RECLAMATION

Managing Water in the West

Southwestern Willow Flycatcher
Rio Grande, NM

Distribution/Abundance/Population Trends

With an Emphasis on the Largest Rangewide SWFL Population
Elephant Butte Reservoir

U.S. Department of the Interior
Bureau of Reclamation

OUTLINE

STUDY AREA

Emphasis on Middle Rio Grande – BDA and EBR

POPULATION TRENDS

EBR and BDA comprise nearly 90% of the total territories within MRG

DRIVING FACTORS OF POPULATION TRENDS

HYDROLOGY and VEGETATION

ELEPHANT BUTTE NEST DATA 2002-2011

Discuss several nesting parameters

Transition from native to exotic – Diorhabda on Rio in 2011

SWFL EBR SPATIAL EXPANSION/DISTRIBUTION

Expansion of territories throughout the Upper Delta of EBR

SWFL EBR ELEVATIONAL EXPANSION/DISTRIBUTION

Discuss territorial distribution

HABITAT MODELING

Quantify Habitat availability throughout MRG

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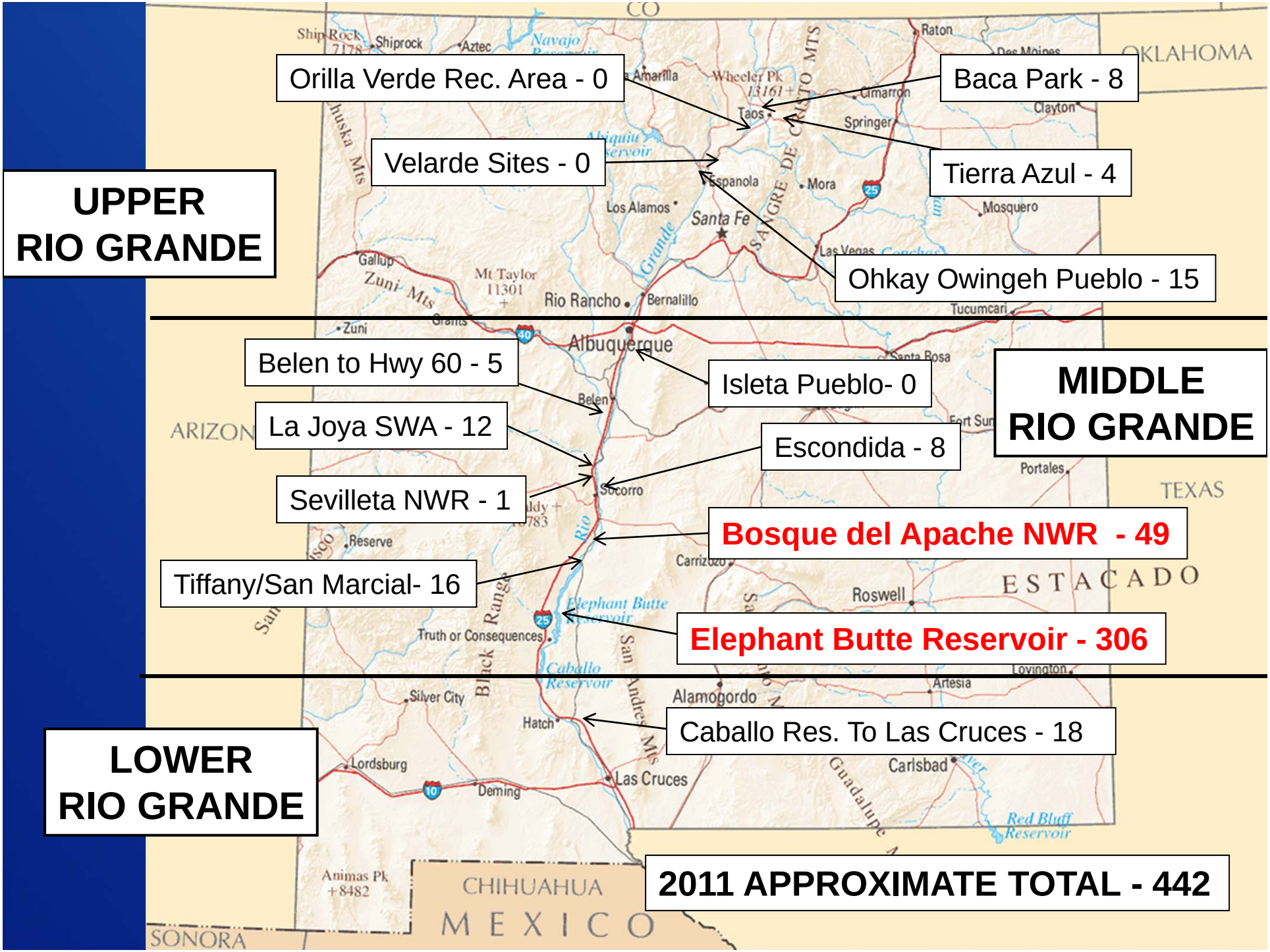
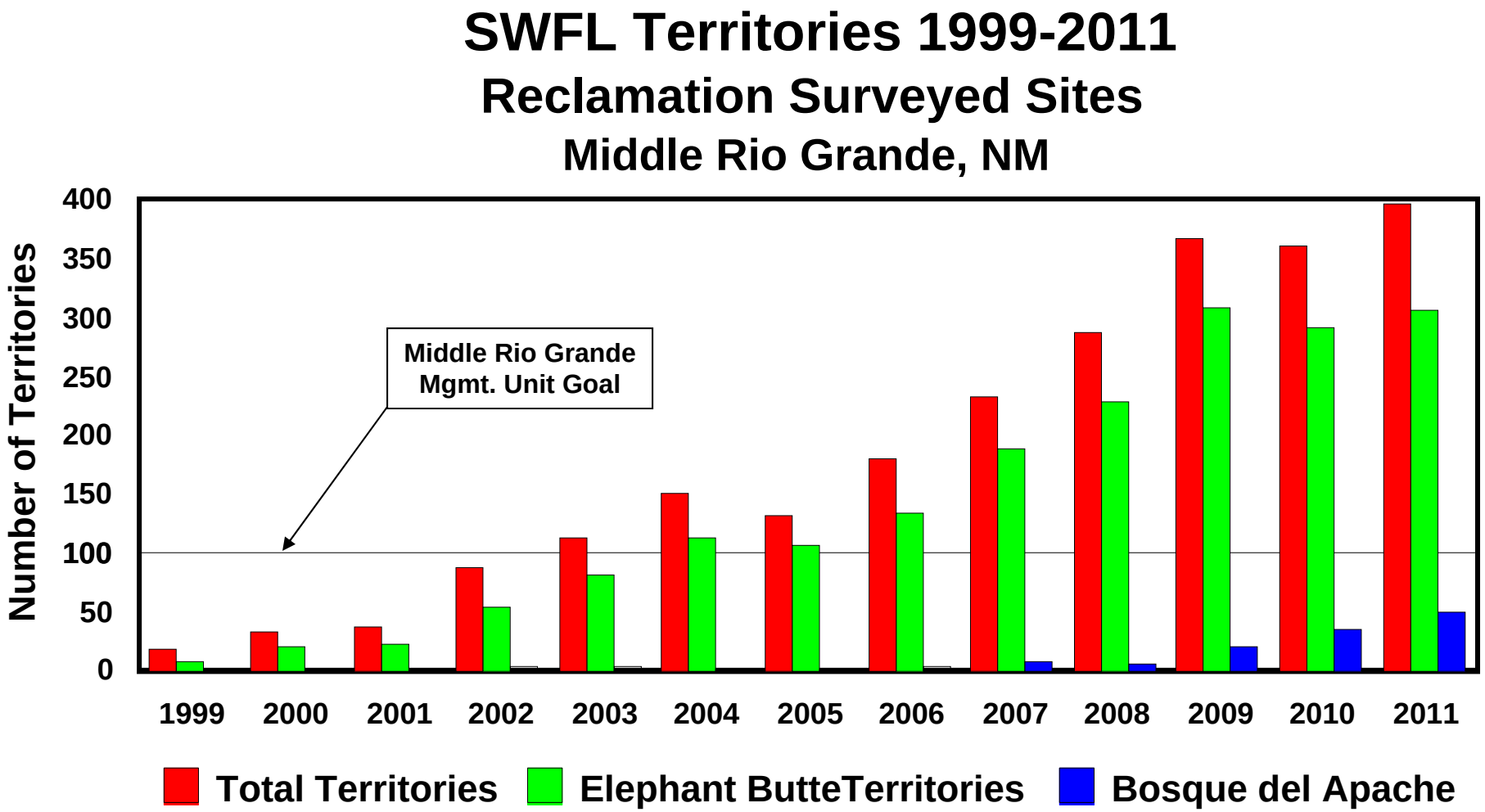

UPPER RIO GRANDE
Orilla Verde Rec. Area - 0
Velarde Sites - 0
Baca Park - 8
Tierra Azul - 4
Ohkay Owingeh Pueblo - 15
MIDDLE RIO GRANDE
Belen to Hwy 60 - 5
Isleta Pueblo- 0
La Joya SWA - 12
Escondida - 8
Sevilleta NWR - 1
Bosque del Apache NWR - 49
Tiffany/San Marcial- 16
Elephant Butte Reservoir - 306
LOWER RIO GRANDE
Caballo Res. To Las Cruces - 18
2011 APPROXIMATE TOTAL - 442
Albuquerque
Santa Fe
Las Cruces
Taos
Roswell
Alamogordo
Truth or Consequences
Elephant Butte Reservoir
Caballo Reservoir
Red Bluff Reservoir
CHIHUAHUA
MEXICO
SONORA
TEXAS
OKLAHOMA
ESTACADO

SWFL Population Trends



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HYDROLOGIC AND ASSOCIATED VEGETATIVE CHANGES AFFECT SWFL DISTRIBUTIONS

* Hydrology is likely the most significant factor in determining population trends and distribution

AND

* Hydrology is the most difficult habitat parameter to predict and most difficult to manage, and probably the most costly!

Hydrologic Changes Within the Rio Grande Include:

- Rising Reservoir
- Receding Reservoir
- Channel Degradation
- Channel Aggradation (e.g. Sediment Plug)
- Prolonged Flooding
- High Flows
- Low Flows

→ All elements of a dynamic system

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“Hydrology Drives Habitat”
“Habitat Drives Productivity” and
“Productivity Drives Population Trends”

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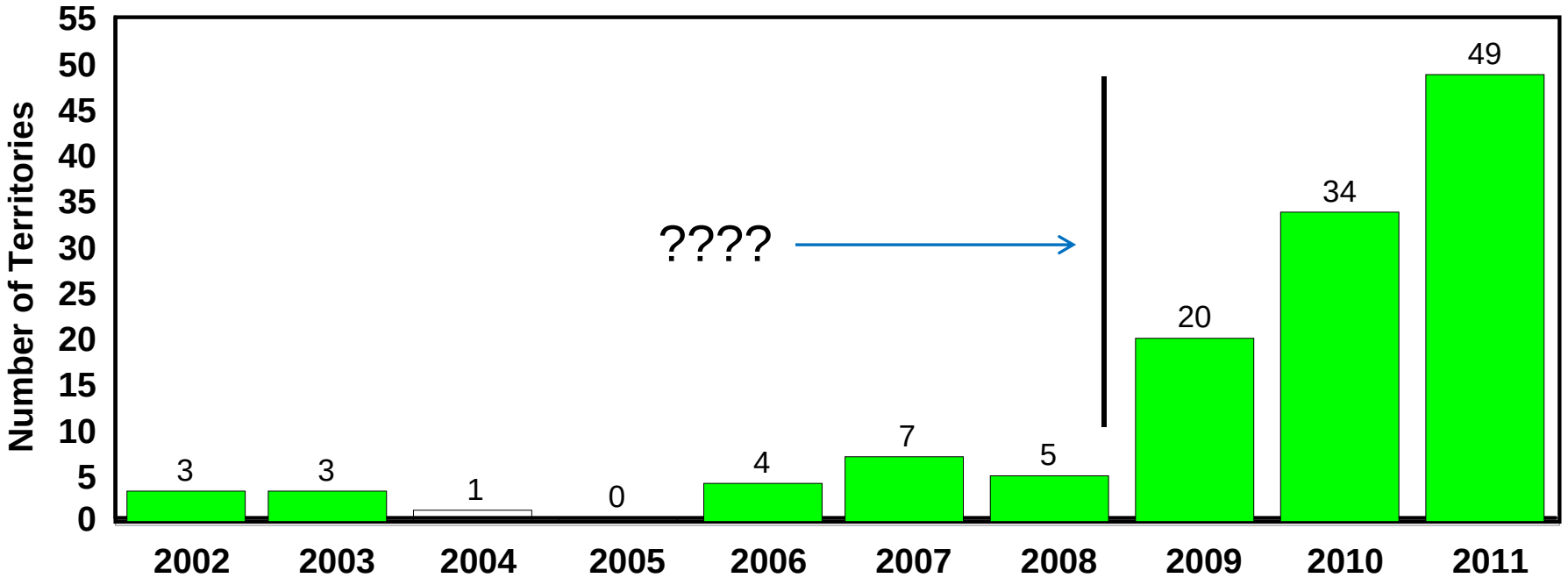
SWFL Territories

Active Floodplain - Bosque del Apache NWR
2002-2011



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Bosque del Apache NWR Sediment Plug

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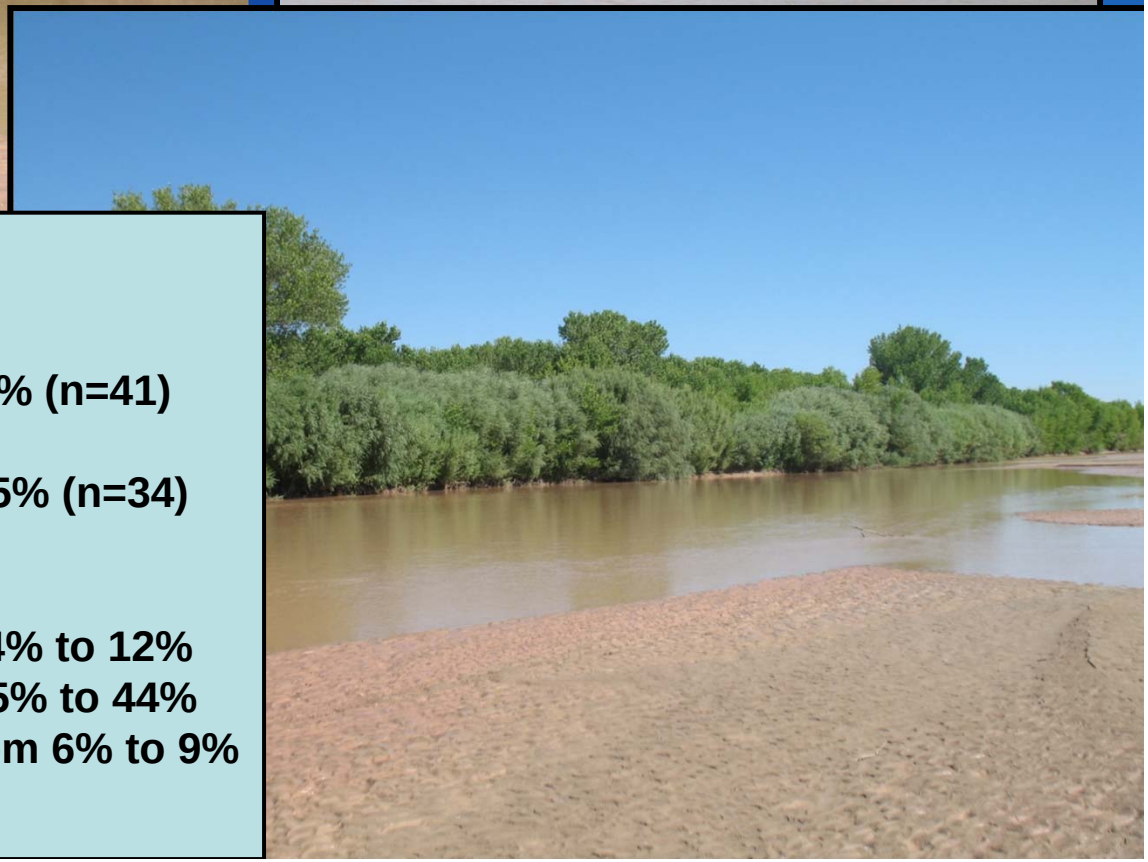
Bosque del Apache NWR SWFL Habitat



Was - Very productive!

2009-2010 Nest Success averaged 61% (n=41)

2011 – Nest Success plummeted to 35% (n=34)

From 2010 to 2011:

- **Parasitism increased from 4% to 12%**
- **Predation increased from 35% to 44%**
- **Abandonment increased from 6% to 9%**

Hemispheric Photos from BDA

Photo Station 2

August 2010; 90% cover

March 2011; 64% cover

August 2011; 72% cover

Photo Station 14

August 2010; 98% cover

March 2011; 59% cover

August 2011; 85% cover

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What Hydrologic event lead to the dramatic increase within EBR??
Currently the single largest SWFL Population within its range.

