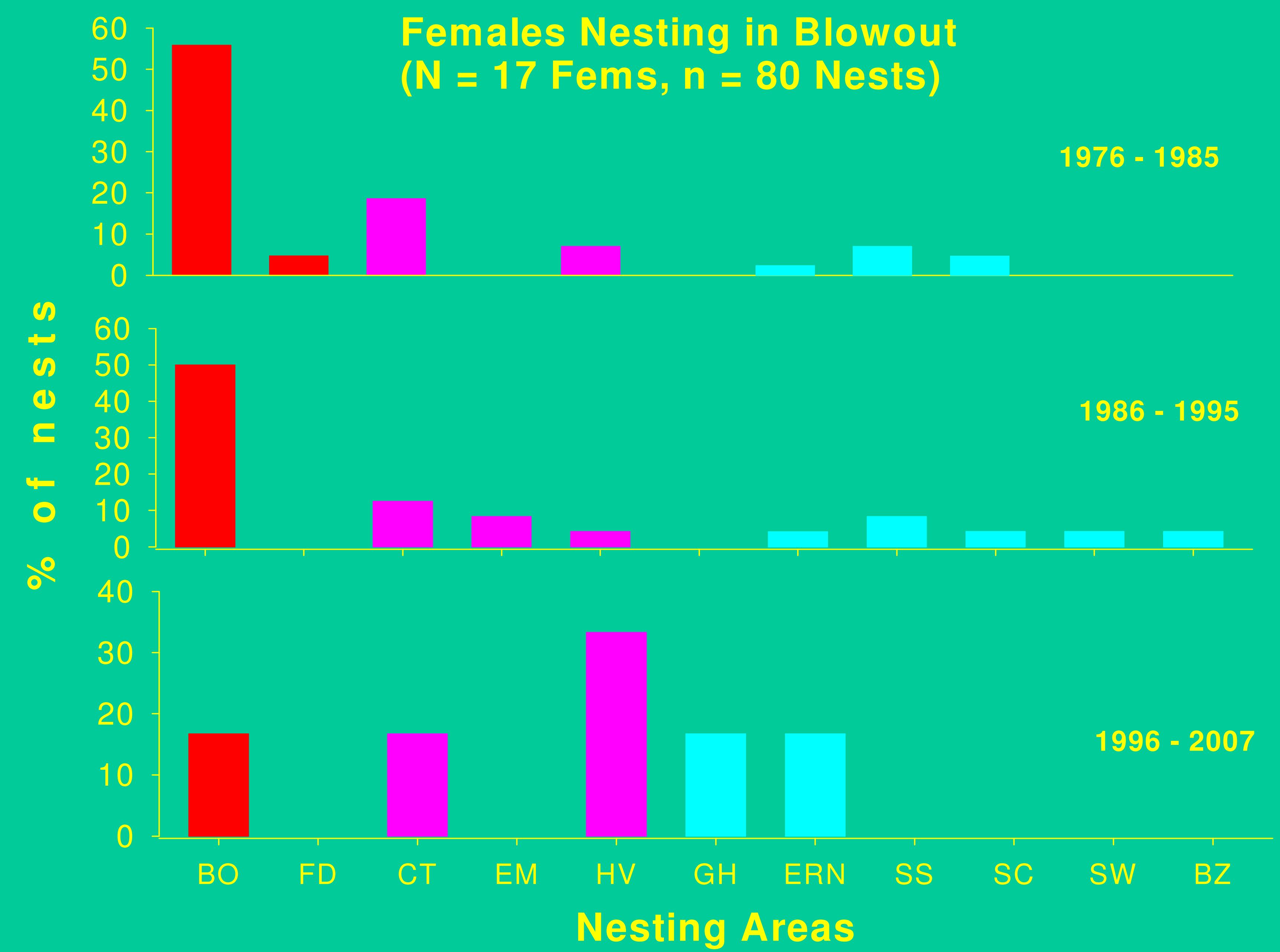
FD	sp	1976-85	1986-95	1996-2007
	CP*	19	50	0
	EB	14	8	0
	CS	4	2	0
BO	CP	6	7	2
	EB	23	15	5
	CS	26	20	2

