ARE THERE LOCAL DIFFERENCES IN ADAPTATION OF *RHIZOPHORA MANGLE* FROM EAST AND WEST COASTS OF FLORIDA?

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GLOBAL CHANGE

URBANIZATION

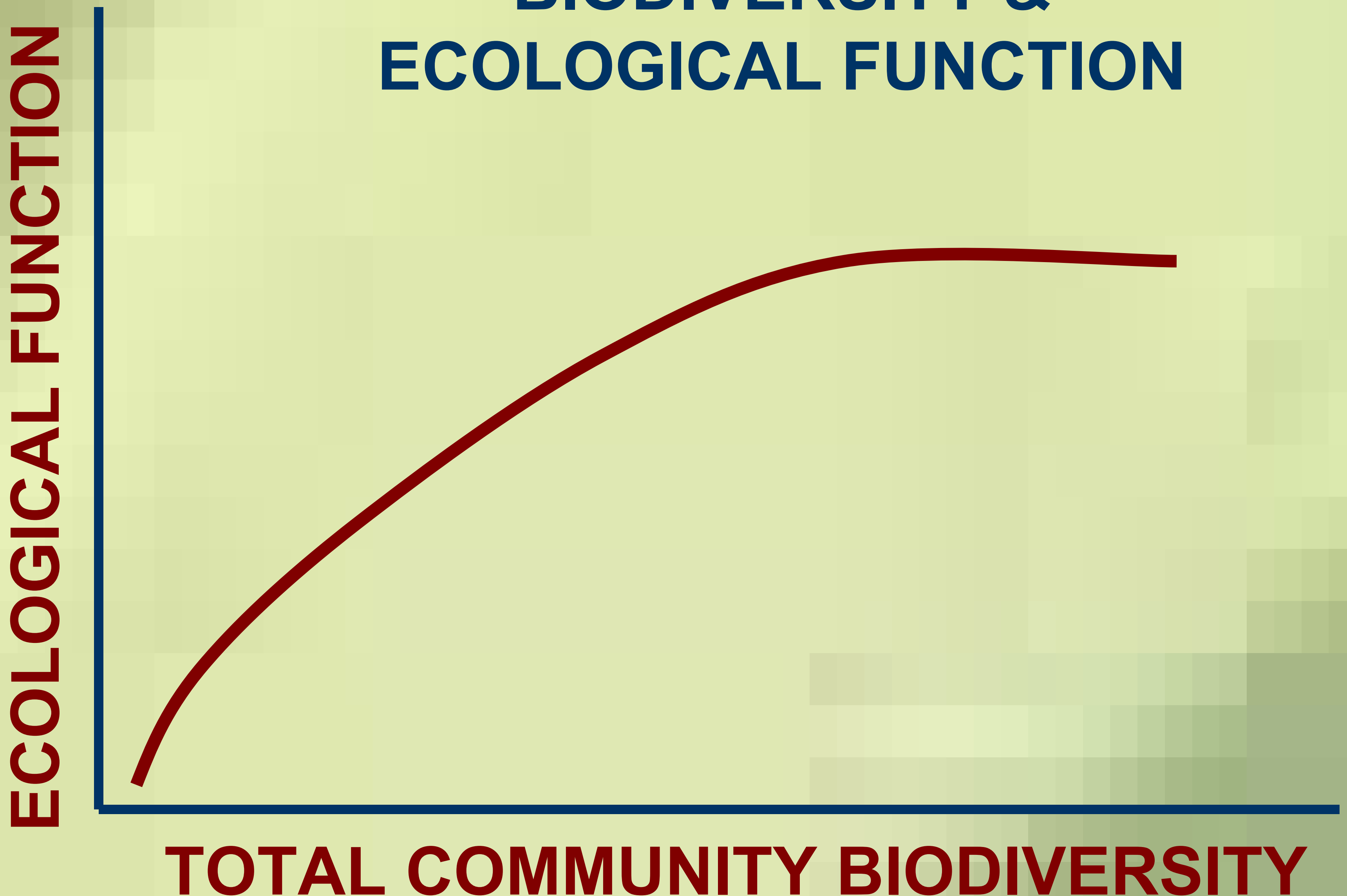
&

RESTORATION

WILL IMPACT

BIODIVERSITY