Since 1995:
Pool receded approx. 75 ft in elevation, exposing 24 river miles of floodplain

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ELEPHANT BUTTE RESERVOIR – HABITAT SUCCESSION

RECLAMATION

RECLAMATION

RECLAMATION

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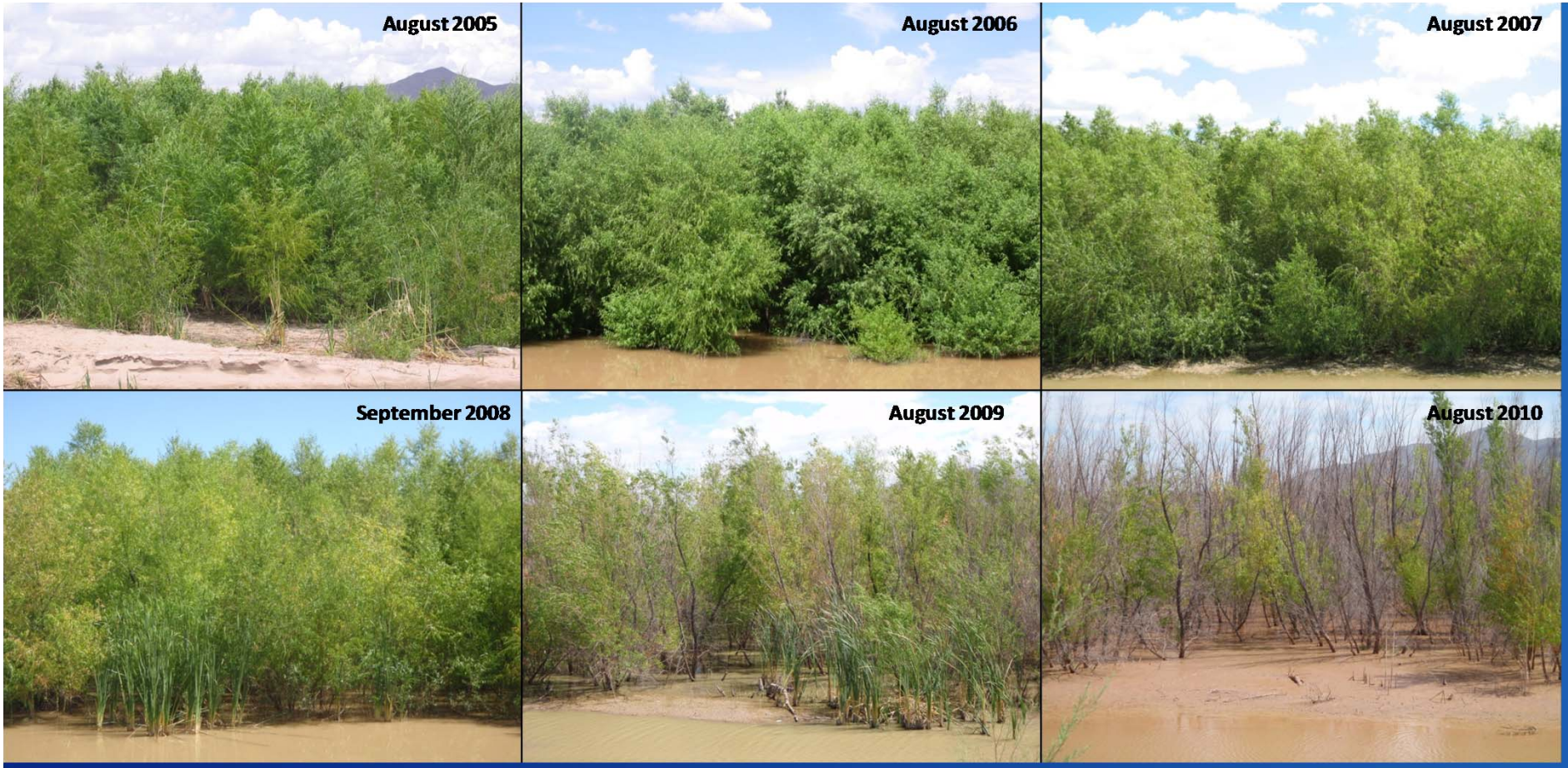
Ideal SWFL Habitat – a few years ago!

(Generally, lack of Water is the Issue)



Negative Effects on Habitat of to much Water!

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Elephant Butte Reservoir

***Good Structure/Density**

***Flooded and/or Saturated Soils**

Elephant Butte Reservoir

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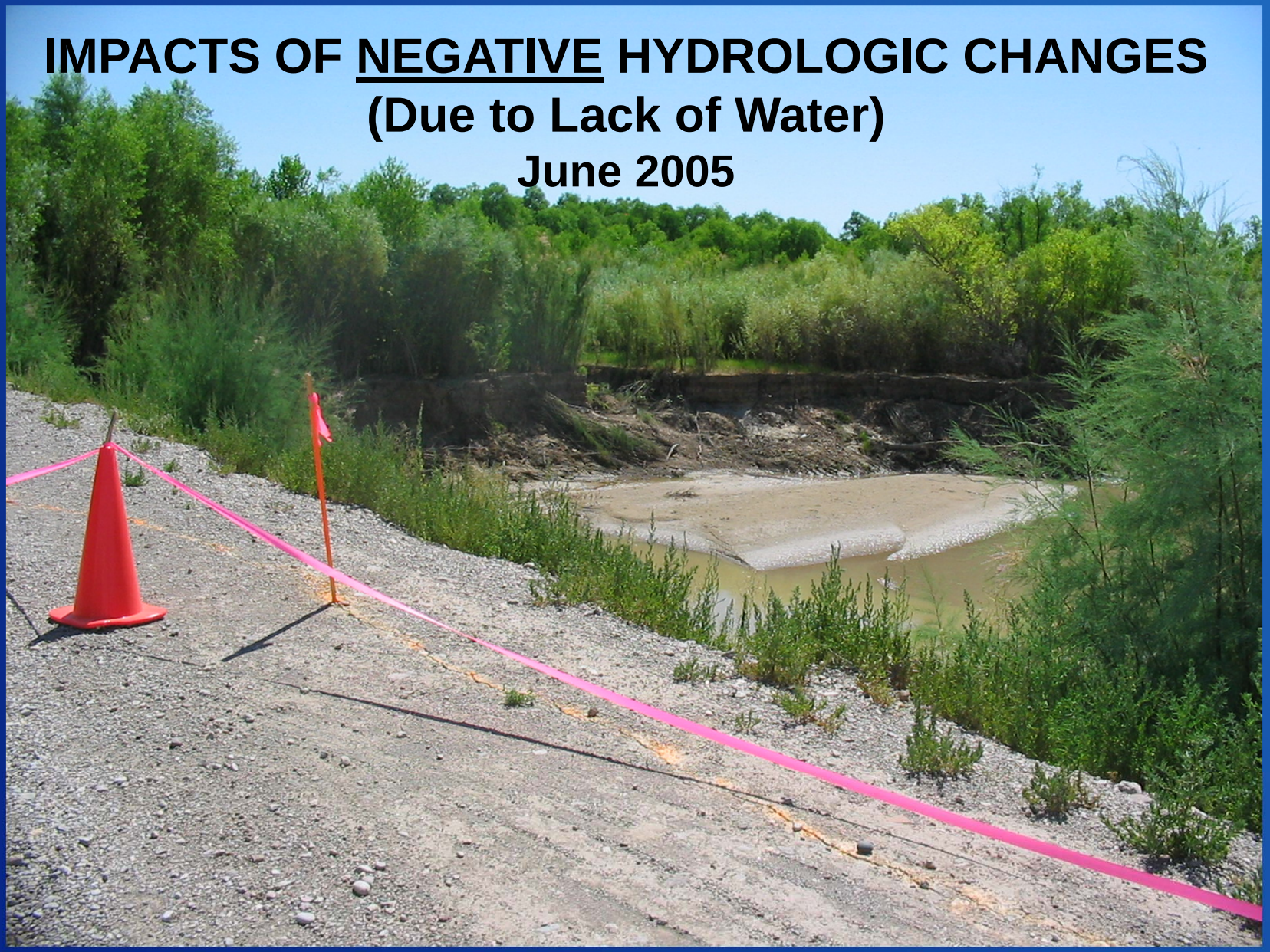
IMPACTS OF NEGATIVE HYDROLOGIC CHANGES
(Due to Lack of Water)
June 2005



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2006

June 2005

Significant Headcut and lowering of Groundwater

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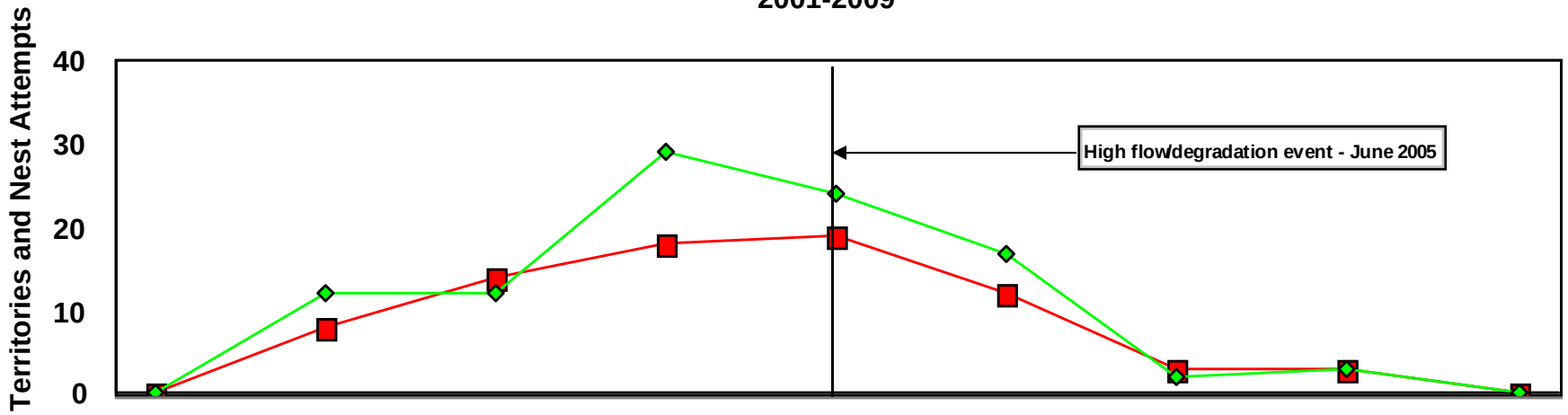
DL03-DL04

Territories/Nest Attempts

2001-2009



	2001	2002	2003	2004	2005	2006	2007	2008	2009
Territories	0	8	14	18	19	12	3	3	0
Number of Nests	0	12	12	29	24	17	2	3	0
Nest Success	0%	42%	83%	63%	55%	24%	100%	0%	0%

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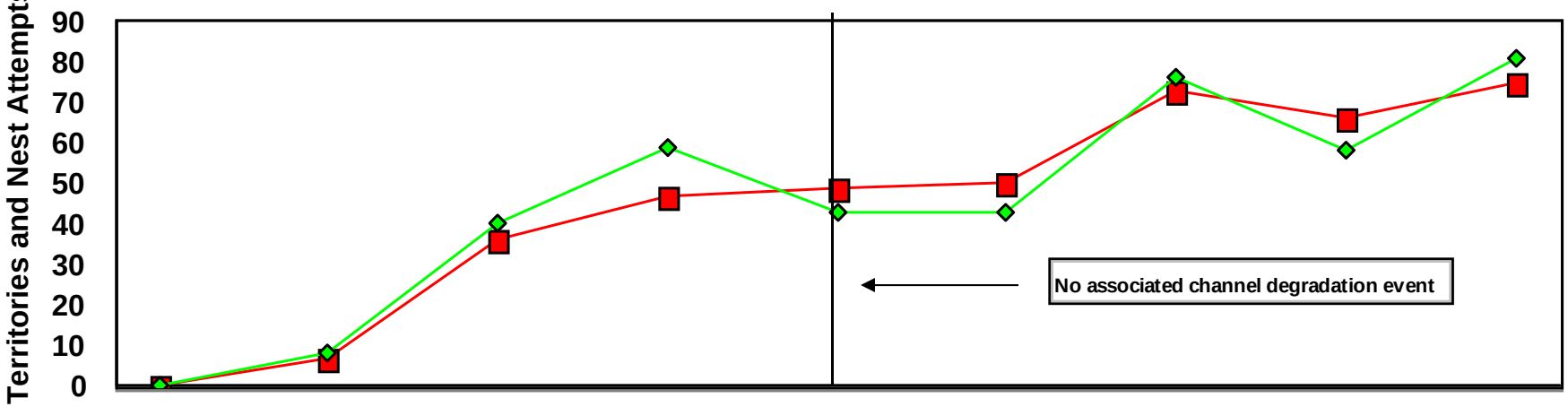
DL01-DL02

Territories and Nest Attempts

2001-2009



	2001	2002	2003	2004	2005	2006	2007	2008	2009
Territories	0	7	36	47	49	50	73	66	75
Number of Nests	0	8	40	59	43	43	76	58	81
Nest Success	0%	75%	47%	41%	58%	72%	55%	53%	34%

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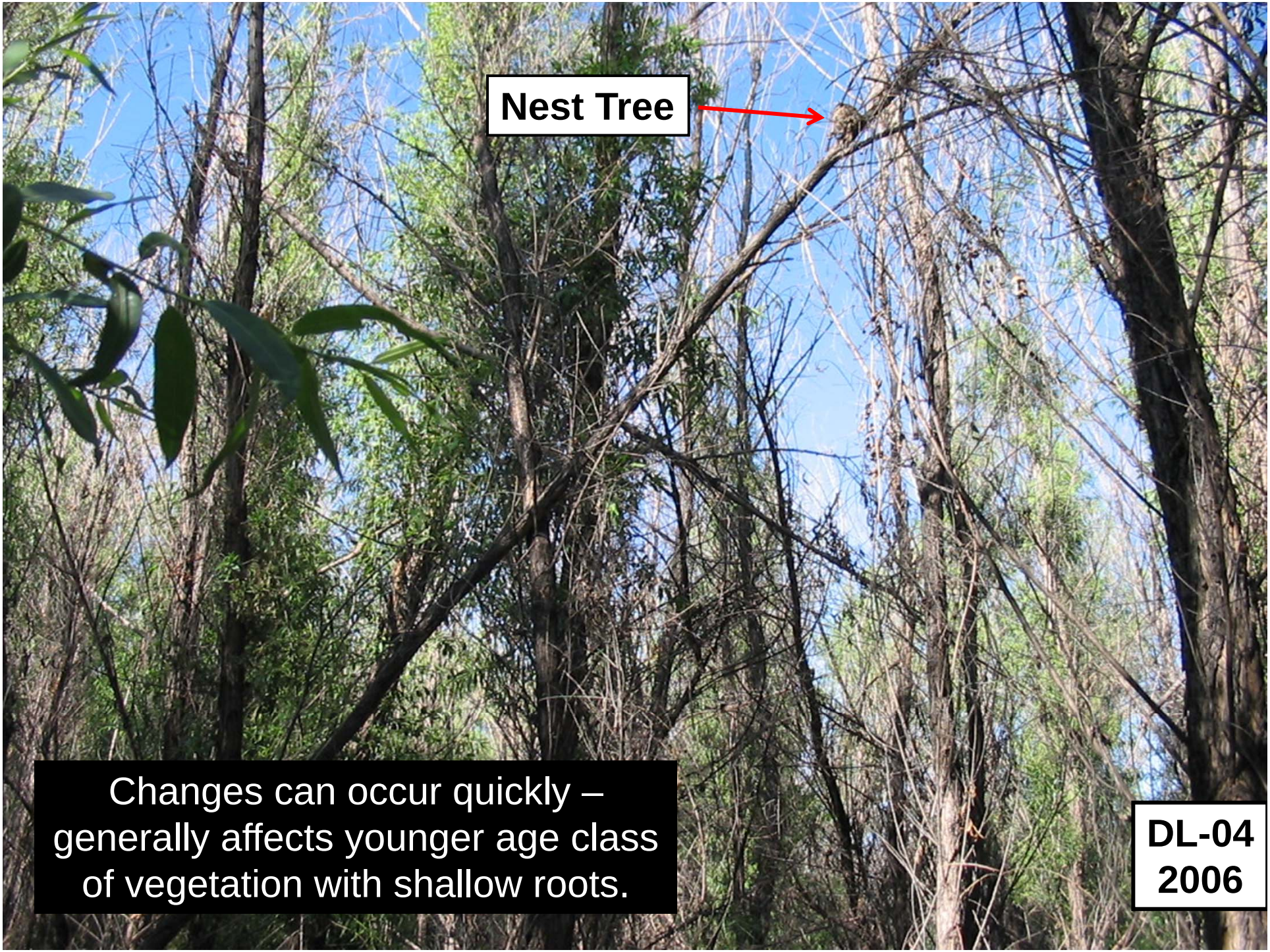
Nest Tree
Changes can occur quickly – generally affects younger age class of vegetation with shallow roots.
DL-04
2006


Saltcedar replacement of native Goodding's Willow community
Most likely due to changes in hydrology within some patches

ELEPHANT BUTTE NEST SUMMARY
1999-2011
(n=1679)

Parasitism Rate – 13%
Predation Rate – 33%
Abandonment Rate – 9%
Nest Success – 50%

Values that obviously contributed to an increasing population

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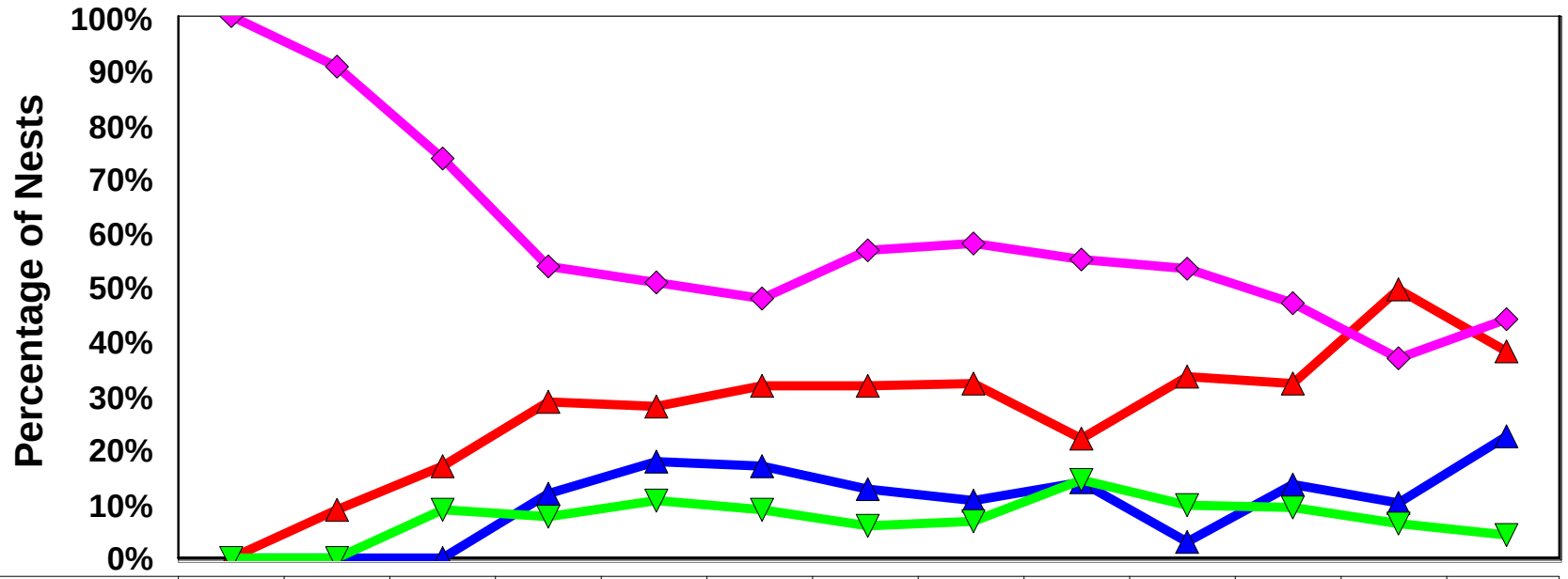
SWFL Nest Monitoring Data Summary