* FD FEMS NESTS = 29 CATT AND 13 E. MARSH

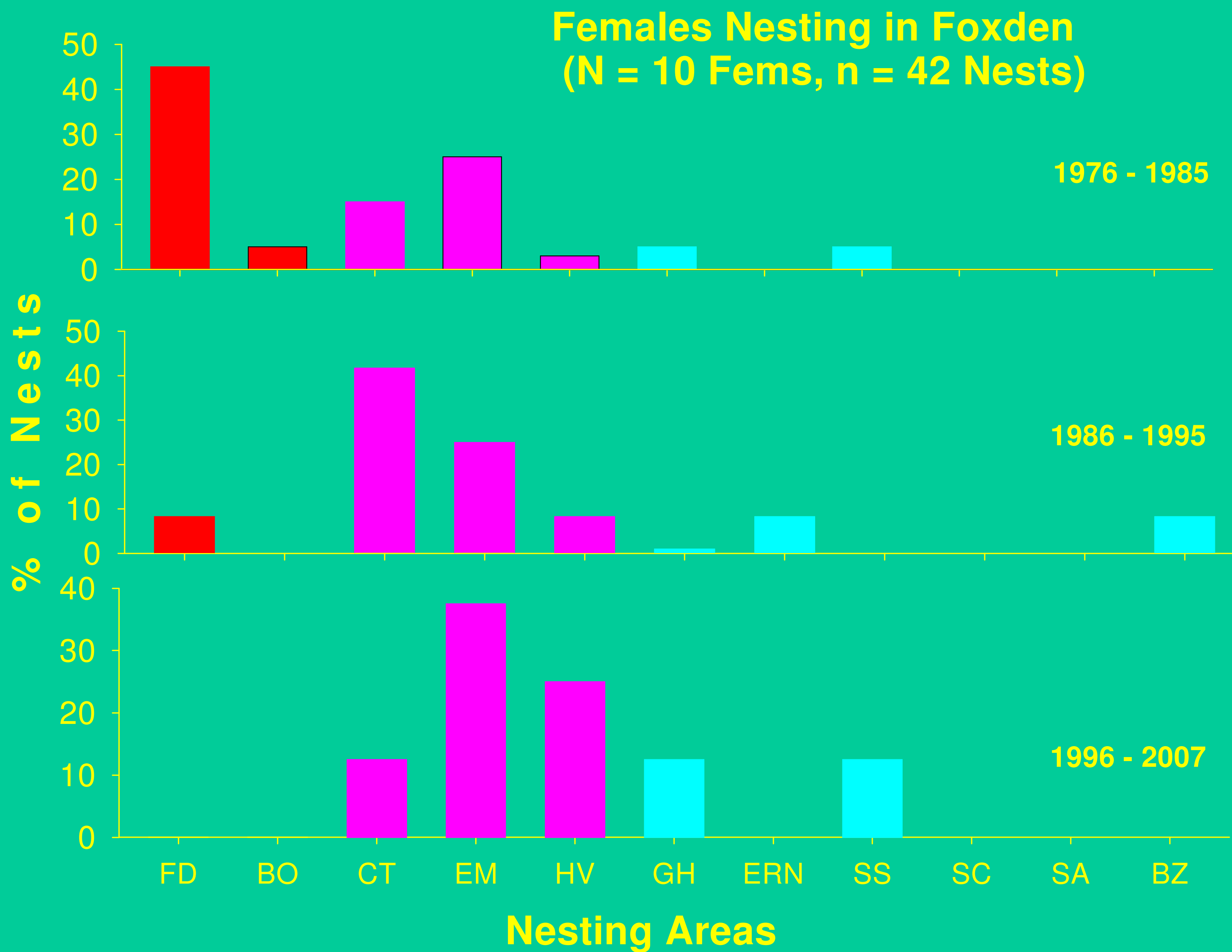
CP S.HILL			
NESTS	52	95	69
FENCE (R)	123	157	124

Blanding's turtle





Females Nesting in Blowout
(N = 17 Fems, n = 80 Nests)
1976 - 1985
1986 - 1995
1996 - 2007
% of nests
60
50
40
30
20
10
0
BO
FD
CT
EM
HV
GH
ERN
SS
SC
SW
BZ
Nesting Areas


Females Nesting in Foxden
(N = 10 Fems, n = 42 Nests)
1976 - 1985
1986 - 1995
1996 - 2007
% of Nests
50
40
30
20
10
0
FD
BO
CT
EM
HV
GH
ERN
SS
SC
SA
BZ
Nesting Areas

Following abandonment of two nesting areas,

changes in nest locations of CP and CS were all relatively short distances (i.e. < 400 m).

In contrast, 25 % ($n = 27$) of the nests subsequently produced by Blanding's turtle females represented changes in nest locations > 1 km.

Co-evolution of Nesting activities of Females and Hatchling Dispersal From Nests.