&
ECOLOGICAL FUNCTION

POSITIVE RELATIONSHIP BETWEEN BIODIVERSITY & ECOLOGICAL FUNCTION

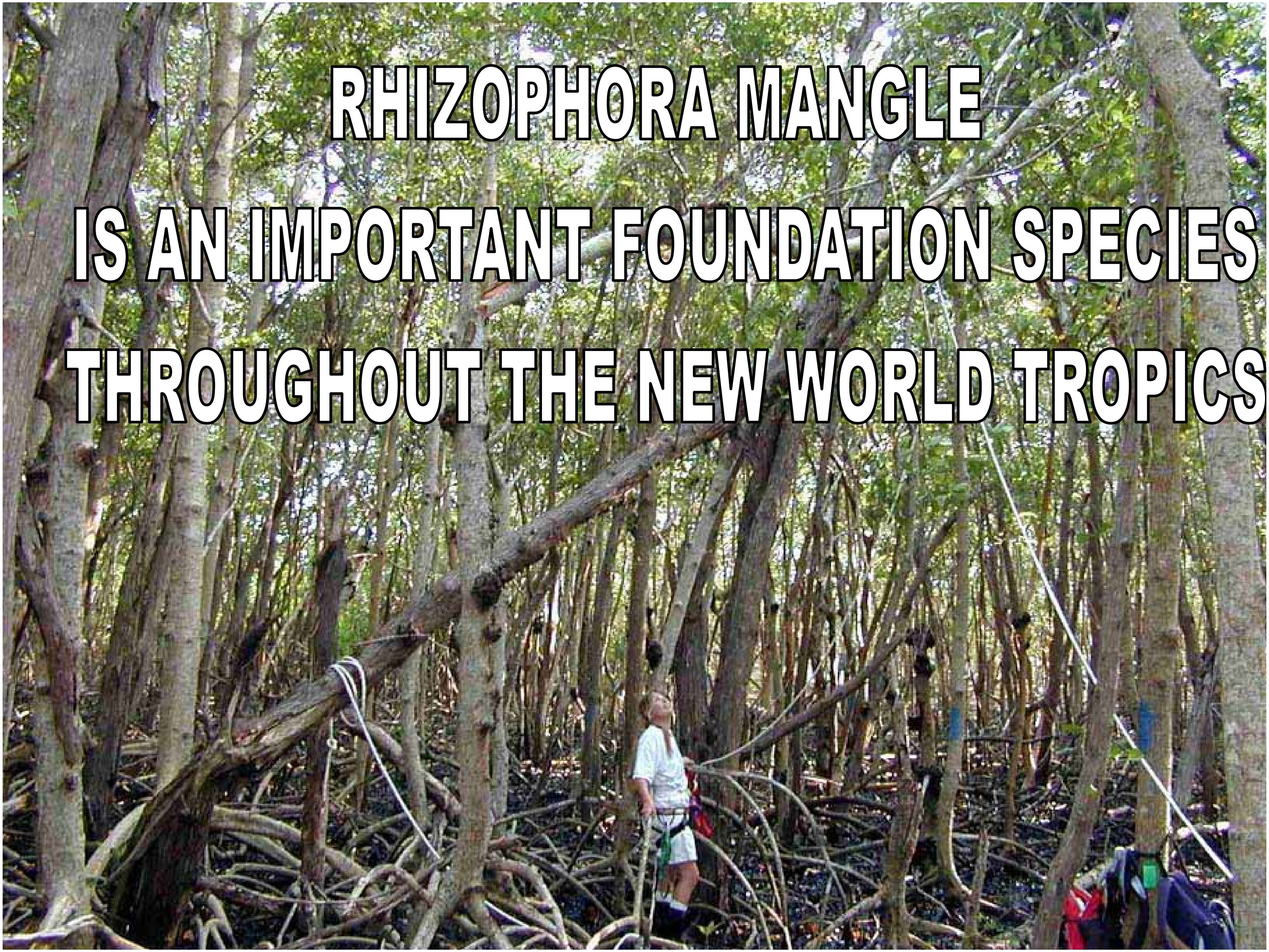


**GENETIC DIVERSITY
IS A
MAIN COMPONENT
OF
BIODIVERSITY
AND IS
INTEGRAL TO THE
ABILITY OF POPULATIONS
TO ADAPT TO
CHANGING CONDITIONS**