Elephant Butte Reservoir Pool

Known Nest Outcomes 1999-2011



Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Number of Nests	2	11	35	65	94	149	120	141	205	160	270	219	208
Parasitism	0%	0%	0%	12%	18%	17%	13%	11%	14%	3%	14%	11%	23%
Predation	0%	9%	17%	29%	28%	32%	32%	33%	22%	34%	33%	50%	39%
Abandonment	0%	0%	9%	8%	11%	9%	6%	7%	15%	10%	10%	6%	4%
Nest Success	100%	91%	74%	54%	51%	48%	57%	58%	55%	54%	47%	37%	44%

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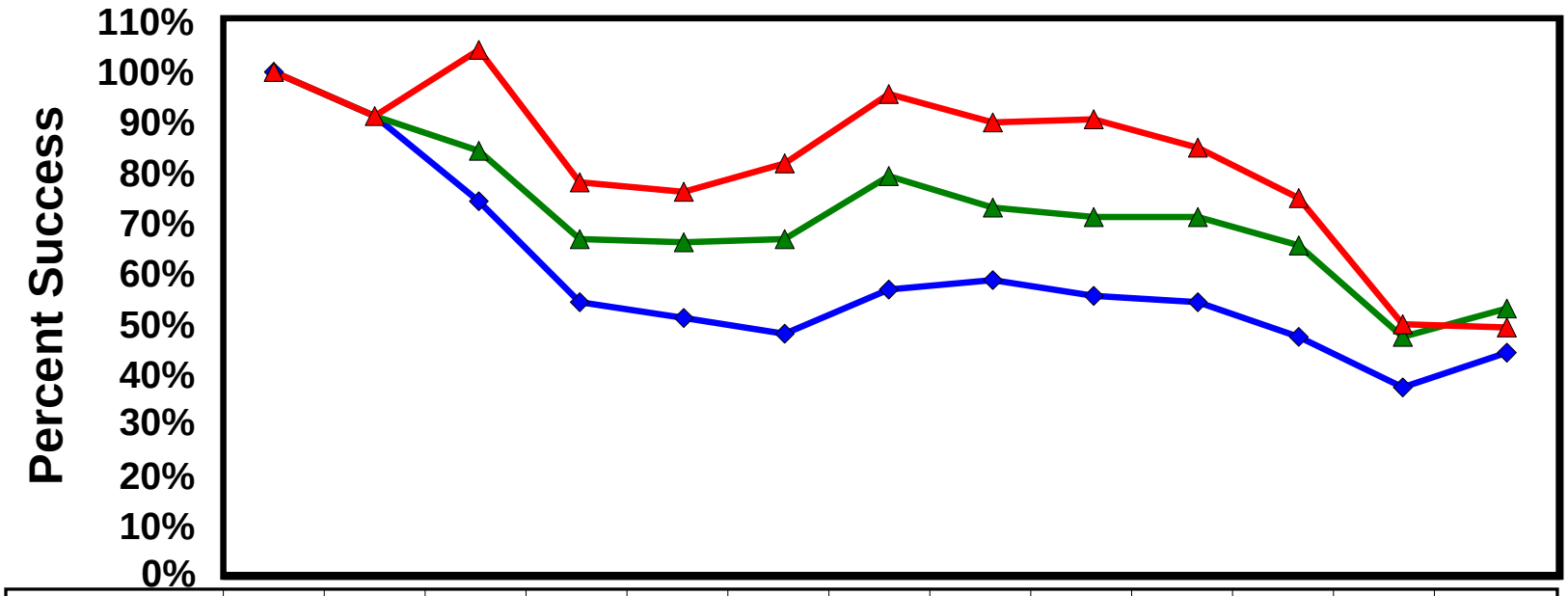
The percentage of individual SWFL pairs that ultimately were able to fledge at least one young during the breeding season declined from 79% in 2005, to 47% in 2010!

Nest Success vs. Pair Success

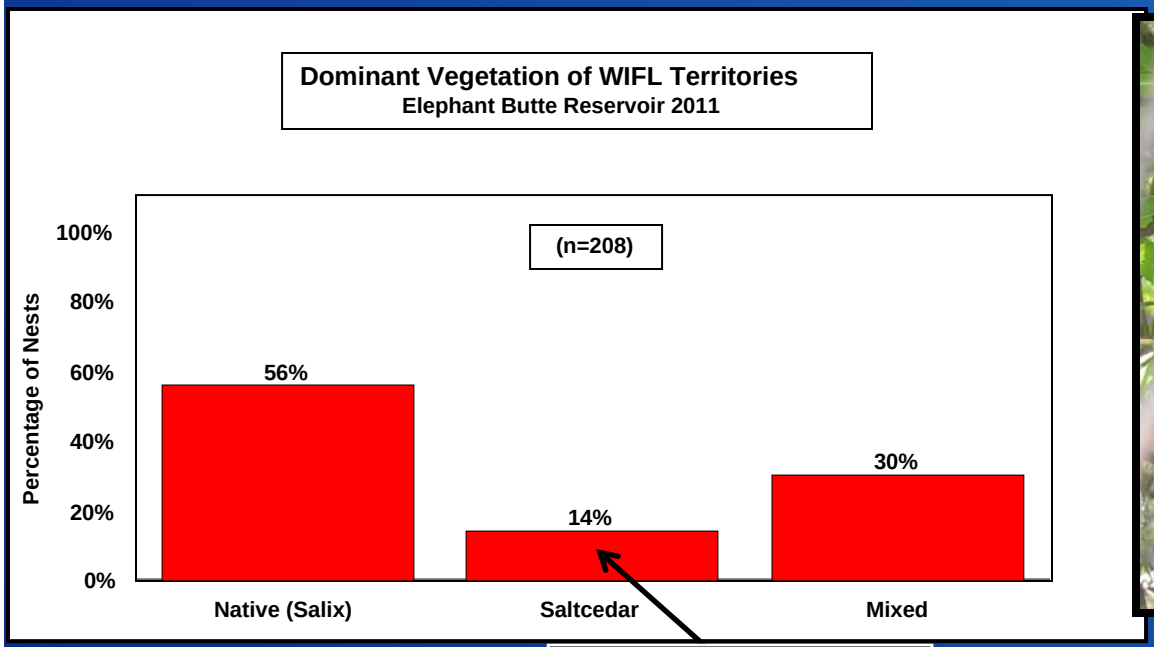
Elephant Butte Reservoir Pool

1999-2011

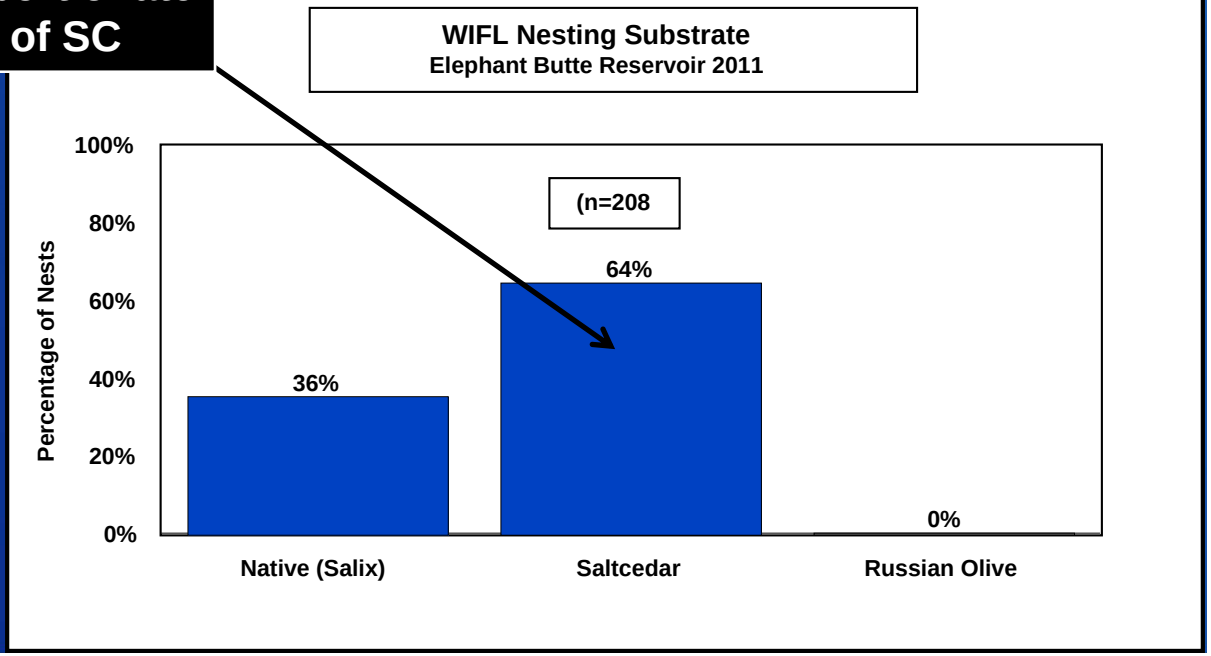


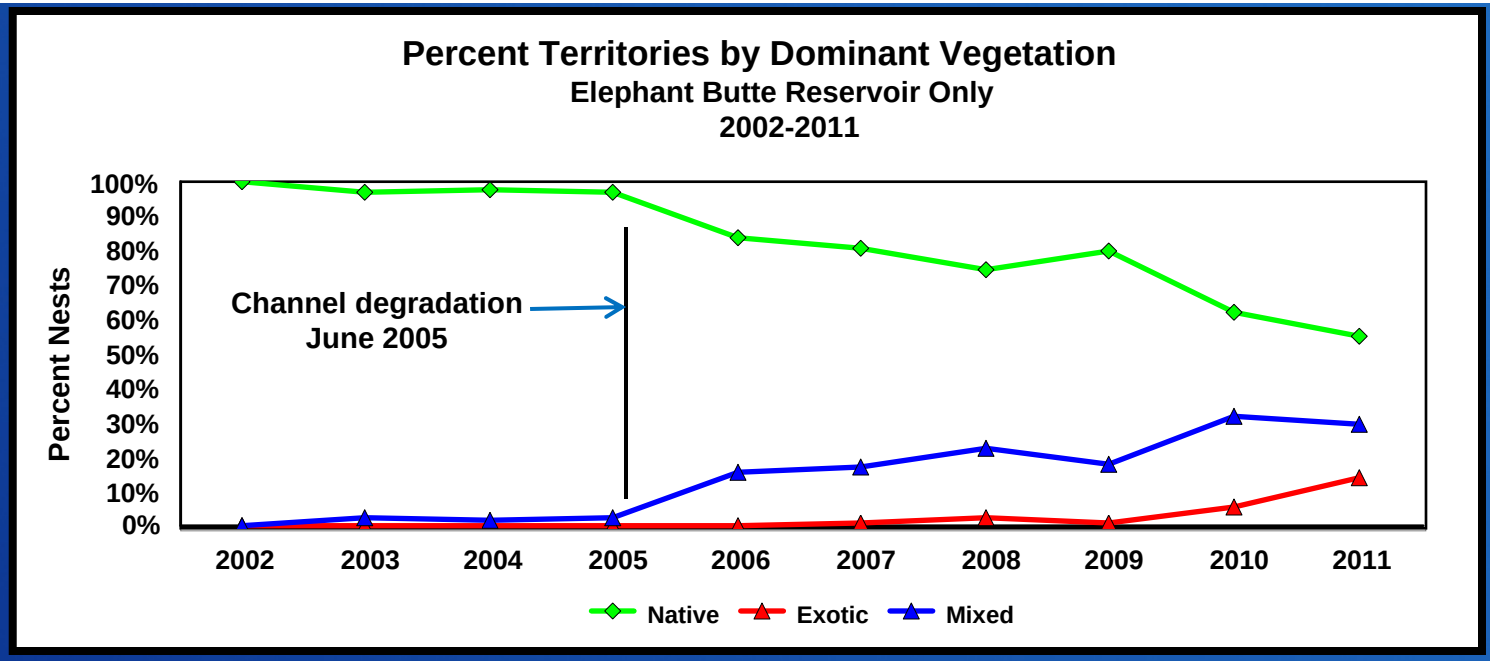
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Year													
Nest Success	100%	91%	74%	54%	51%	48%	57%	58%	55%	54%	47%	37%	44%
Pr Success (Ind)	100%	91%	84%	67%	66%	66%	79%	73%	71%	71%	66%	47%	53%
Pr Success (Pop)	100%	91%	104%	78%	76%	81%	96%	90%	90%	84%	75%	50%	49%
Number of Pairs w/nest	2	11	25	45	62	86	67	89	121	119	171	162	165

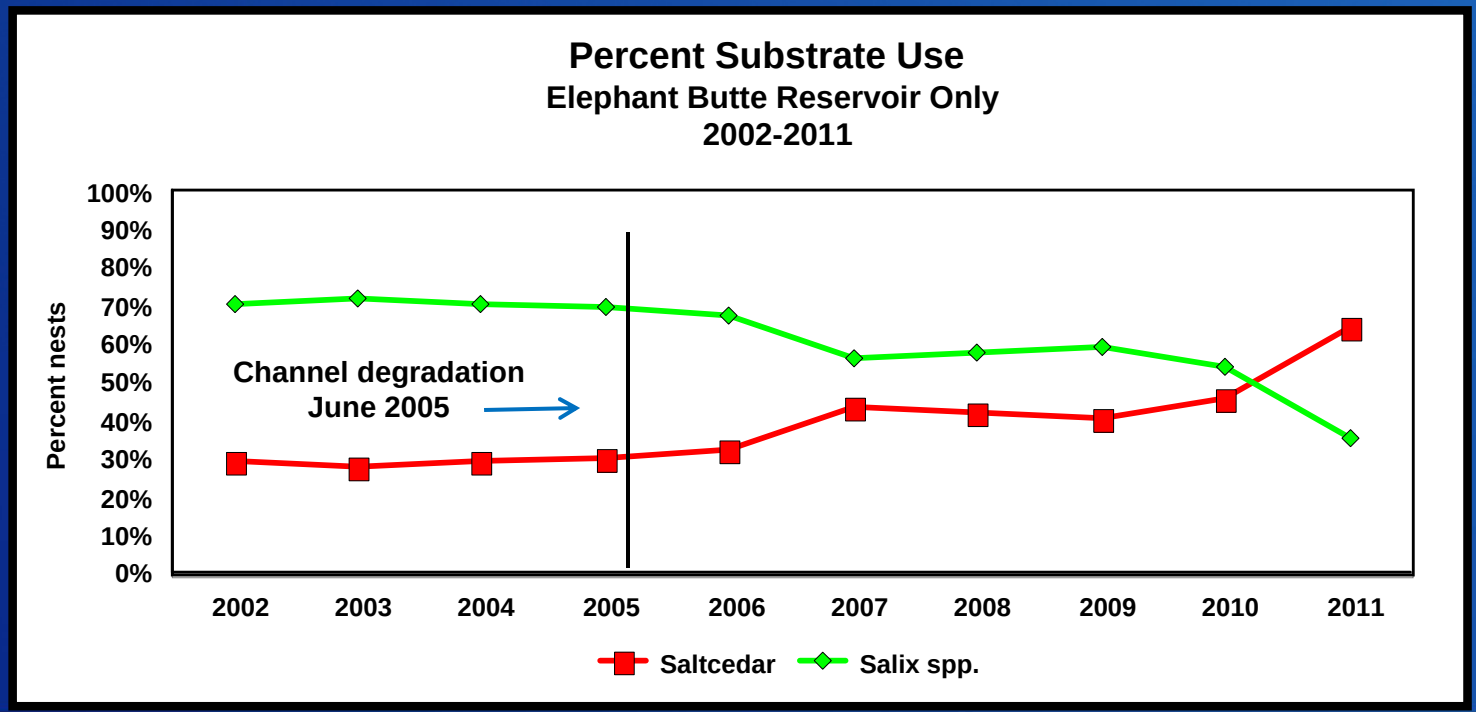
ELEPHANT BUTTE RESERVOIR – MIDDLE RIO GRANDE