Justin Congdon, Mike Pappas,
and Bruce Brecke

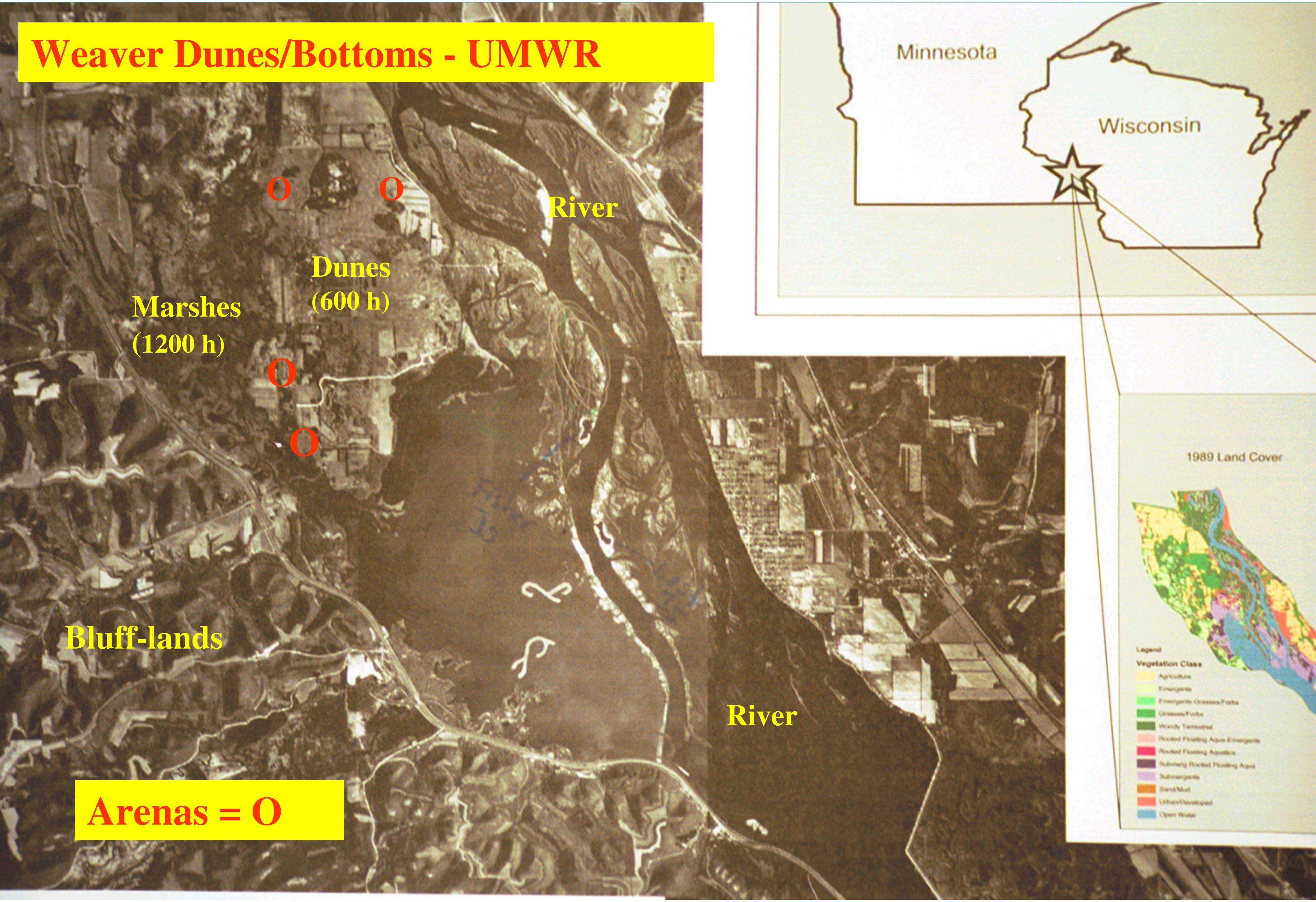
Two kinds of experiments are required to help develop generalizations about orientation systems of animals: first are experiments with different species employing similar procedures, and second are experiments with the same species under a variety of conditions (Able 1991).

We present the results of field experiments that apply both protocols using only naïve hatchlings (those that have had no previous exposure to environmental cues) of three species of marsh turtles that nest relatively near (*Celdrya serpentina, Chrysemys picta belli*) and relatively far (*Emydoidea blandingii*) from water.