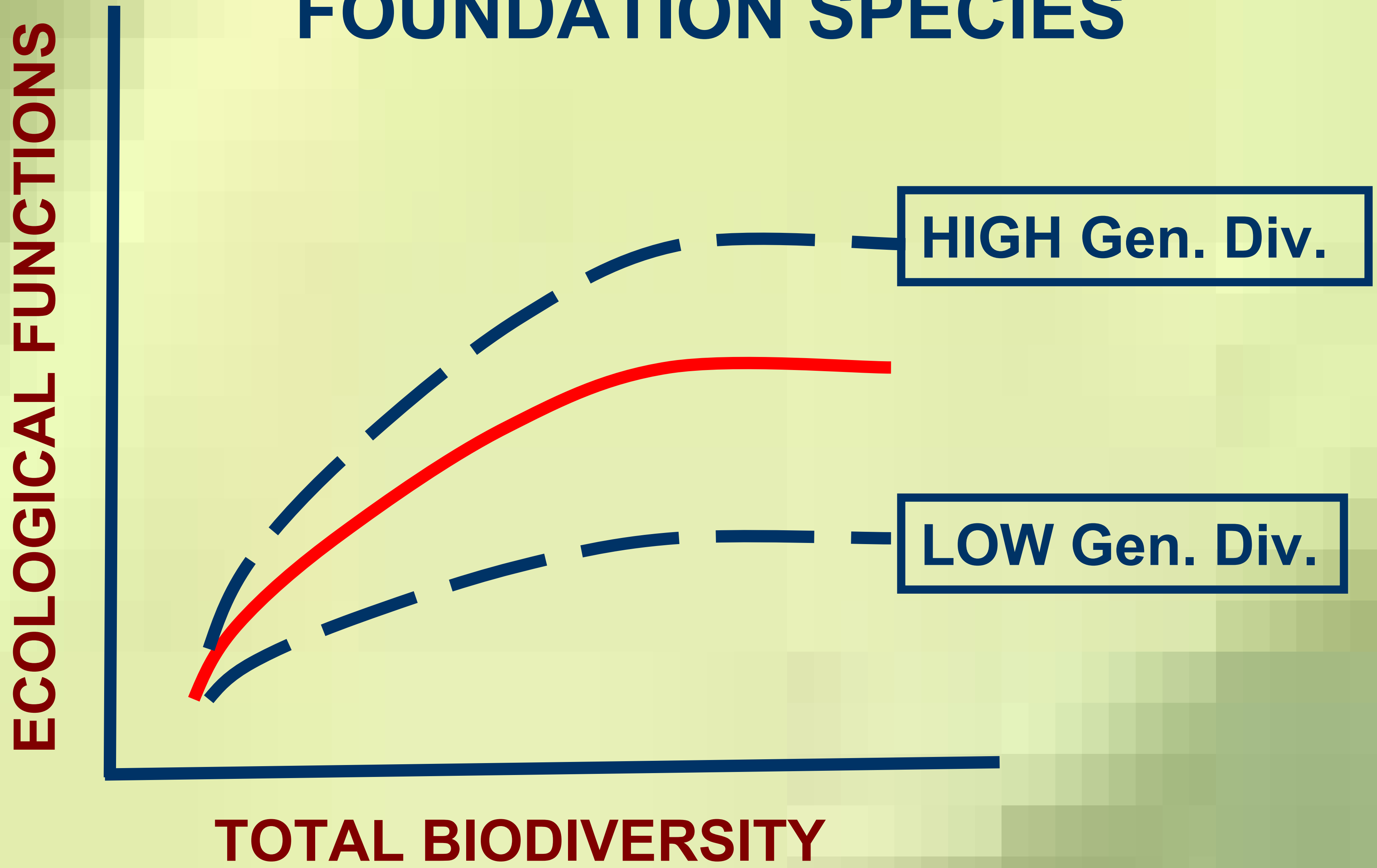
FOR COMMUNITIES DOMINATED BY A FEW HABITAT FORMING SPECIES

GENETIC DIVERSITY CAN PLAY A ROLE SIMILAR TO SPECIES DIVERSITY BY ENHANCING BIODIVERSITY

CRUTSINGER ET AL. 2006 SCIENCE


RHIZOPHORA MANGLE
IS AN IMPORTANT FOUNDATION SPECIES
THROUGHOUT THE NEW WORLD TROPICS