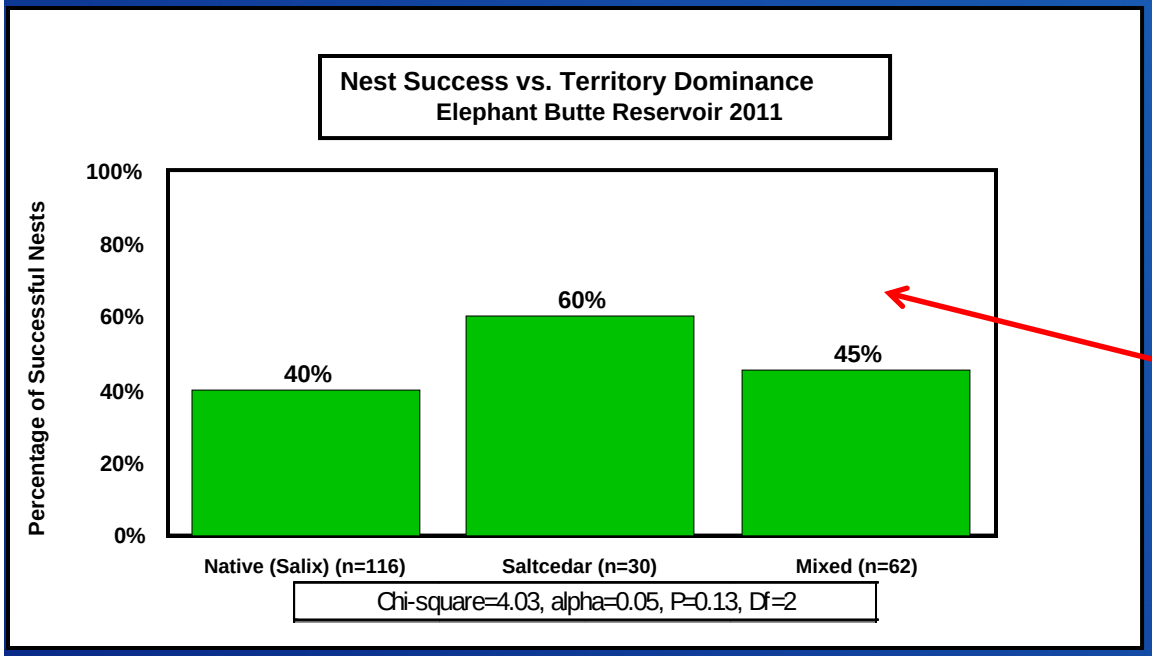
Disproportionate use of SC




Percent Territories by Dominant Vegetation
Elephant Butte Reservoir Only
2002-2011
Percent Nests
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Channel degradation
June 2005
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Native
Exotic
Mixed

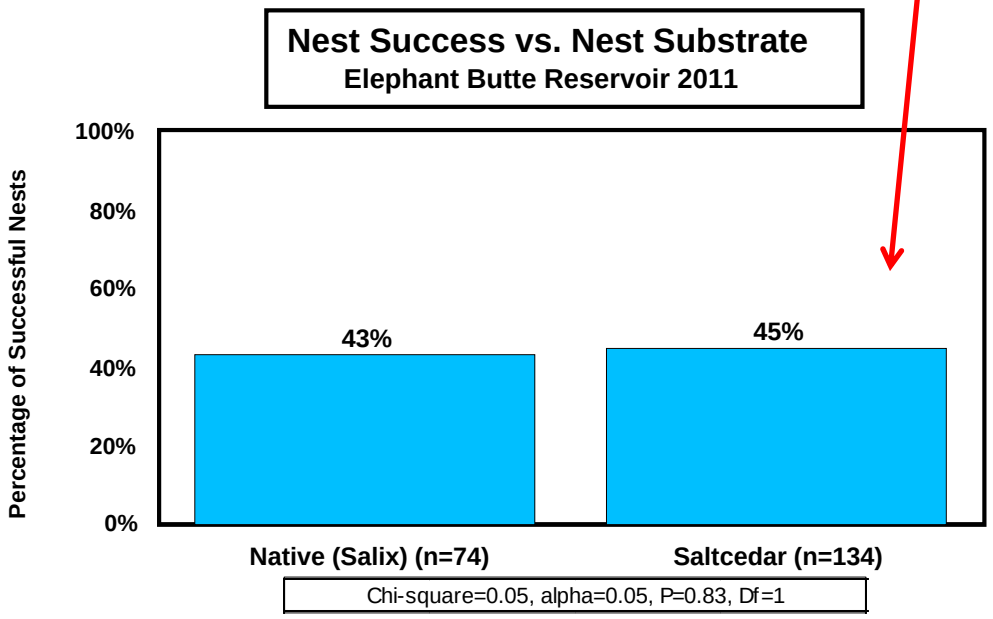

Percent Substrate Use
Elephant Butte Reservoir Only
2002-2011
Percent nests
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Channel degradation
June 2005
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Saltcedar
Salix spp.

ELEPHANT BUTTE RESERVOIR – MIDDLE RIO GRANDE



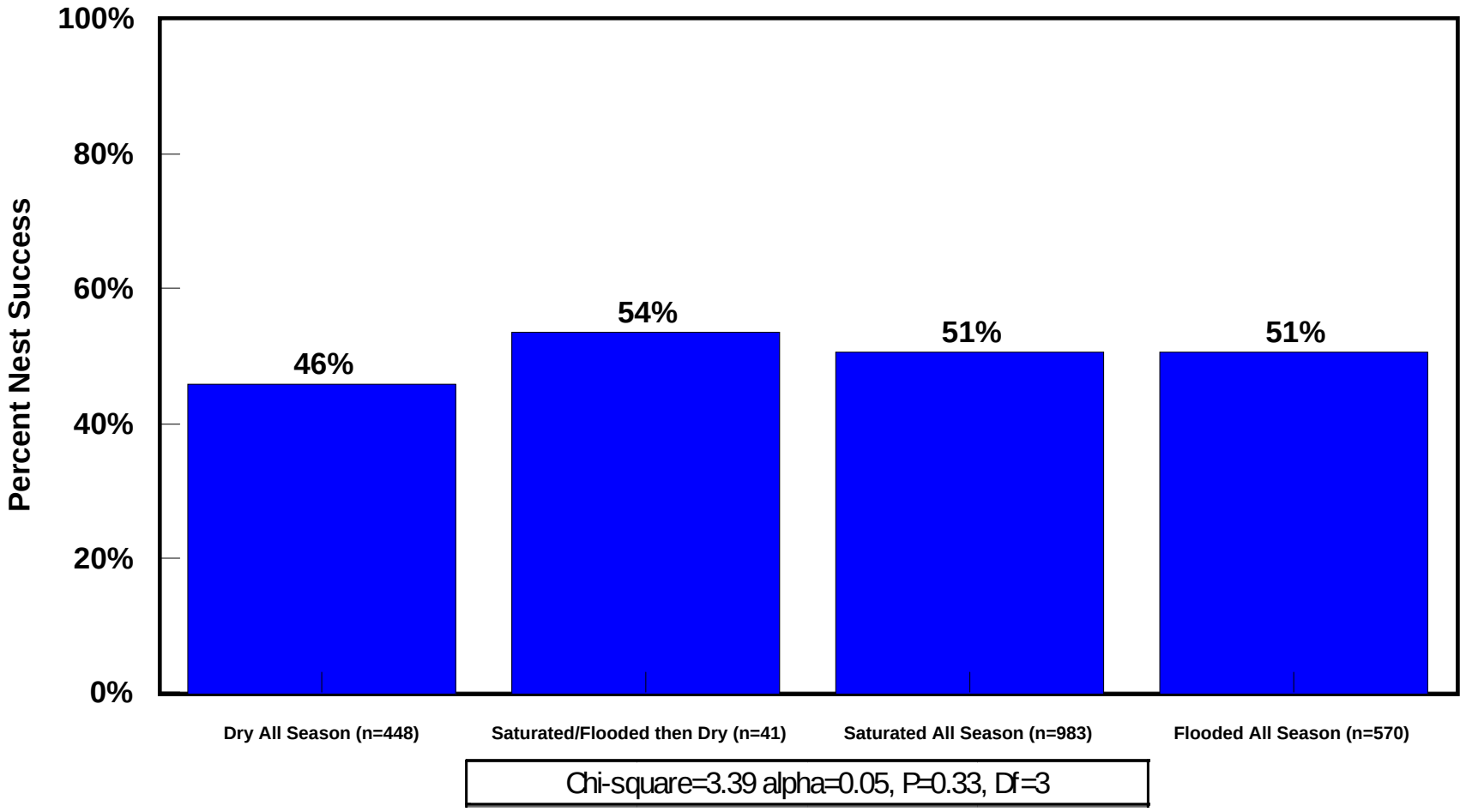
No statistical difference in nest success based on dominance or substrate.

Results likely reflect the importance of structure and density over nest substrate or dominate vegetation within the territory!



Nesting Success

Based on Hydrology Immediately Under Nest
Elephant Butte Reservoir Only - 2004-2011



Chi-square=3.39 alpha=0.05, P=0.33, Df=3

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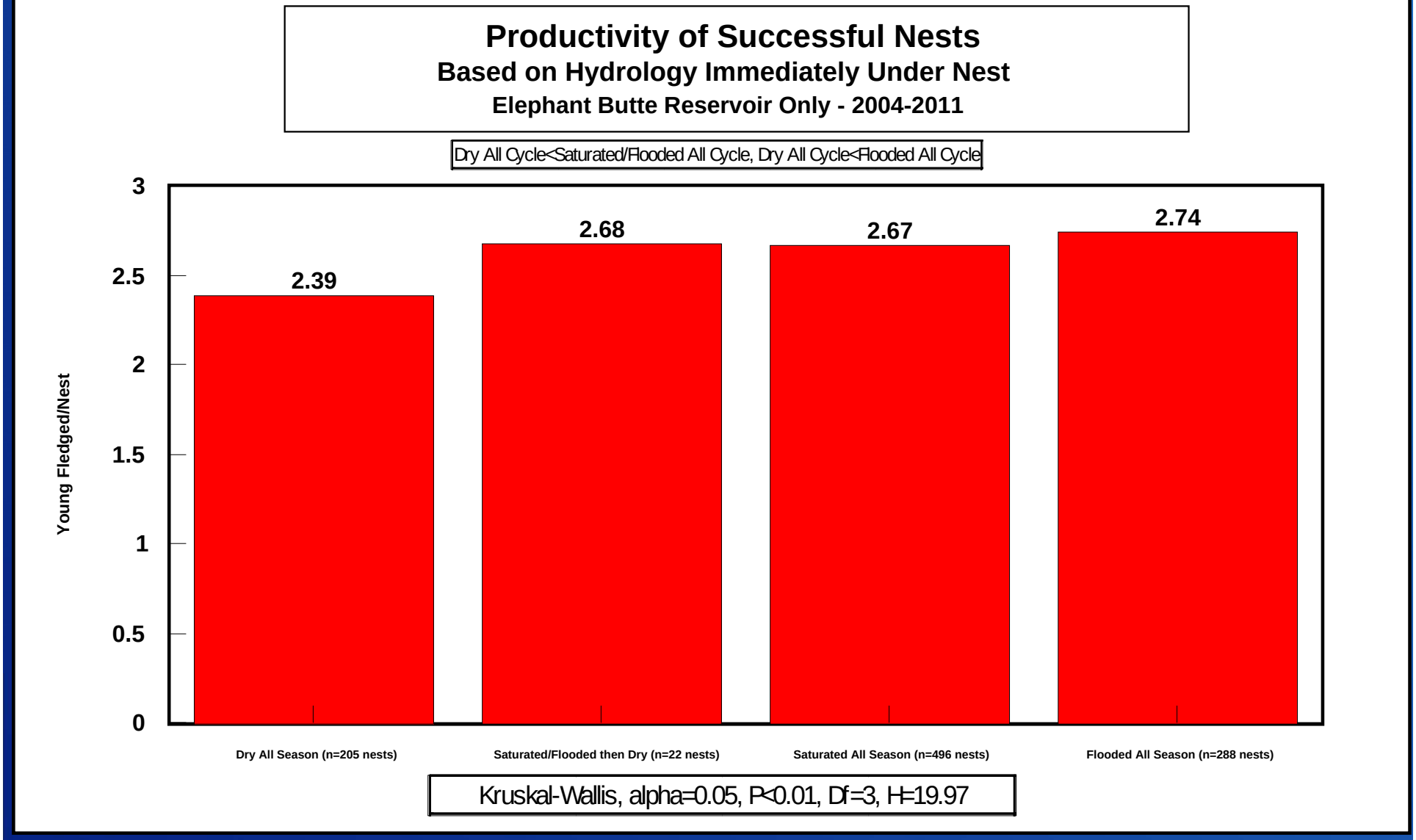
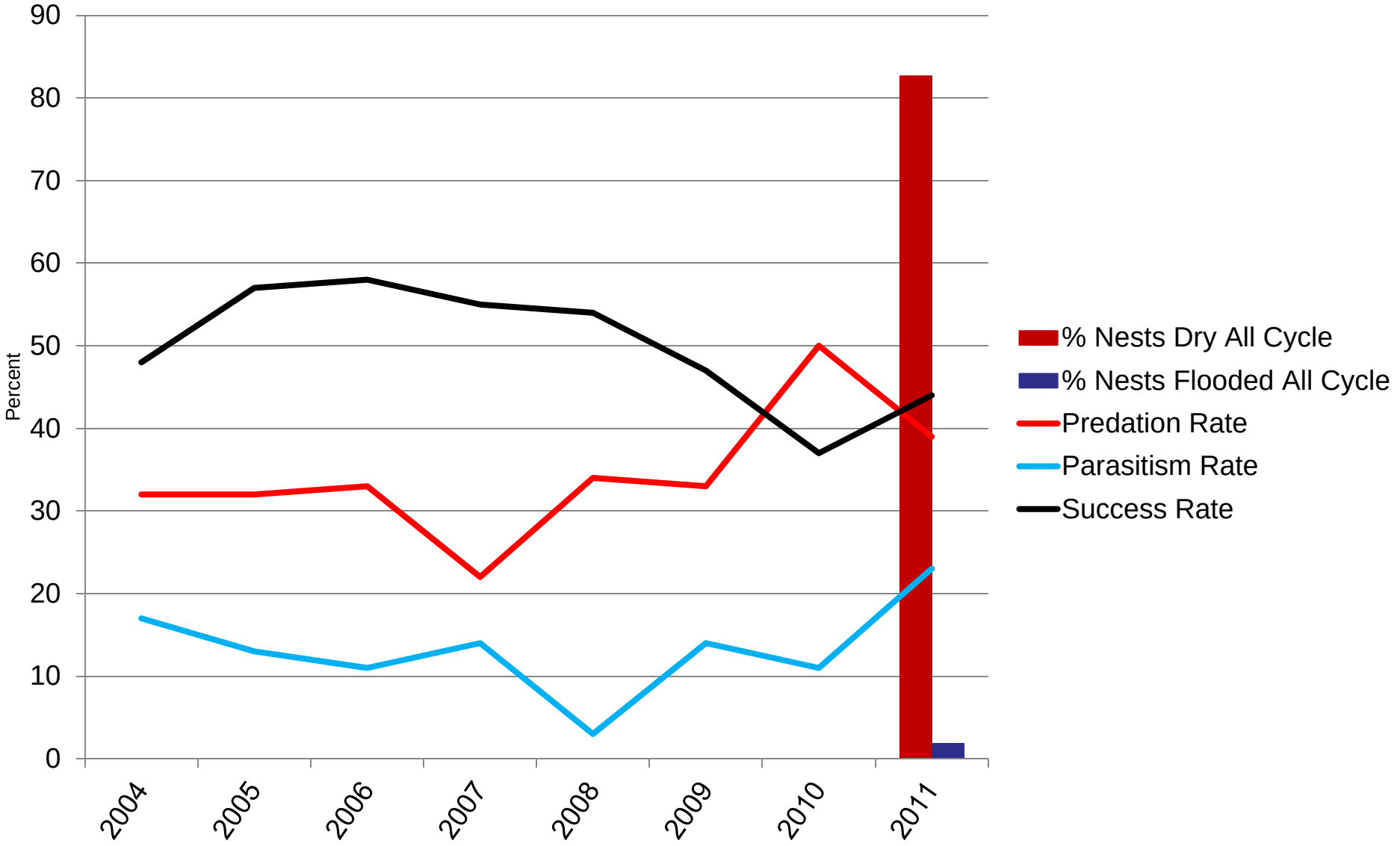
Wetter is better – generally!



RECLAMATION

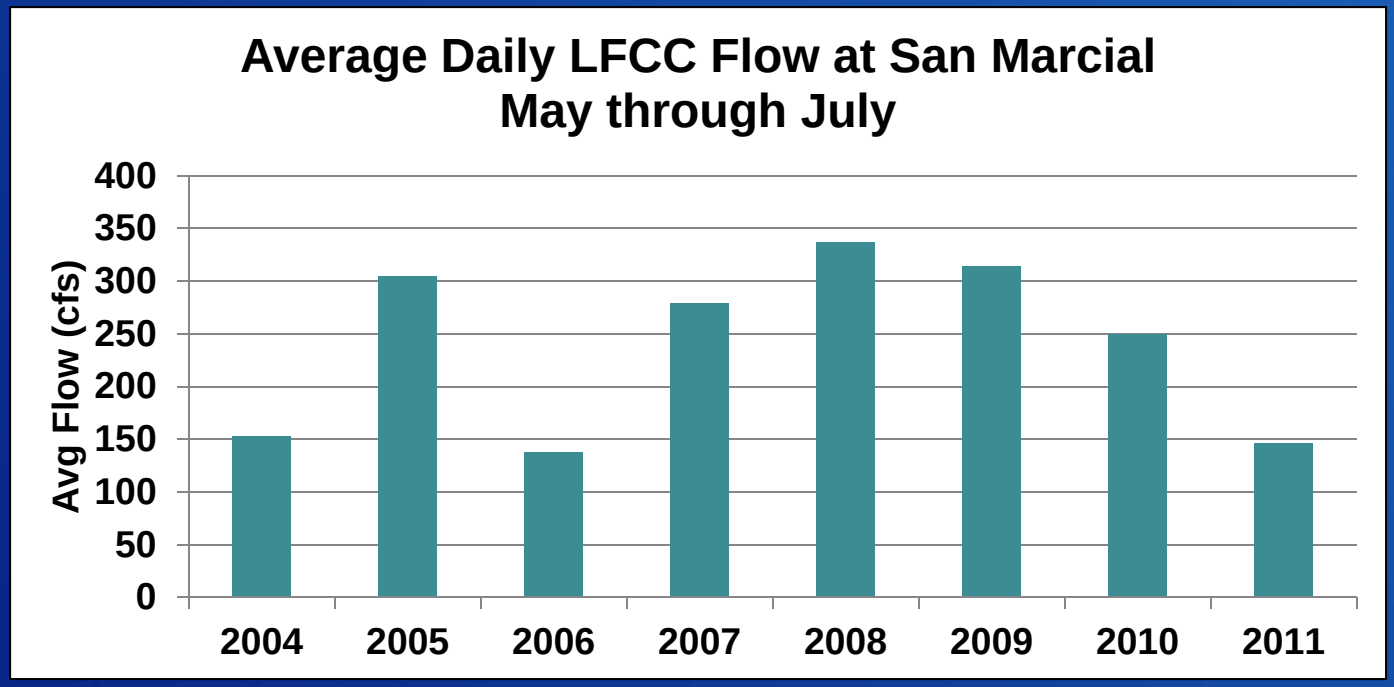
Percentage of Nests Flooded and Dry All Cycle in Relation to Nest Variables - Elephant Butte Reservoir Pool