Distances of nests to nearest water at Weaver Dunes

Species	(n)	mean	(range)	Cue
Blanding's	138	622 m	(70 – 1380 m)	dark/closed
Snappers	87	58 m	(5 – 370 m)	light/open
Painted – Islands	11	19 m	(2 – 44 m)	light/open
Painted – Land	71	24 m	(2 – 225 m)	light/open

Weaver Dunes/Bottoms - UMWR



Arenas = O

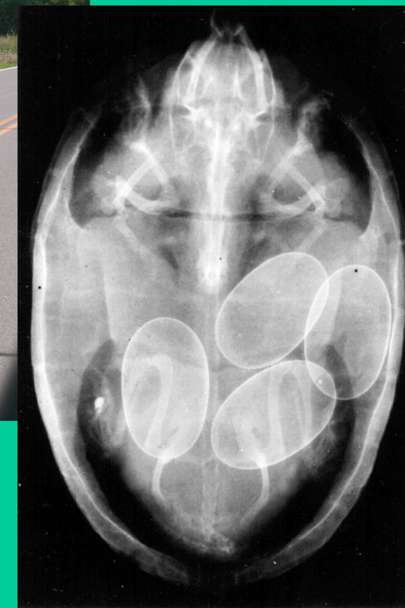
After digging out of nests, freshwater turtle hatchlings face a major problem of finding water

Inferring mechanisms from patterns of dispersal

Potential mechanisms

- Random dispersal (the null hypothesis)
- Negative geotaxis (the go down hill rule)
- Phototaxis
- Chemotaxis
- Humidity
- Piloting based on landmarks
- Compass orientation (e.g., sun compass)
- True navigation (requires a map and compass)

Collect eggs & oxcytocin



Eggs were moved to a dark room at least a week before hatching

Hatchlings were marked & measured under a red light in a dark room

Hatchlings were transported to release arenas in release buckets wrapped in black plastic

Build Arenas

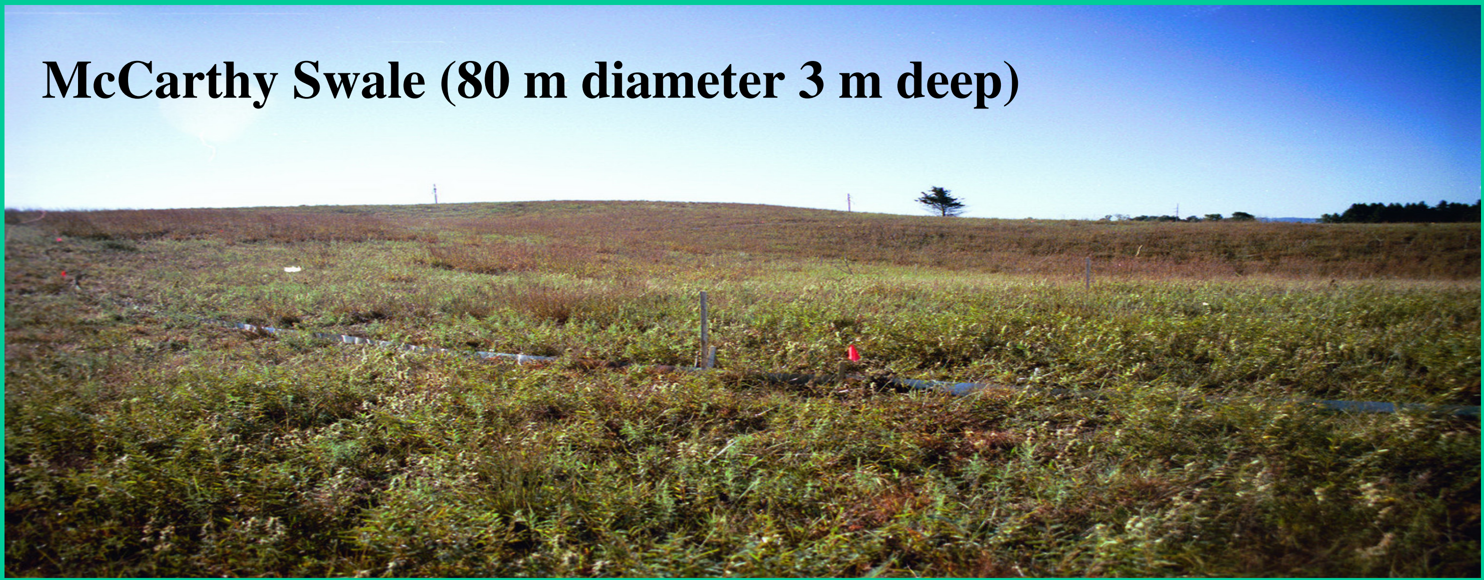
(70 – 90 m
diameter)