GENETIC DIVERSITY OF FOUNDATION SPECIES



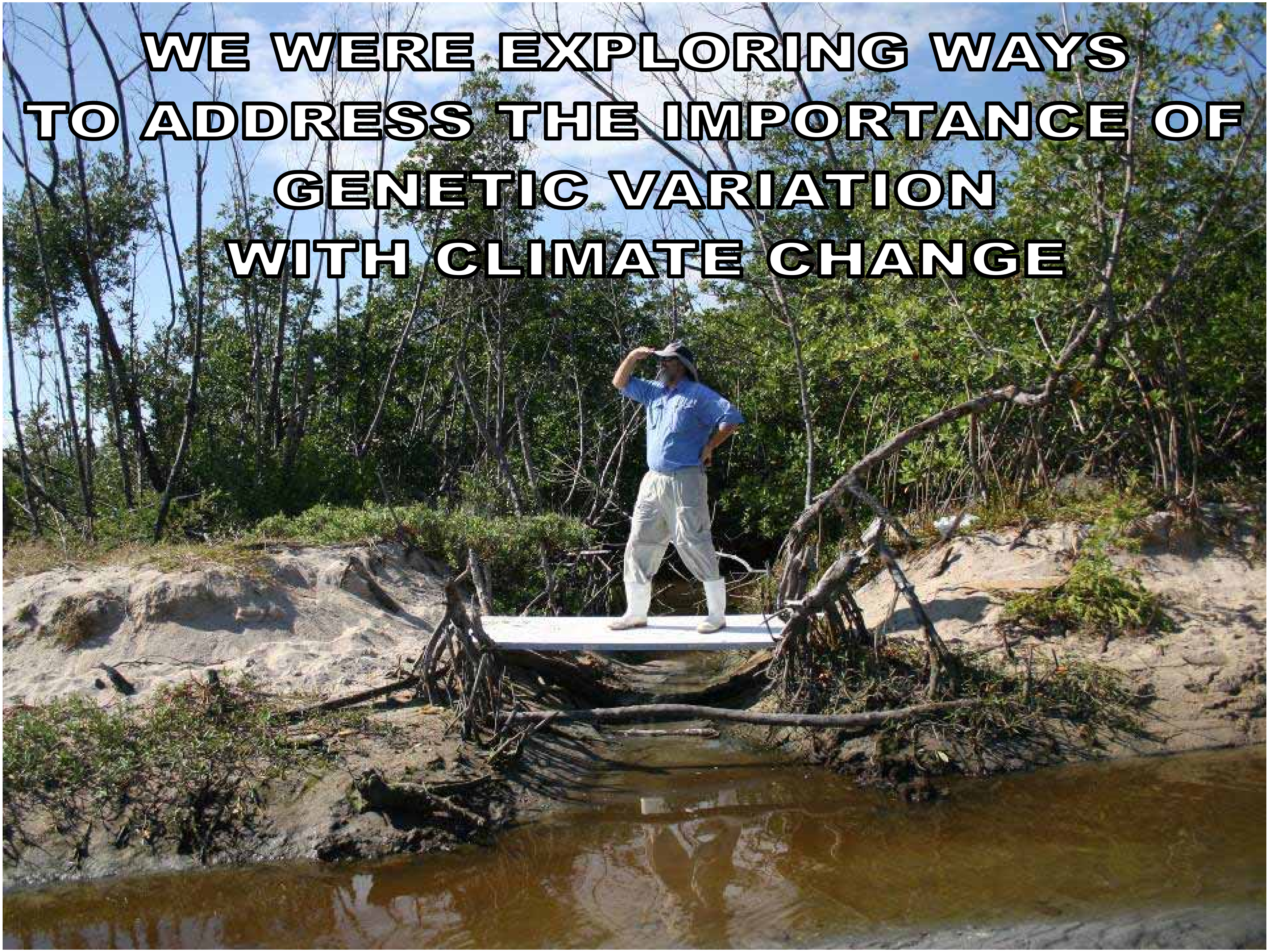
POPULATIONS OF MANGROVES
&
OTHER FOUNDATION SPECIES

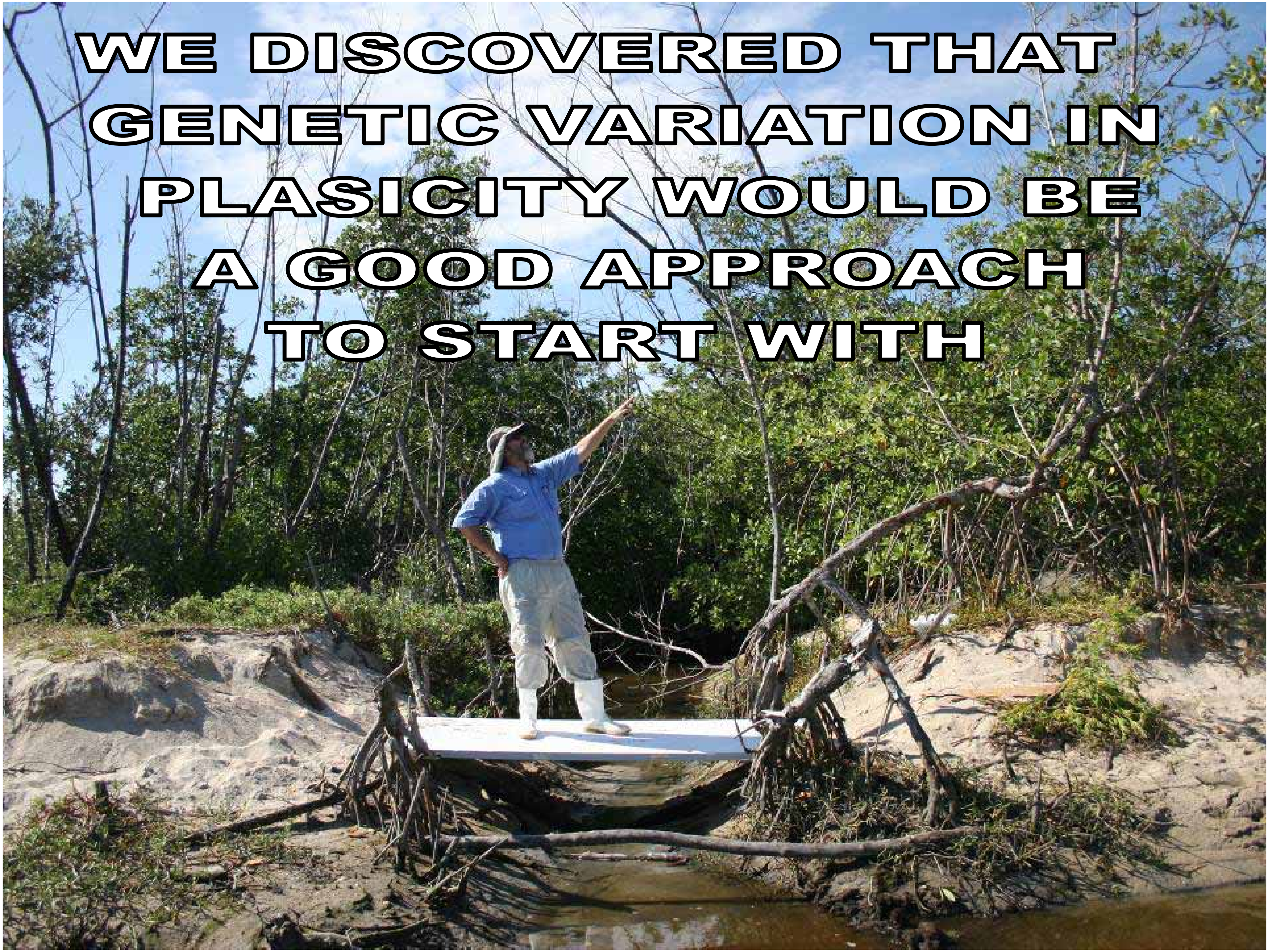
WILL HAVE TO
ADAPT
TO CHANGING

PHYSICAL CONDITIONS
&
BIOTIC INTERACTIONS

CRITICAL
THAT WE UNDERSTAND
HOW FOUNDATION SPECIES
WILL ADAPT TO
BOTH
CLIMATE CHANGE
&
HUMAN MANIPULATIONS

BECAUSE THEY AFFECT
SO MANY OTHER SPECIES


WE WERE EXPLORING WAYS
TO ADDRESS THE IMPORTANCE OF
GENETIC VARIATION
WITH CLIMATE CHANGE


WE DISCOVERED THAT
GENETIC VARIATION IN
PLASICITY WOULD BE
A GOOD APPROACH
TO START WITH

GENETIC VARIABILITY

(HERITABLE VARIATION)