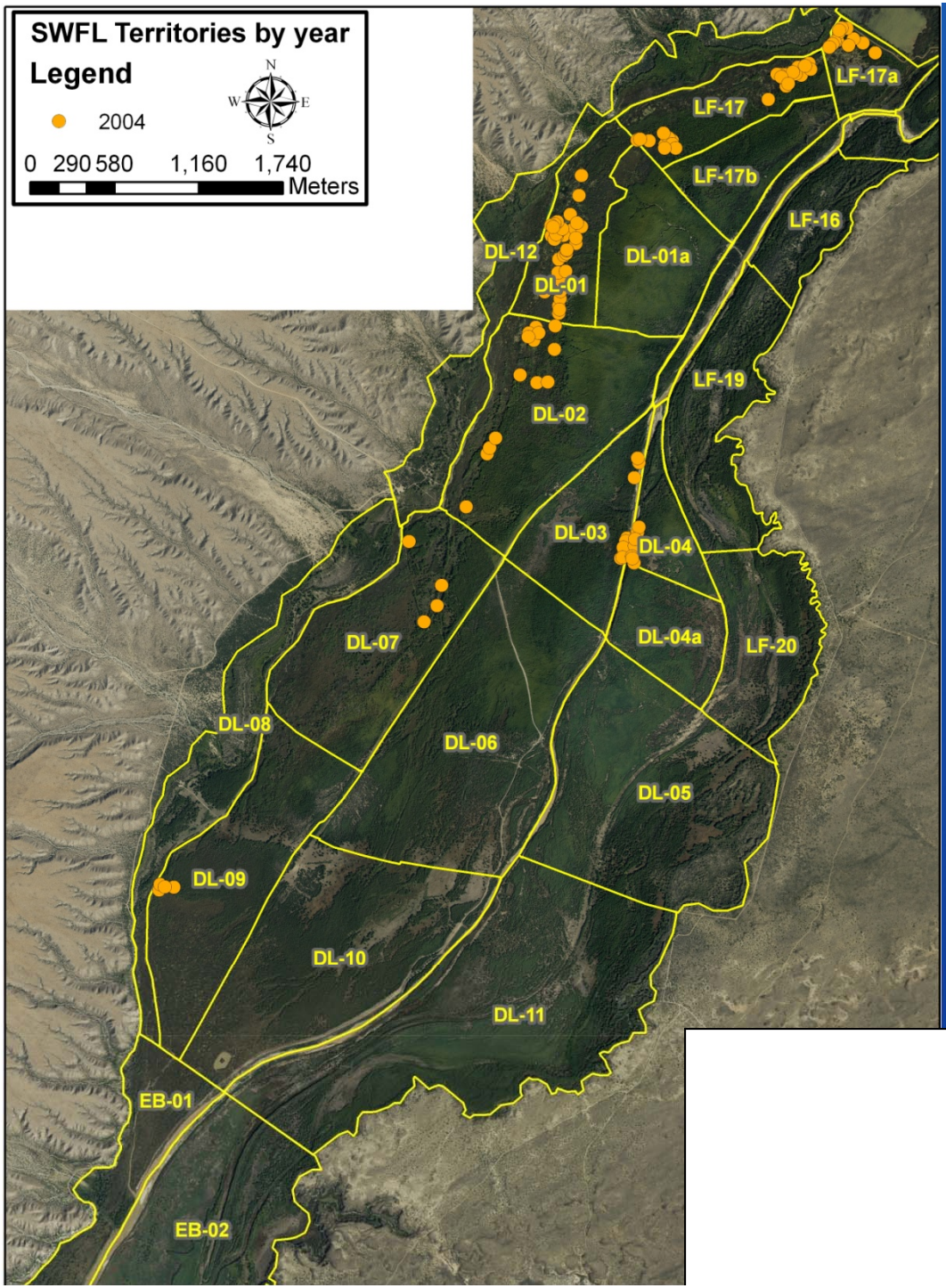
2004 - 2010 SPATIAL DISTRIBUTION OF SWFLS IN UPPER DELTA

IMPORTANT!

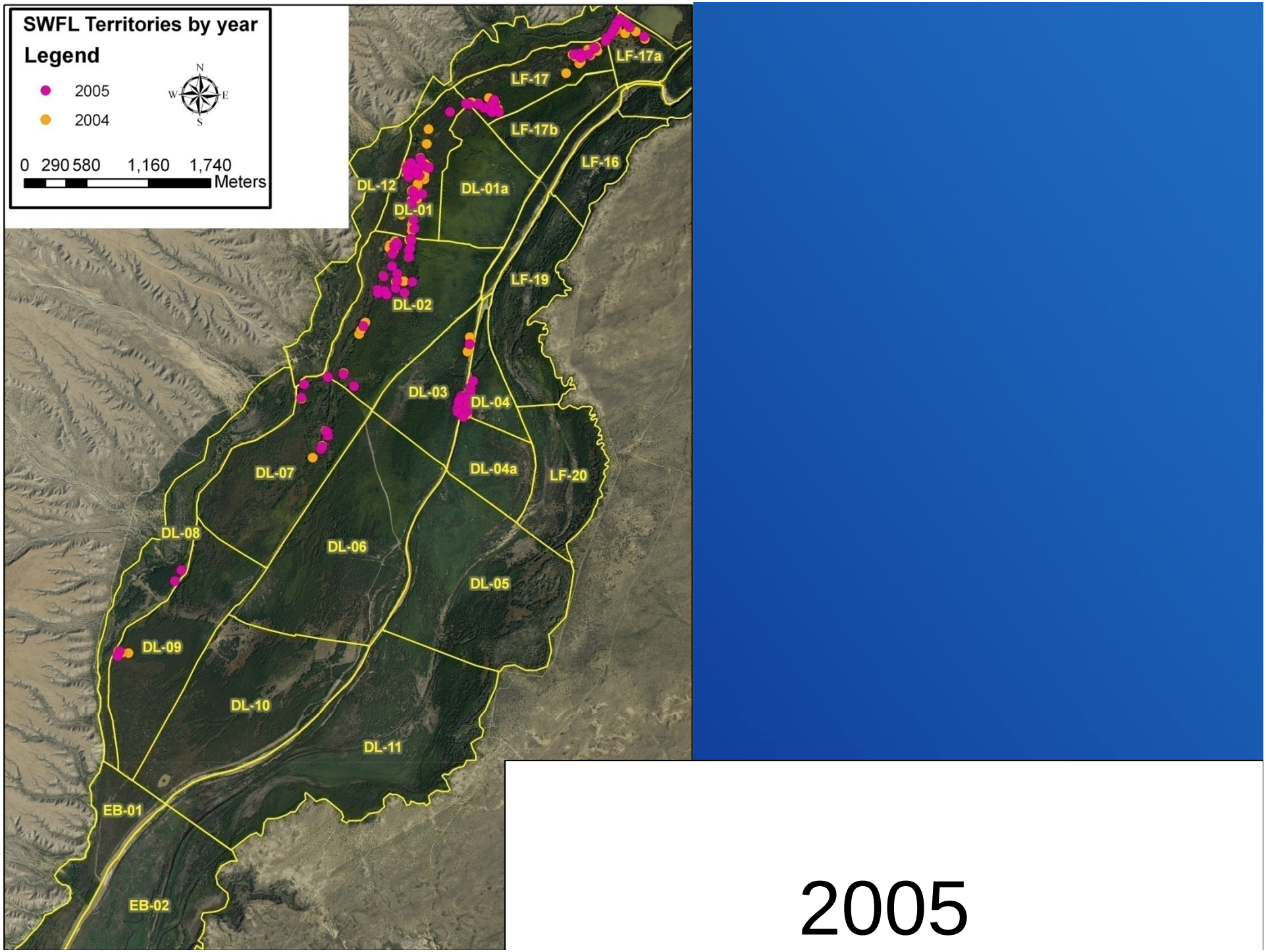
Nearly all SWFL territories within EBR are associated with LFCC flows – Not the Rio Grande



RECLAMATION


SWFL Territories by year
Legend
2004
N
W
E
S
0 290 580 1,160 1,740
Meters
LF-17a
LF-17
LF-17b
LF-16
DL-12
DL-01a
DL-01
LF-19
DL-02
DL-03
DL-04
DL-07
DL-04a
LF-20
DL-08
DL-06
DL-05
DL-09
DL-10
DL-11
EB-01
EB-02

2004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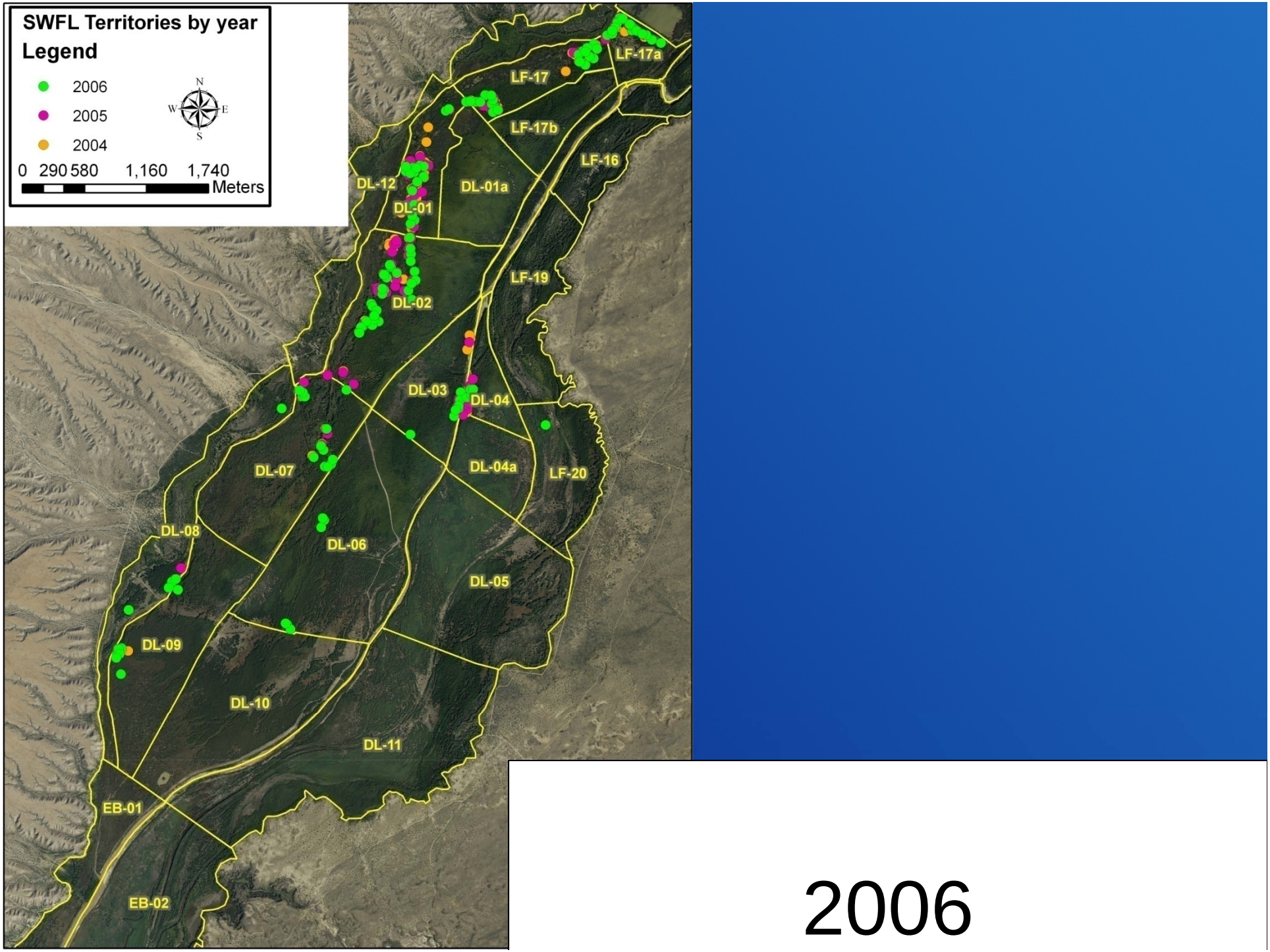
2005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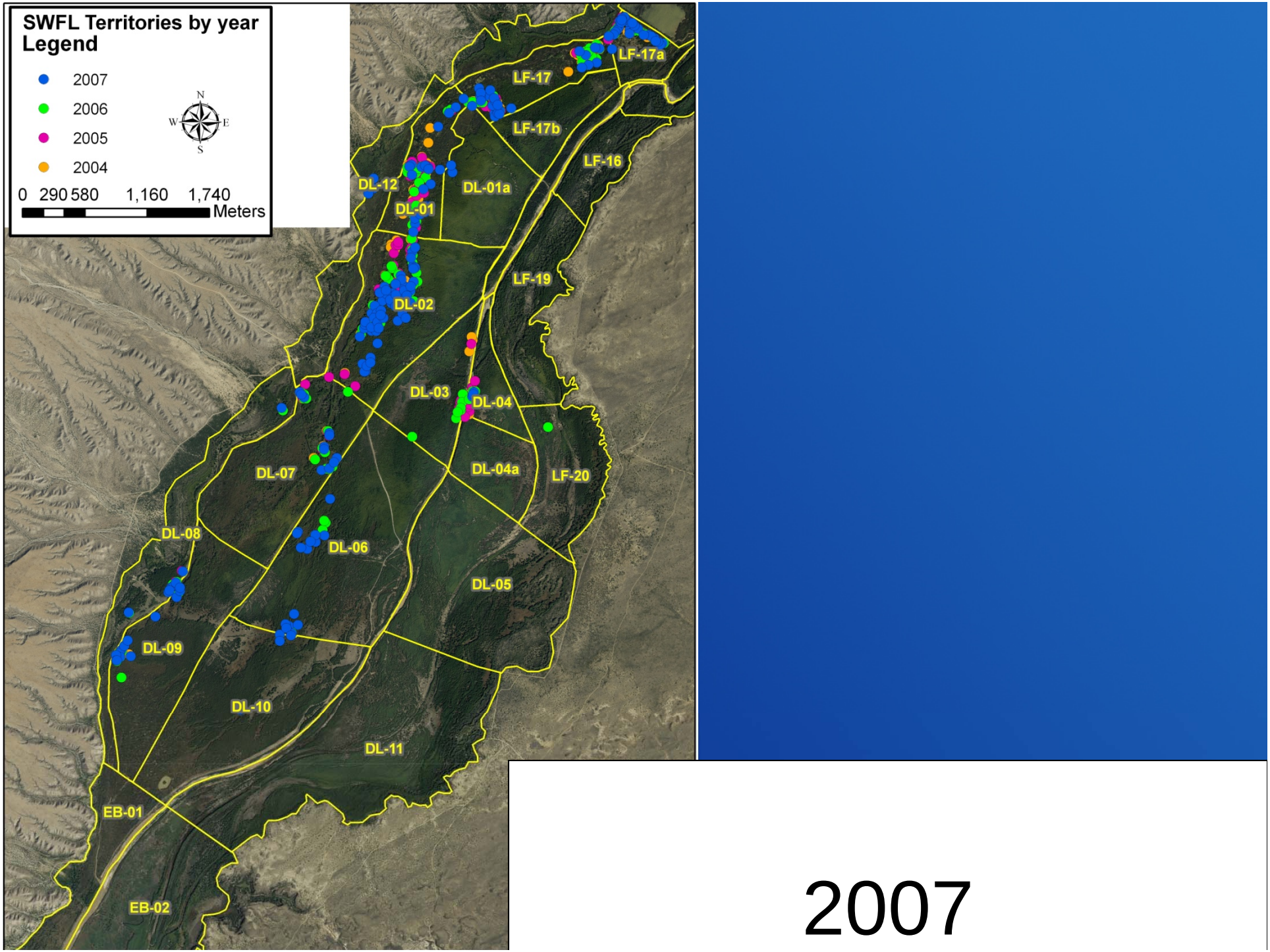
2006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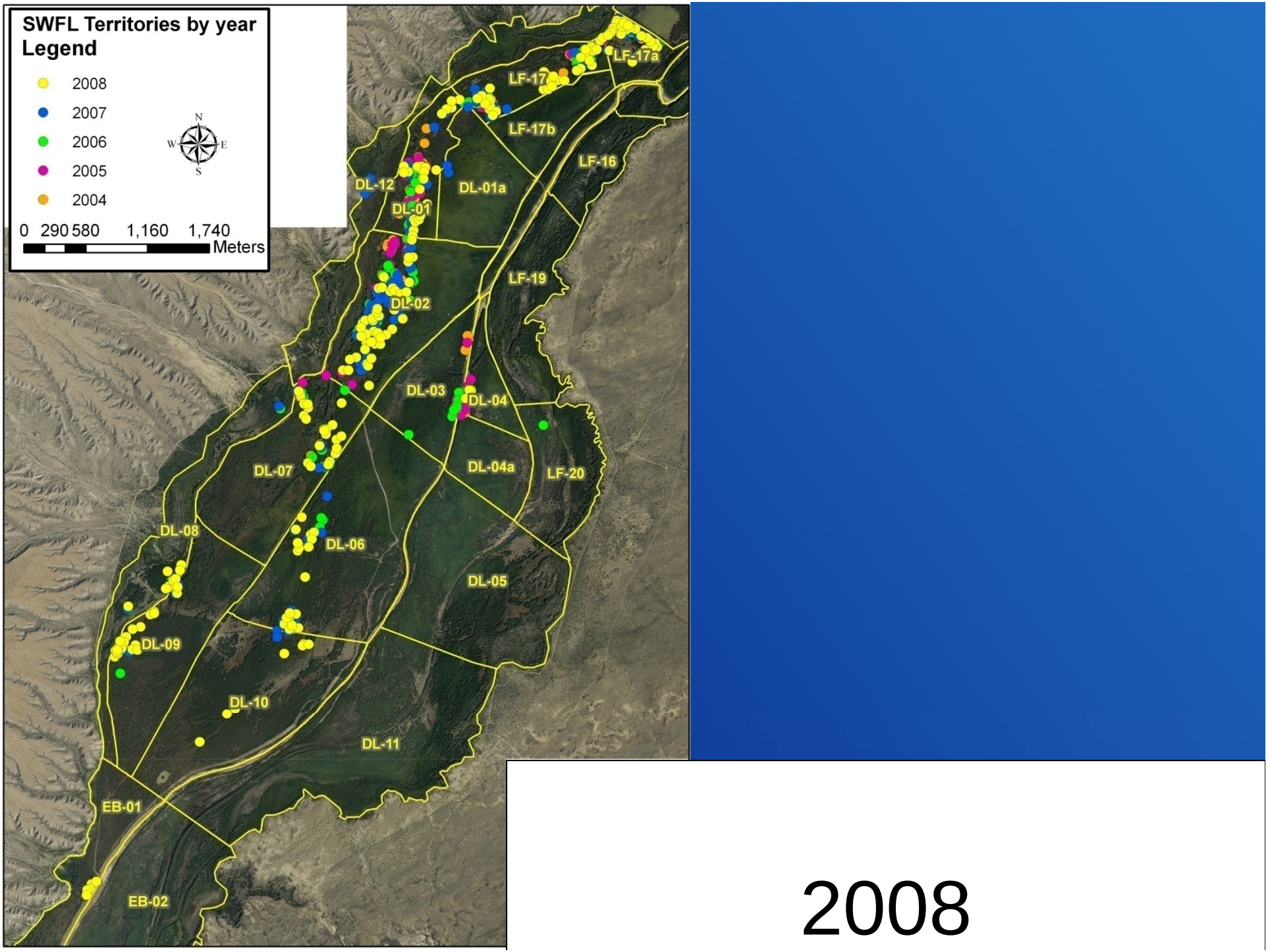
EB-02