Release hatchlings at center of arena

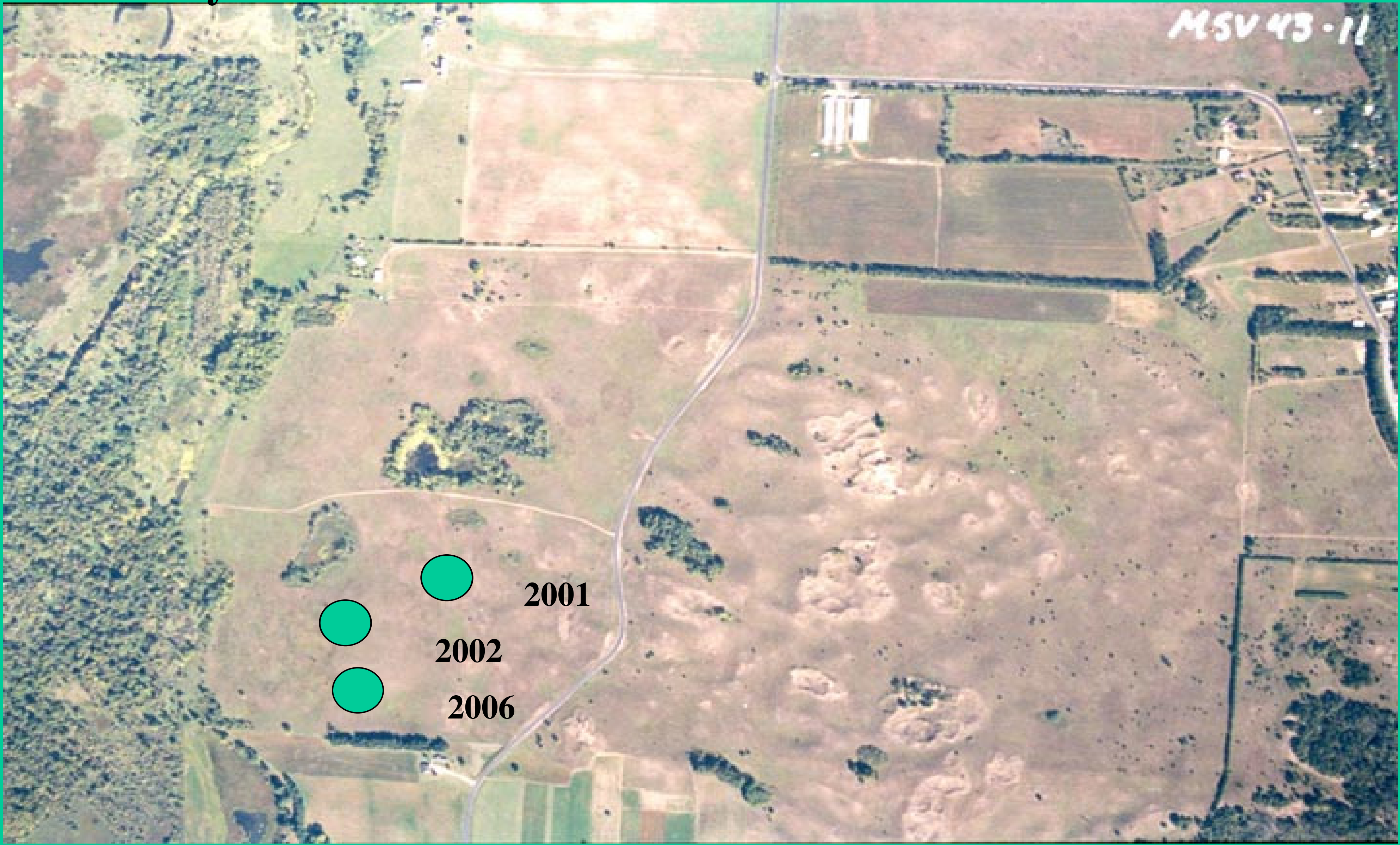
Walk fences

Record time, location and id of hatchlings found in buckets or on the fence

Orientation of Naïve Hatchling Marsh Turtles



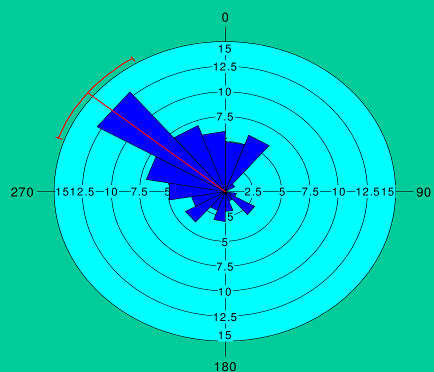
McCarthy WMA Arena – 2001 Swale & 2002 Flat



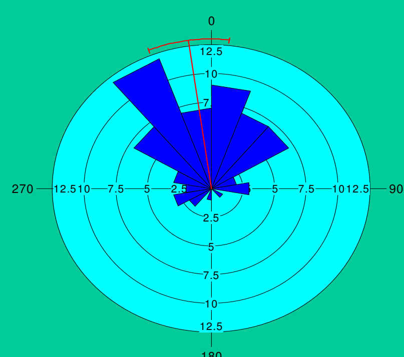
McCarthy WMA Arena – Blanding's, Snapping & Map (2001 & 2002)