2007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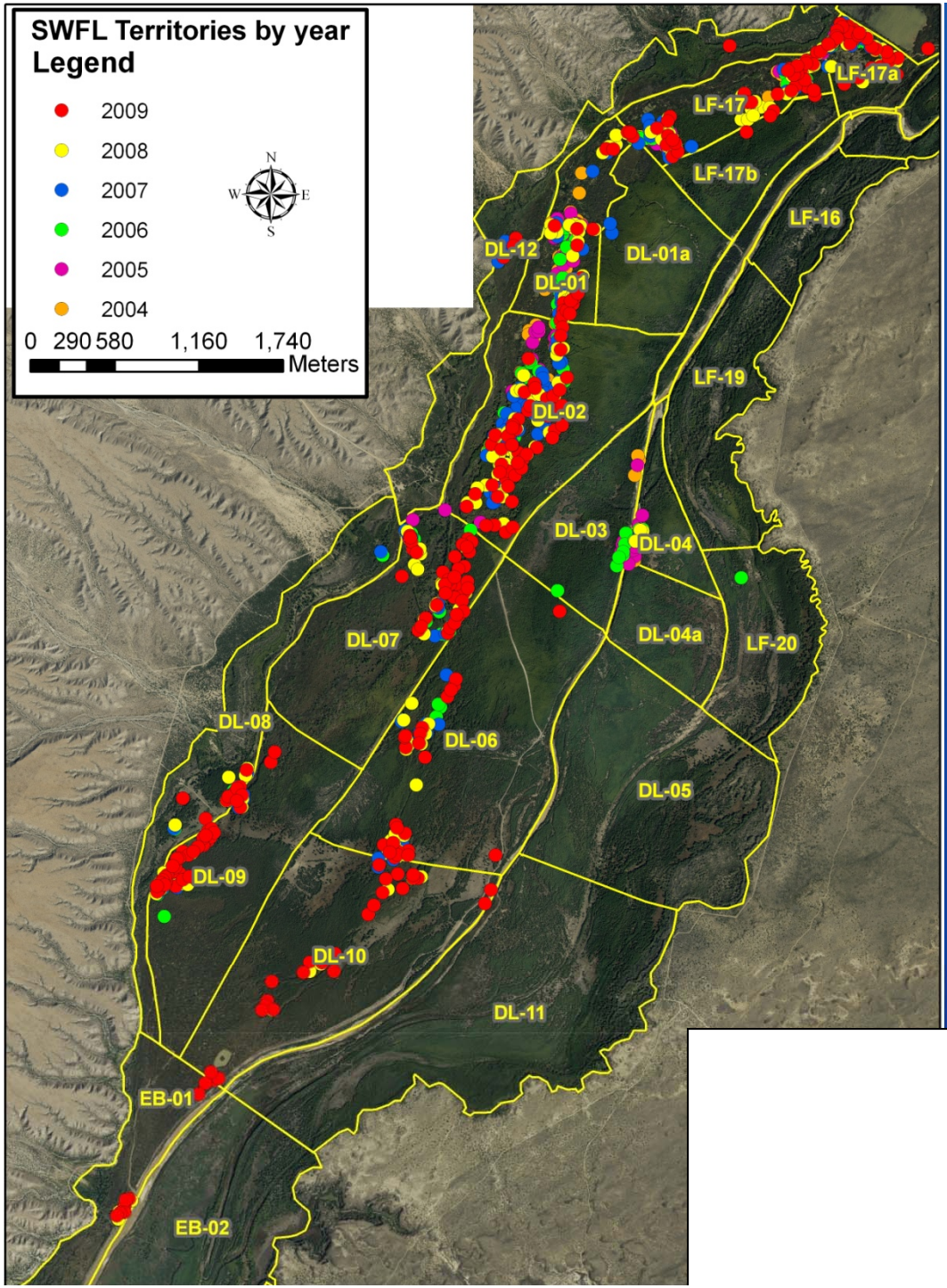
DL-09
DL-10
DL-11
EB-01
EB-02

2008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Meters
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DL-01a
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DL-07
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LF-20
DL-08
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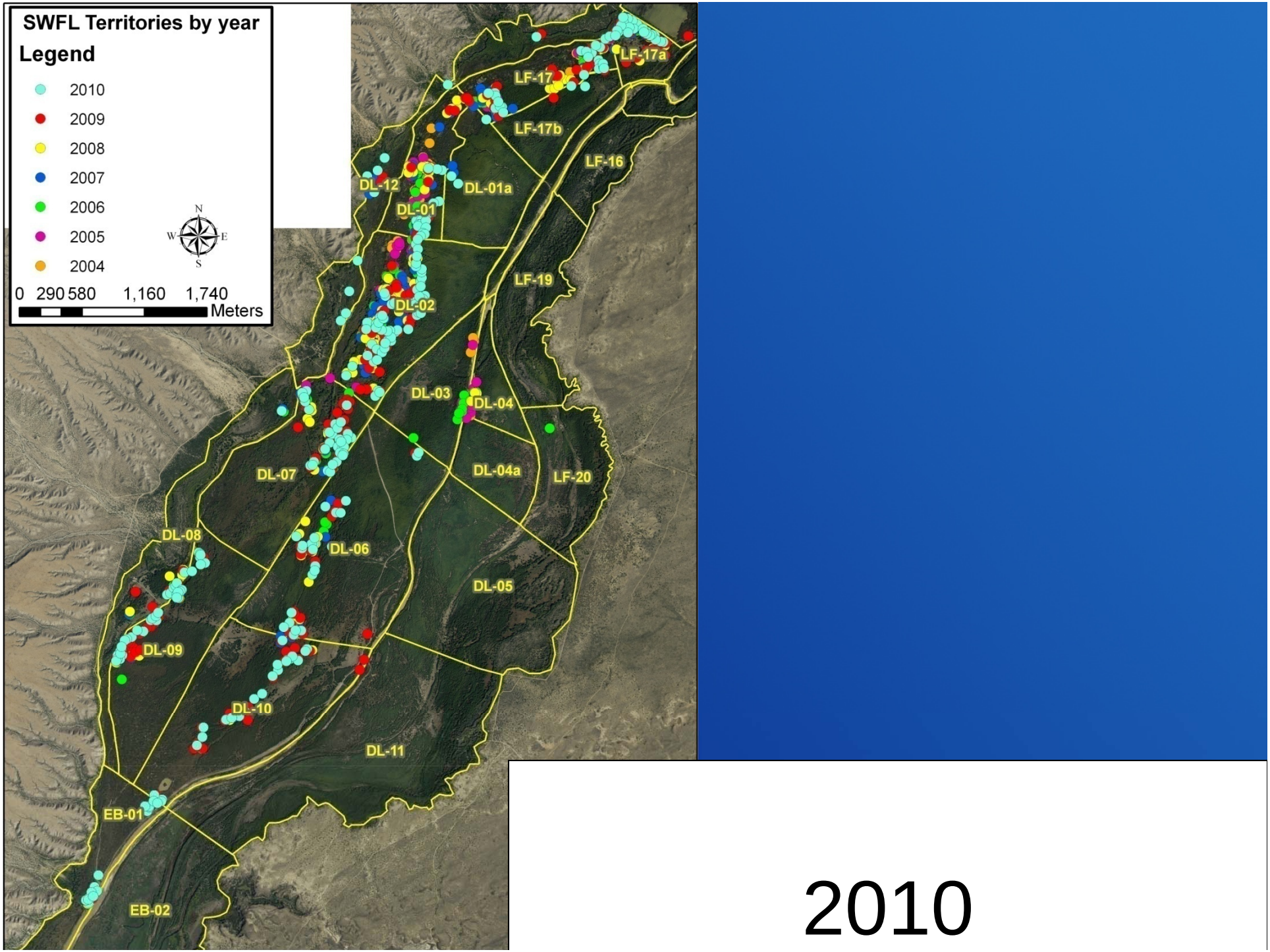
EB-01
EB-02

2009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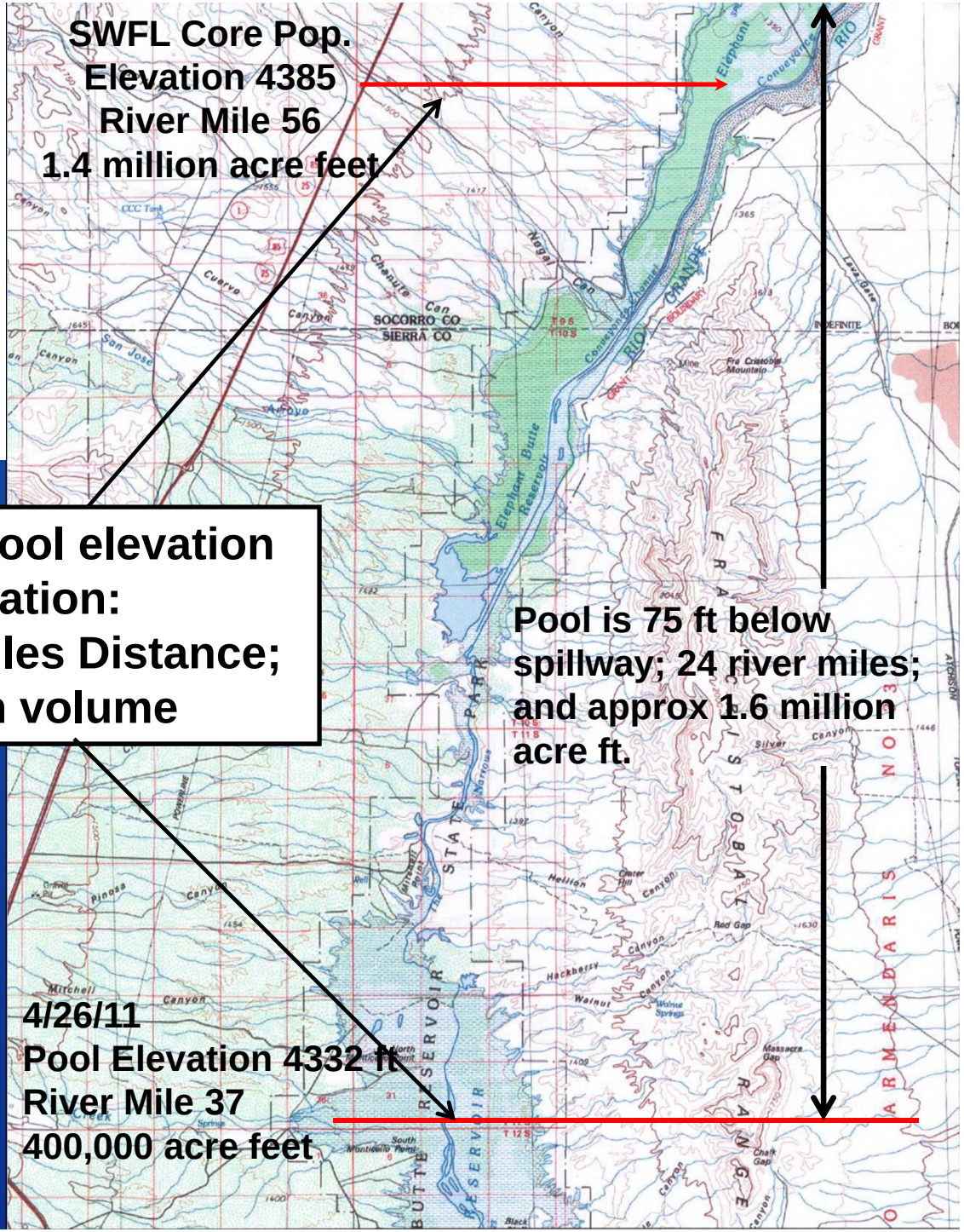
DL-05
DL-09
DL-10
DL-11
EB-01
EB-02

2010

2007 - 2011
ELEVATIONAL DISTRIBUTION OF SWFLS

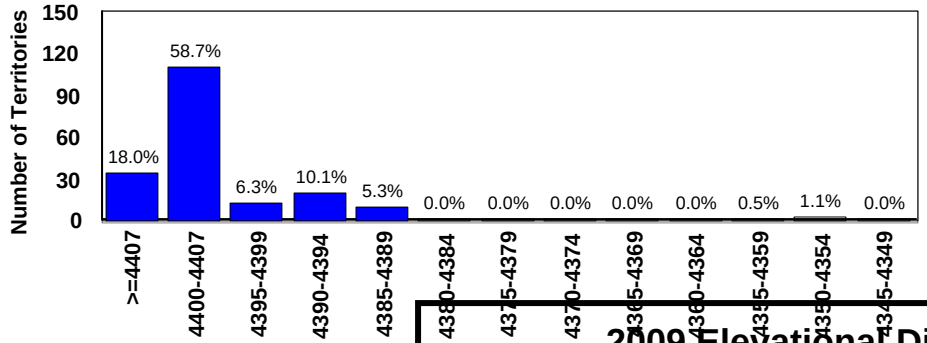
DRIVEN BY HABITAT QUALITY AND AVAILABILITY



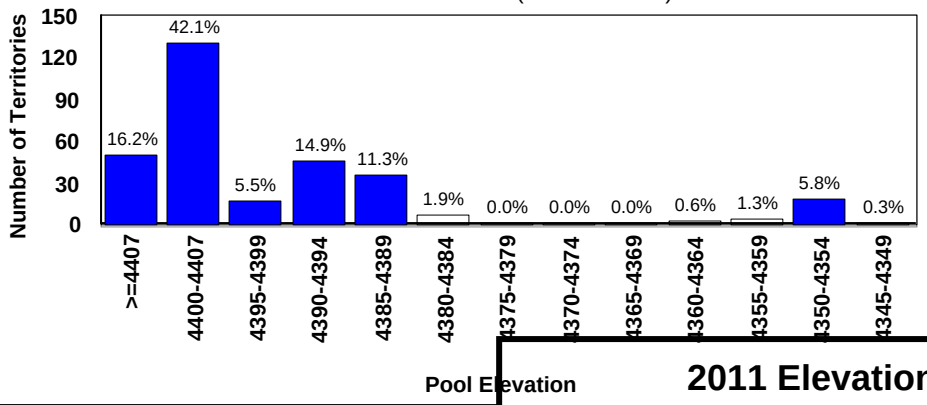
Difference between current Pool elevation and Core SWFL Population:
53 ft in Elevation; 19 River Miles Distance; and 1 million acre feet in volume

Multiple age classes and species of vegetation established over a 10 year period

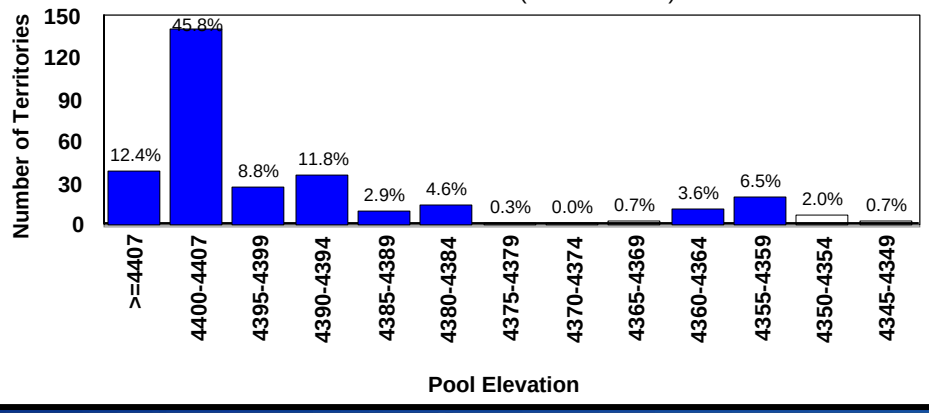
2007 Elevational Distribution of SWFLs
Elephant Butte Reservoir (n=189)
>4400 = 76.7% (145 Territories)



2009 Elevational Distribution of SWFLs
Elephant Butte Reservoir (n=309)
>4400 = 58.3% (180 Territories)



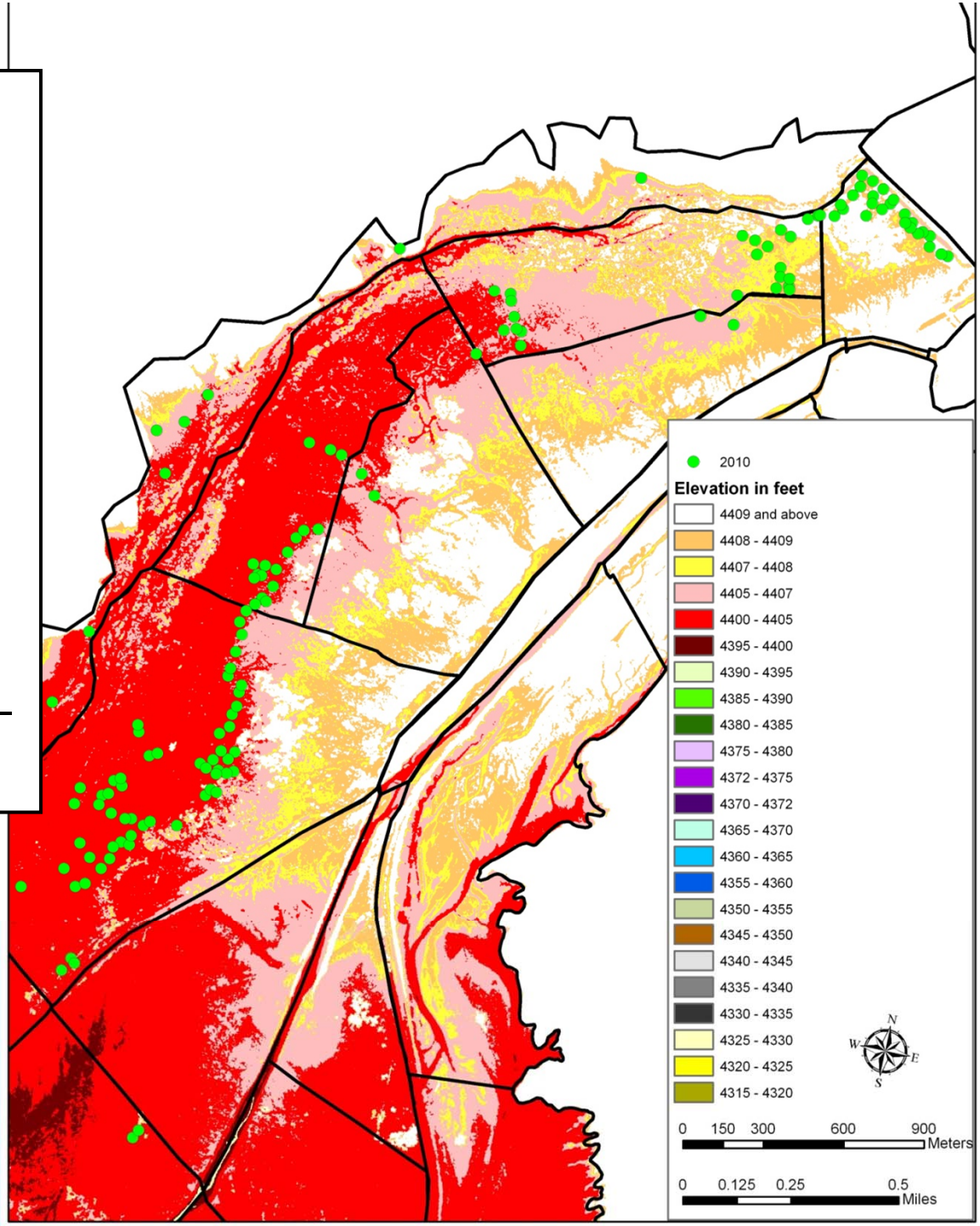
2011 Elevational Distribution of SWFLs
Elephant Butte Reservoir (n=306)
>4400 = 58.2% (178 Territories)



2010 Distribution of SWFLs within upper delta of Elephant Butte Reservoir

In 2010,
41 territories (14%) above spillway elevation and
171 Territories (59%) within the upper 7 ft.

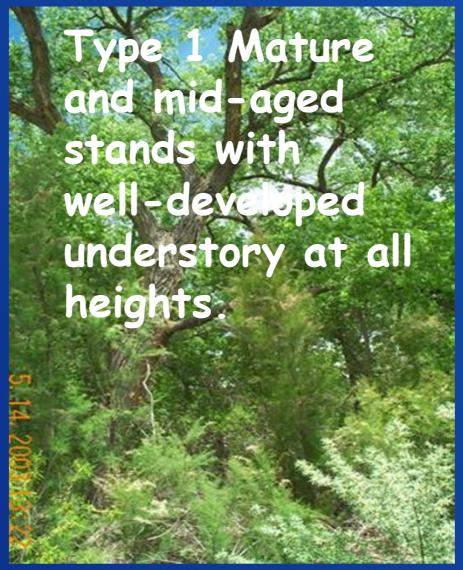
Threat by a rising reservoir – very minimal.