2001

EB

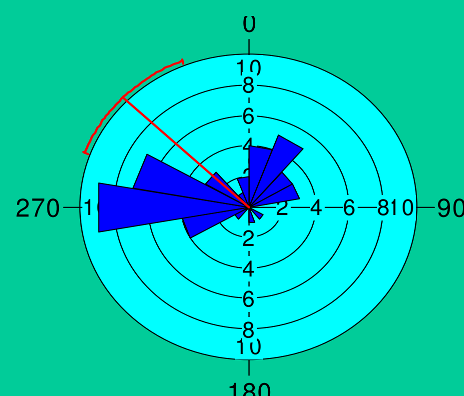


EB

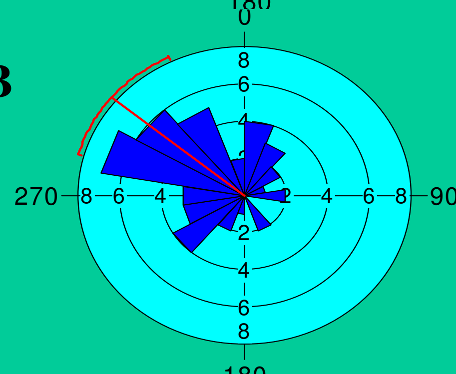


2002

EB

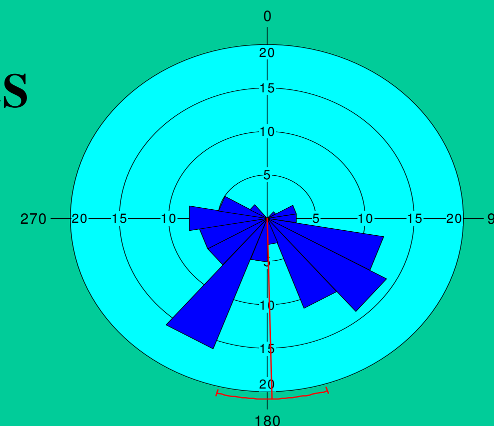


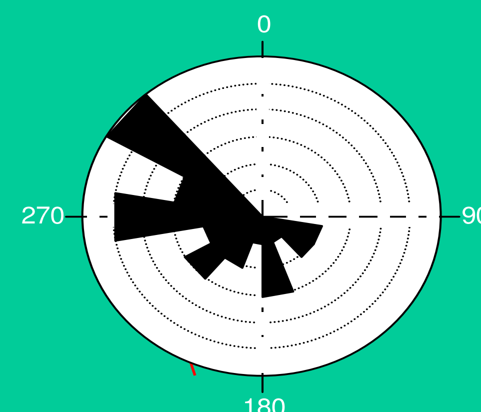
EB



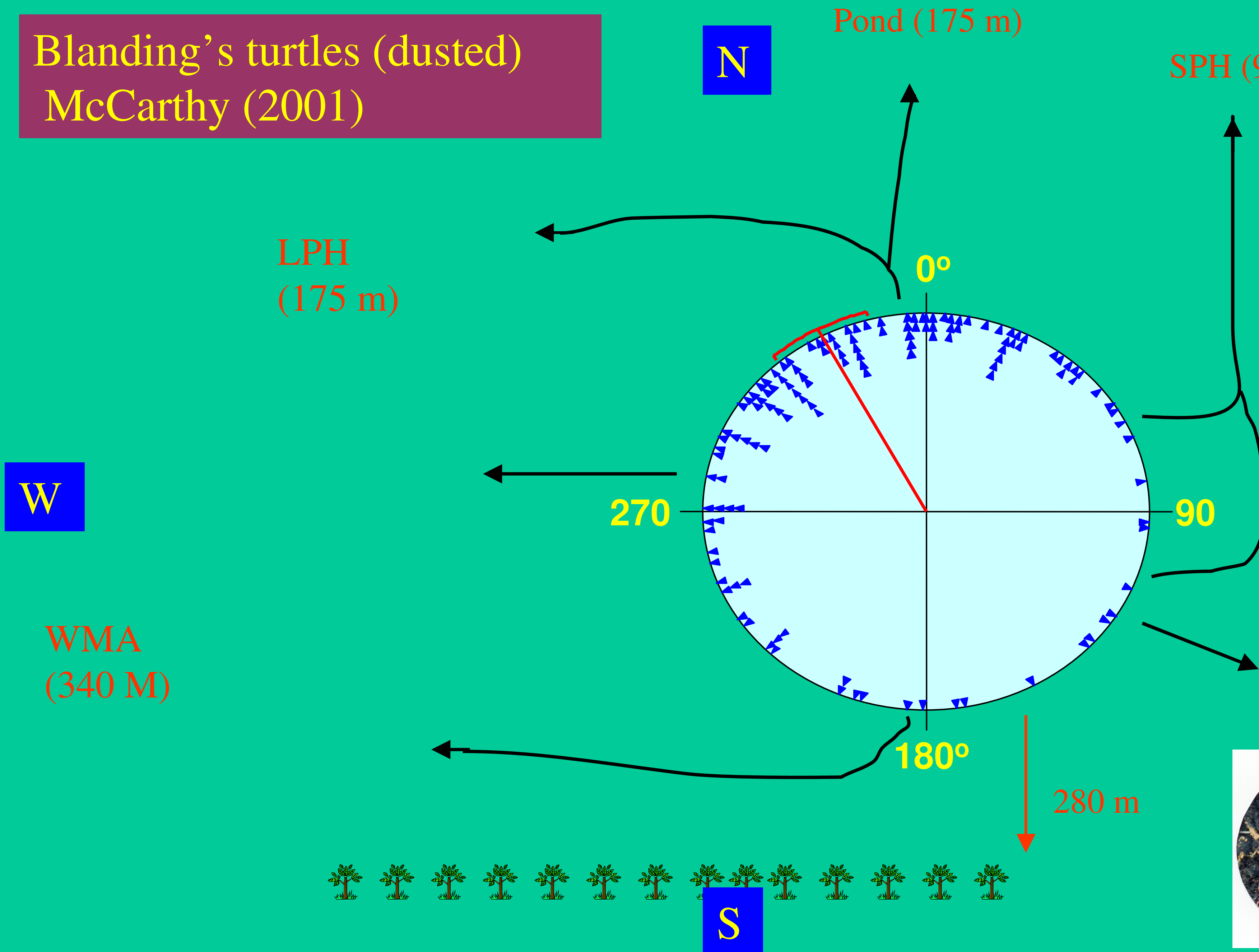
2002

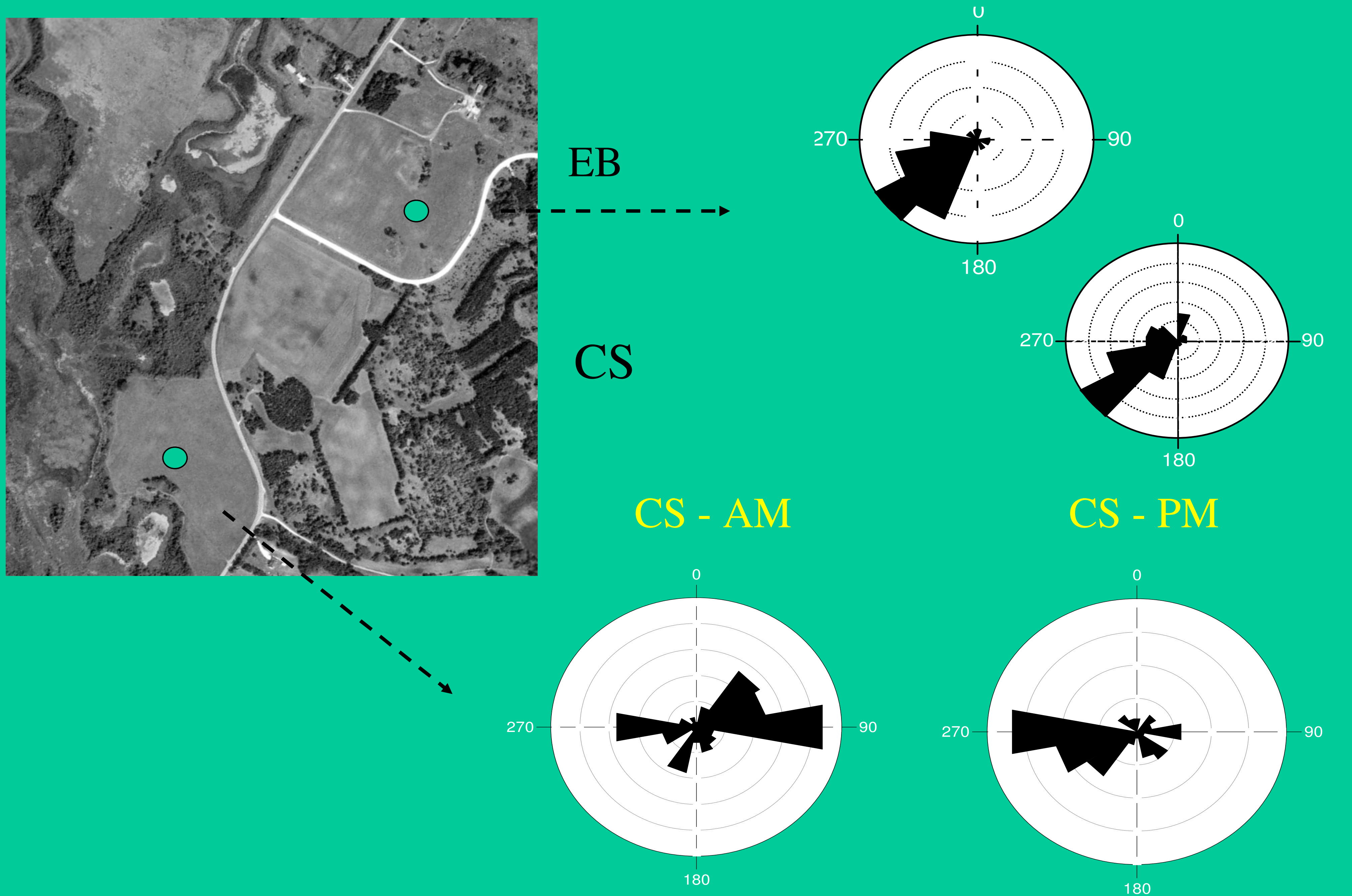
CS



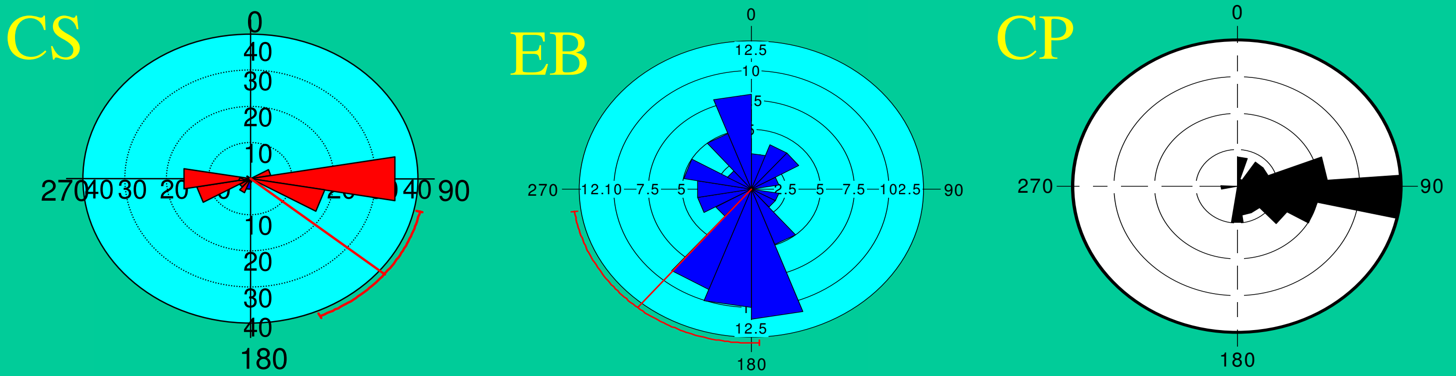


Blanding's turtles (dusted)
McCarthy (2001)




EB
CS
CS - AM
CS - PM
0
270
90
180

WNF Arena



Blanding's, Snapping & Painted turtle dispersal patterns

RANDOM	**no**
+ GEOTAXIS	**no evidence**
HORIZON	**both near and far appear to influence dispersal of all 3 species**
(near)	**Snapping and Painted turtles**
(far)	**Blanding's**
HORIZON	**light or open**
(light-open)	**Snapping and Painted turtles**
(dark-closed)	**Blanding's**
Olfaction	**no evidence**
Humidity	**no evidence**

Nesting behavior of females and hatchling nest dispersal/orientation patterns are co-evolved

The morphology and physiology (body size, mobility, risk of predation, desiccation rates of females and hatchlings influence how long they can stay on land.

Those abilities are influenced by wetland habitat and availability of suitable nesting areas

Environmental cues for orientation used by hatchlings that emerge from nests in Fall or Spring

- distance from wetlands
- habitats types between nests and wetlands
- wetland type (marsh, lake, stream, river)

Conservation implications:

1) acquisition and management of terrestrial and aquatic habitats

2) alteration of habitats may interfere with orientation and navigation (hatchlings and adults?)

3) alteration of habitats may interfere with survival of hatchlings and/or negatively skew sex ratios (females preferred)

4) head starting (impaired navigation? i.e., sea turtles)