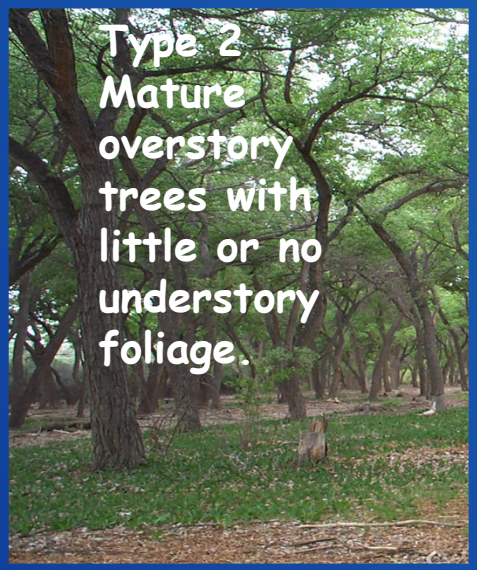


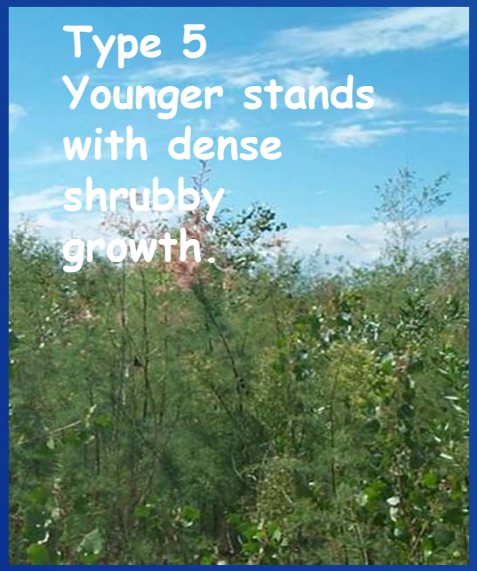
SWFL HABITAT MODELING

Used a slightly modified version of Hink and Ohmart Classification System

RECLAMATION

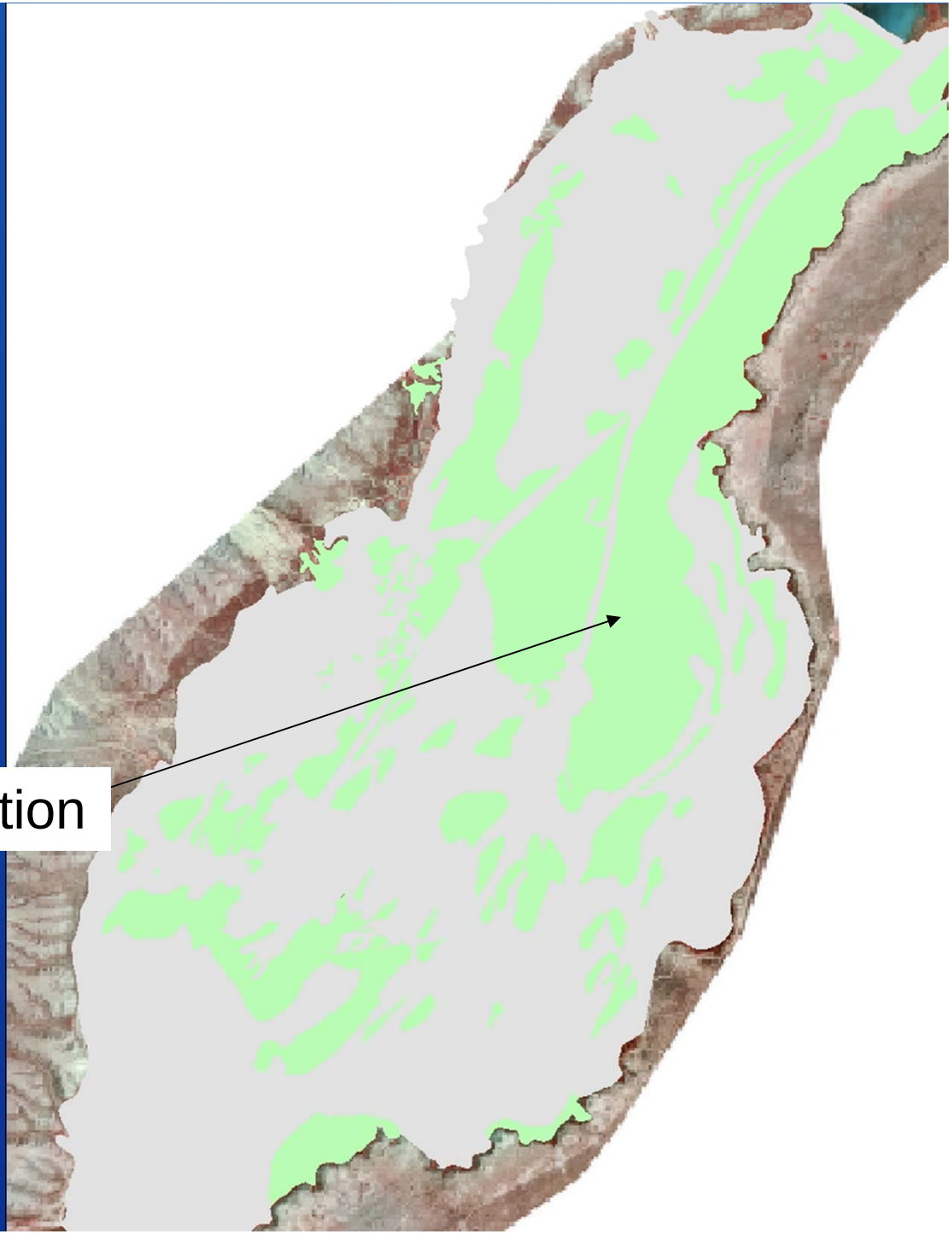






RECLAMATION

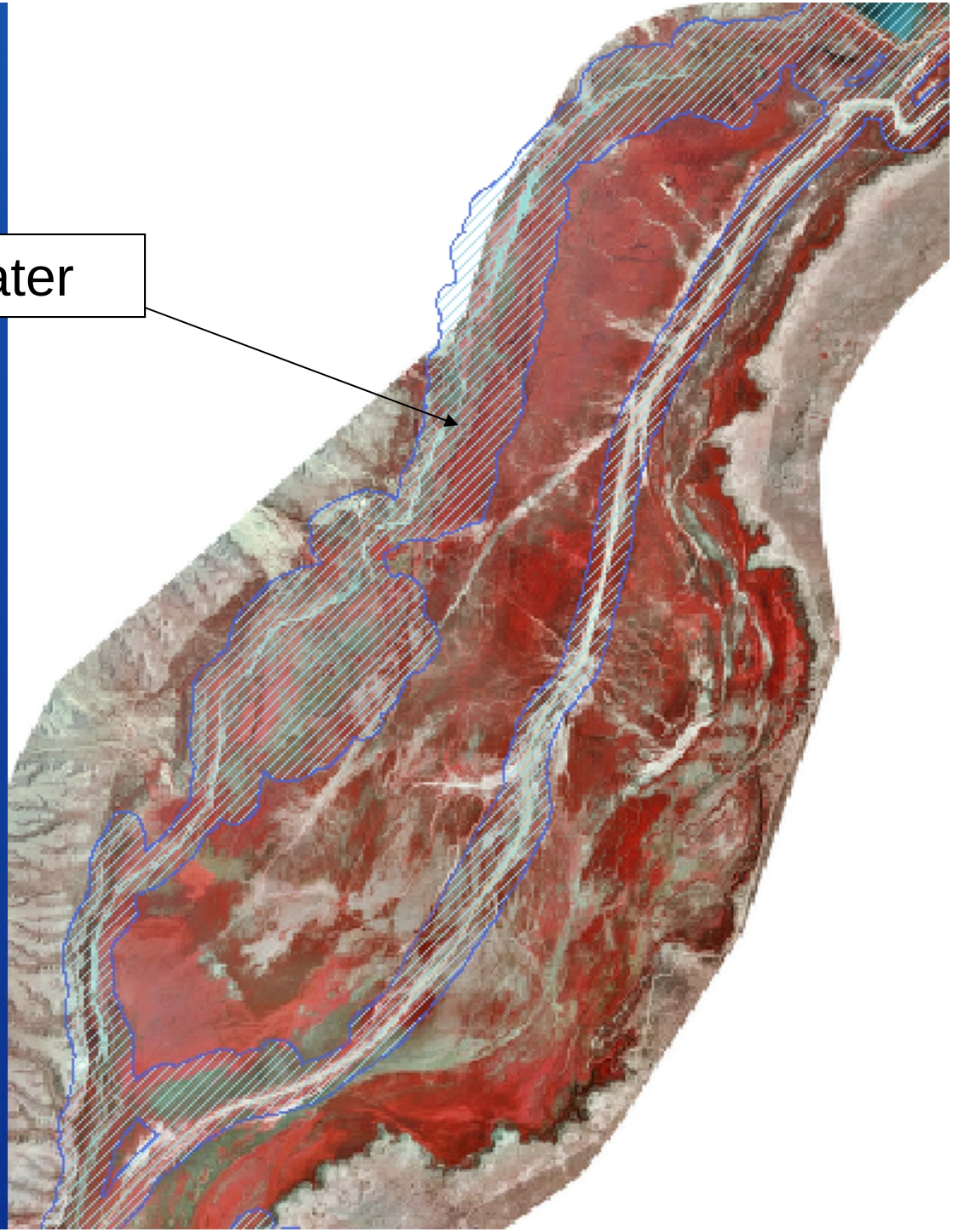
Habitat Suitability Model



Structurally Suitable Vegetation

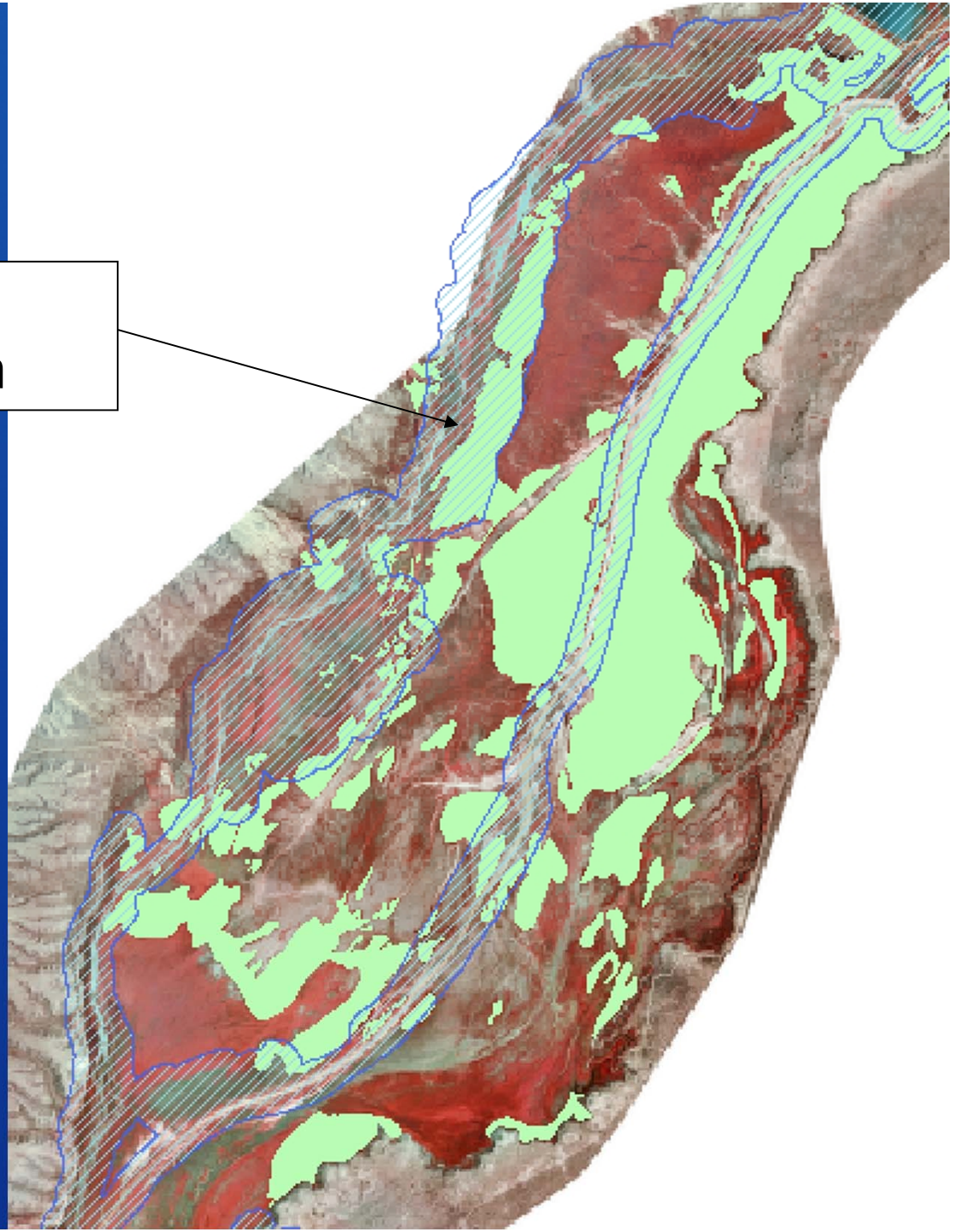
Habitat Suitability Model

100 meter buffer of open water



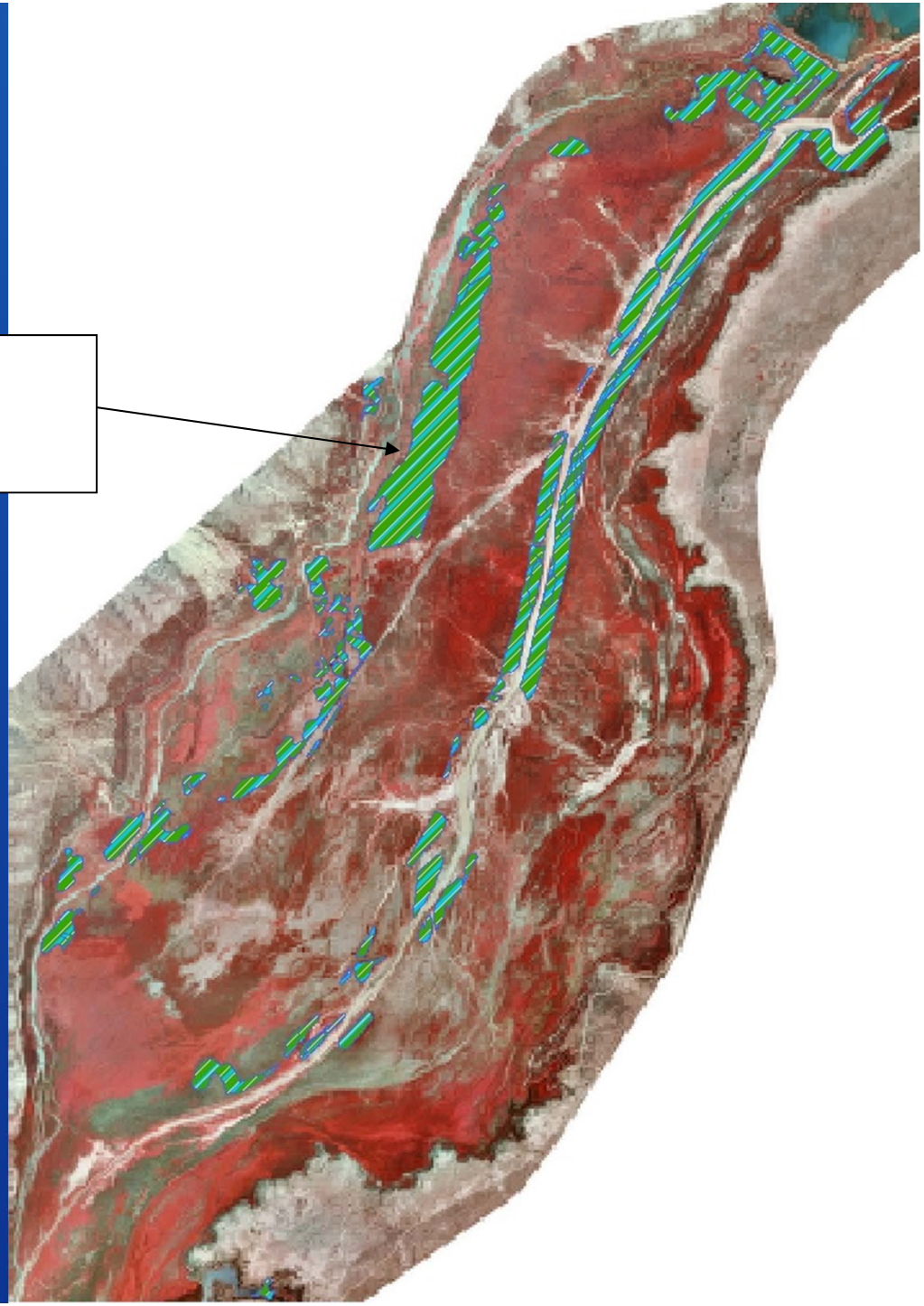
Habitat Suitability Model

Overlay Hydrology
on Structural Vegetation



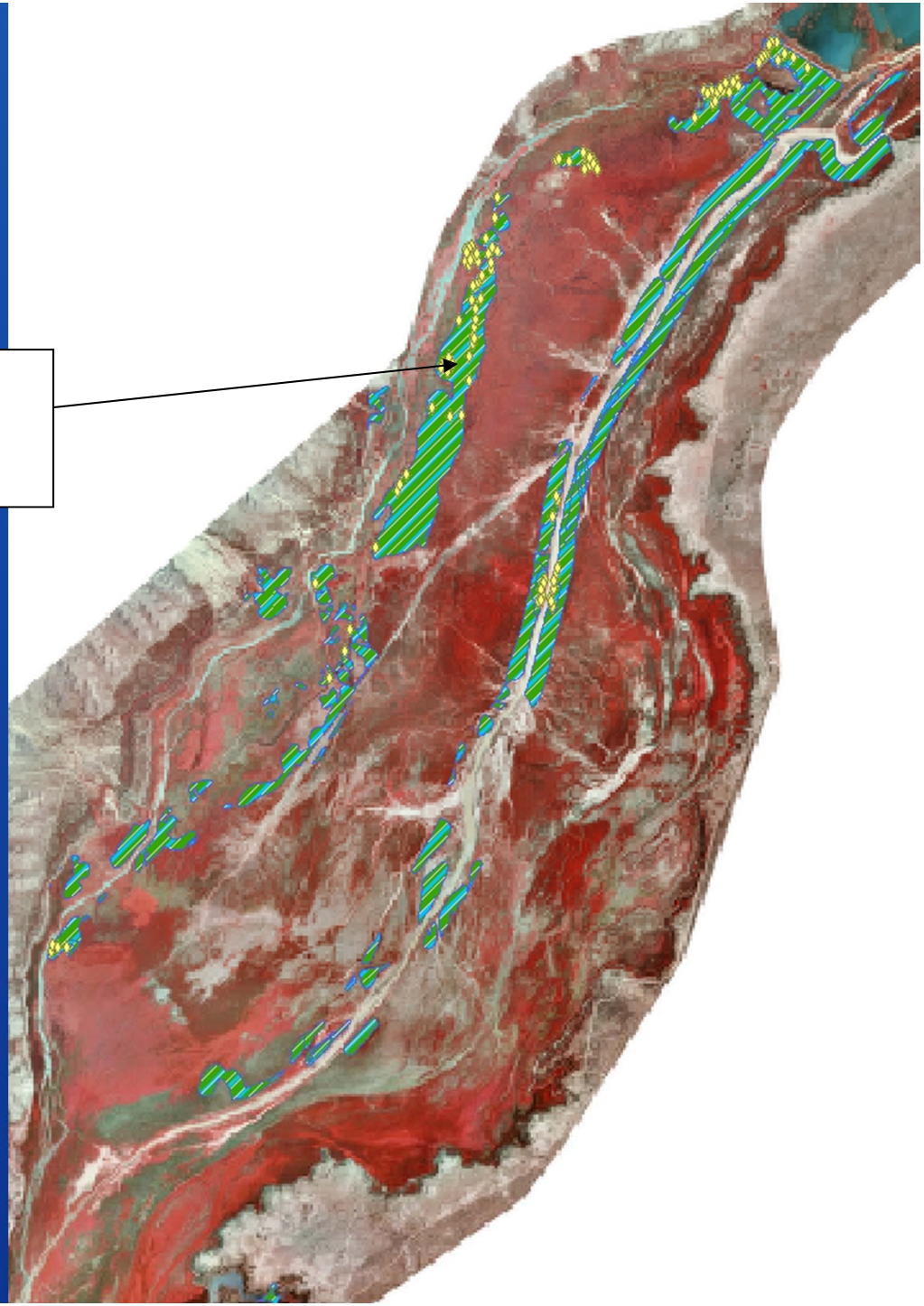
Habitat Suitability Model

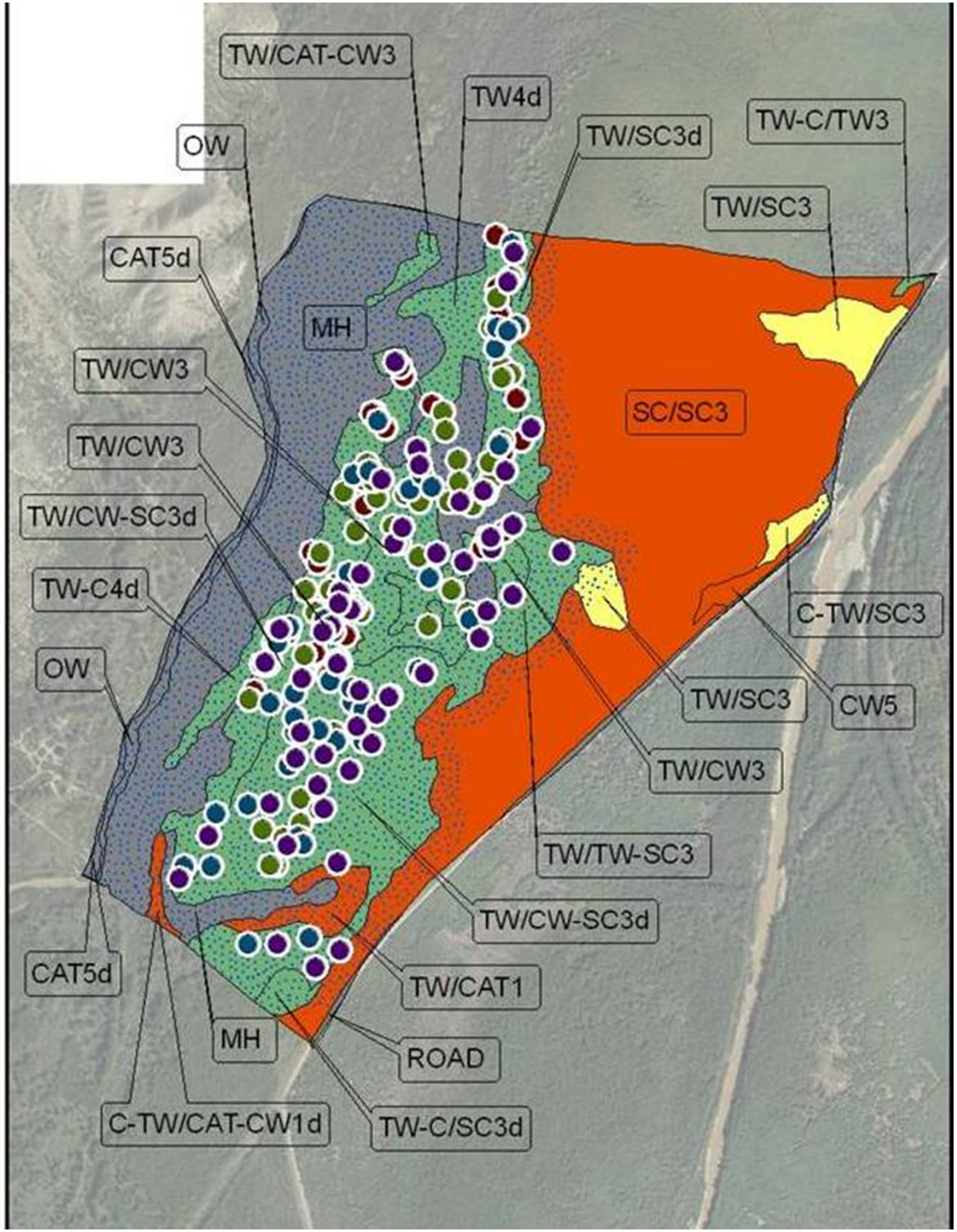
Suitable Habitat within 100m of Water



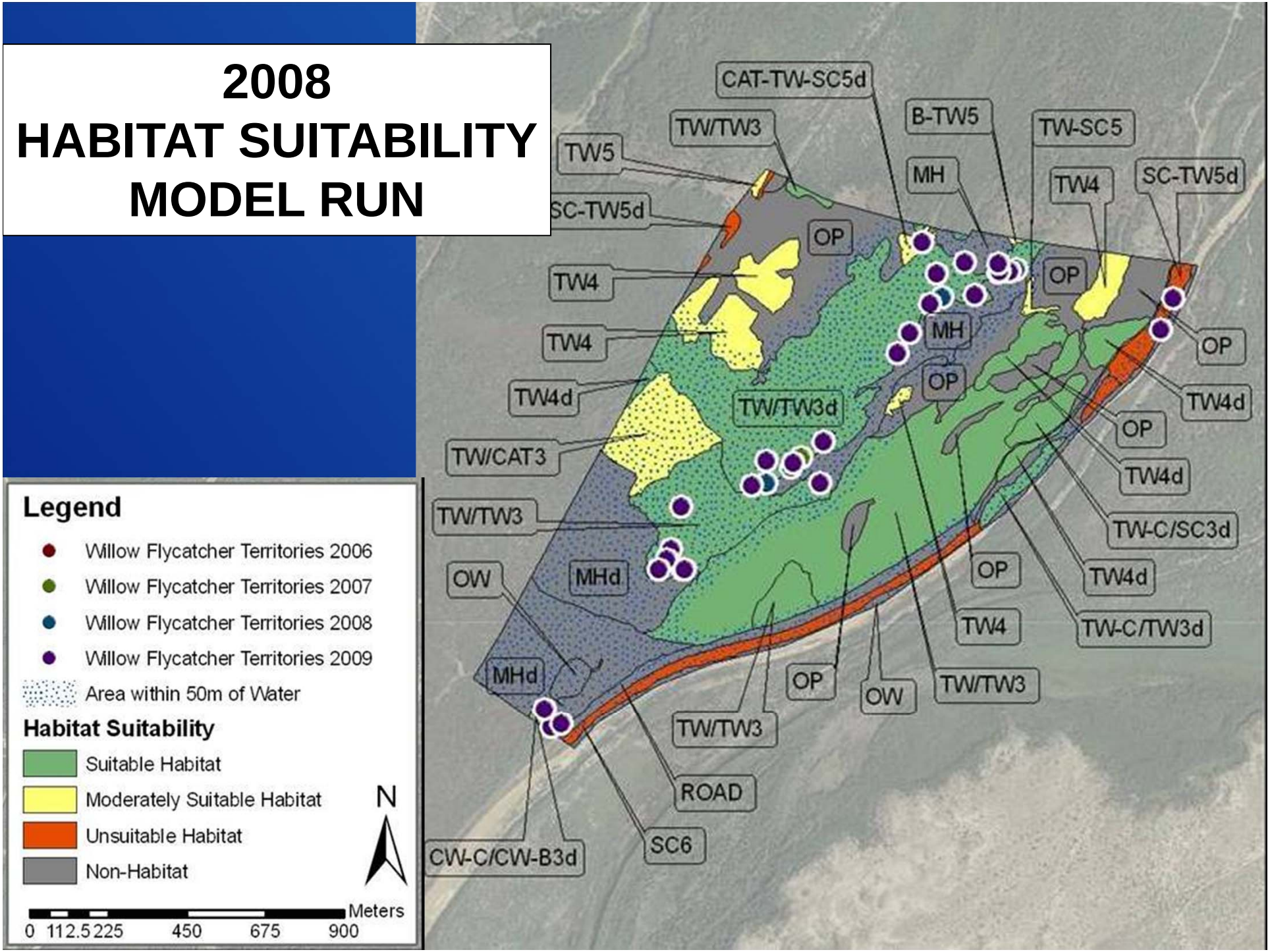
Habitat Suitability Model

Locations of 2004 Territories with Suitable Habitat



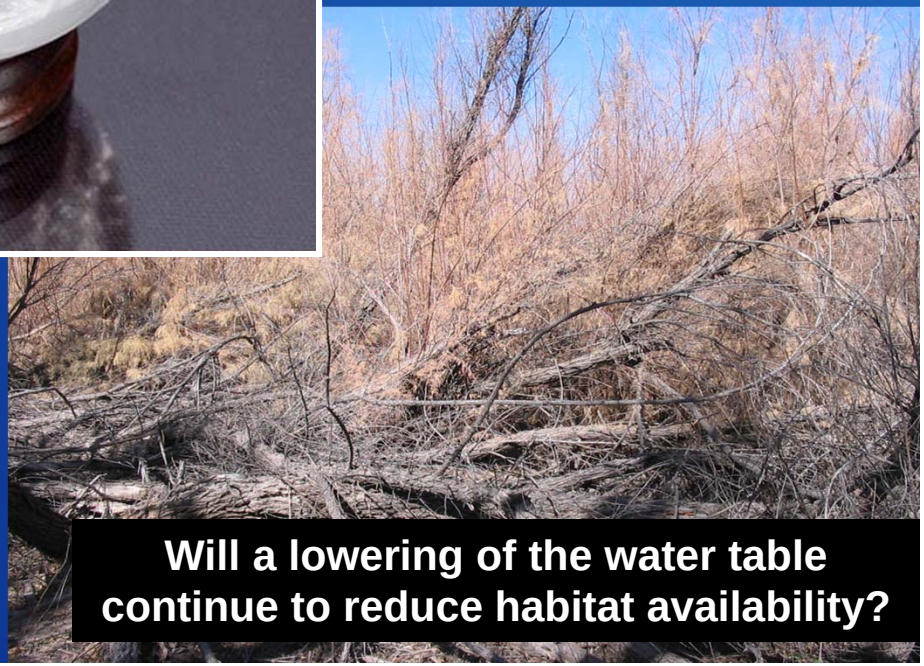

TW/CAT-CW3
TW4d
TW/SC3d
TW-C/TW3
OW
TW/SC3
CAT5d
MH
TW/CW3
SC/SC3
TW/CW3
TW/CW-SC3d
TW-C4d
C-TW/SC3
OW
TW/SC3
CW5
TW/CW3
TW/TW-SC3
TW/CW-SC3d
CAT5d
TW/CAT1
MH
ROAD
C-TW/CAT-CW1d
TW-C/SC3d

2008
HABITAT SUITABILITY MODEL RUN



WHAT IS THE FUTURE HABITAT USE AND PRODUCTIVITY OF RIO GRANDE SWFLS??

Will prolonged flooding continue to reduce habitat availability?



Will a lowering of the water table continue to reduce habitat availability?

IMPACT OF COTTONWOOD LEAF BEETLE

(*Chrysomela scripta)*

Early stage larva

May 16, 2005

Adult Male and Female

Feeding Adult and Larva

Defoliation of Cottonwood and Goodding's willow – May 2005

Is the timing of Defoliation different between *Diorhabda* and *Chrysomela?*

RECLAMATION