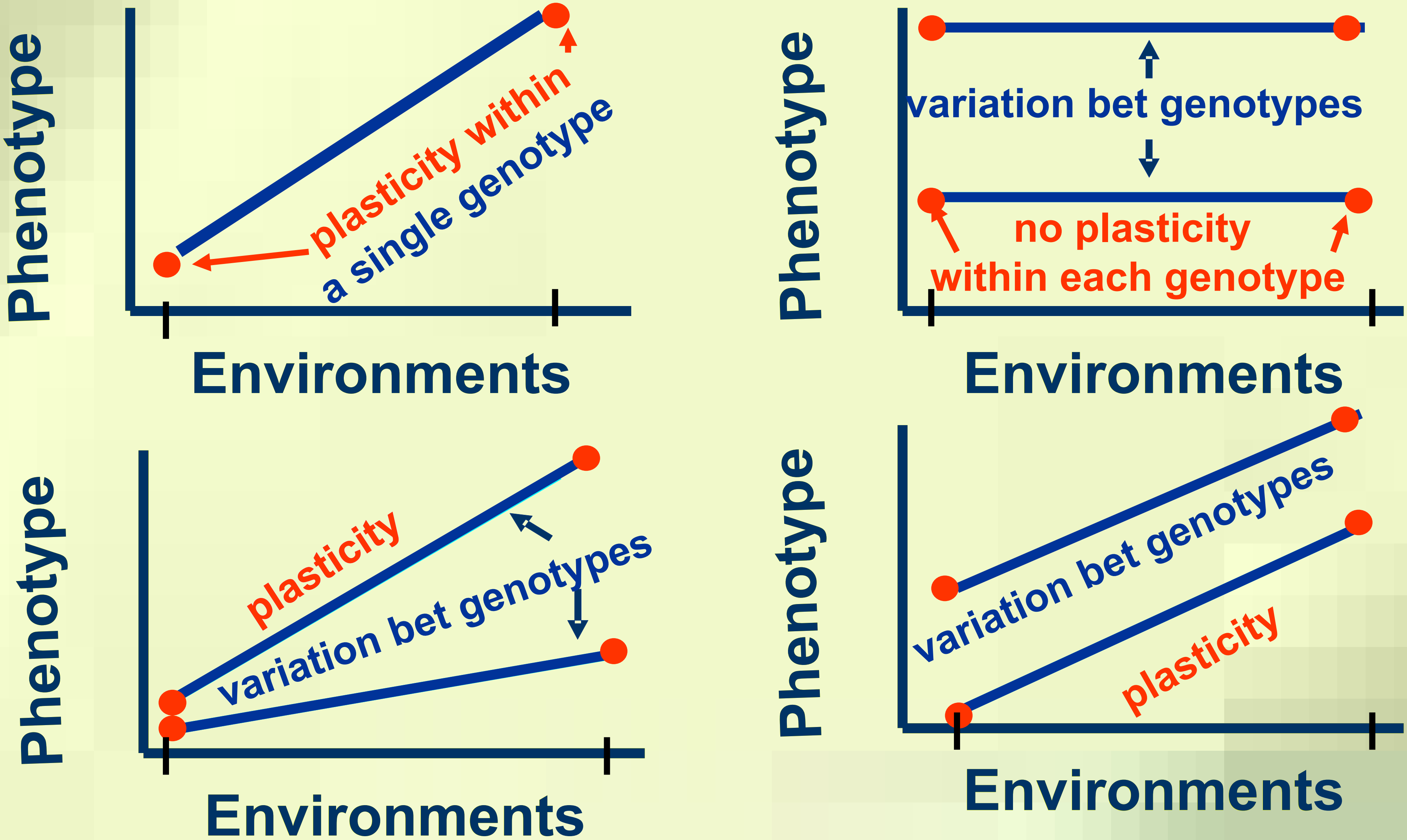
IN

PHENOTYPIC PLASTICITY

(evolution *for* plasticity)

IS IMPORTANT IN DETERMINING

FATE OF POPULATIONS



NORMS OF REACTION

QUESTIONS:
WITHIN SPECIES

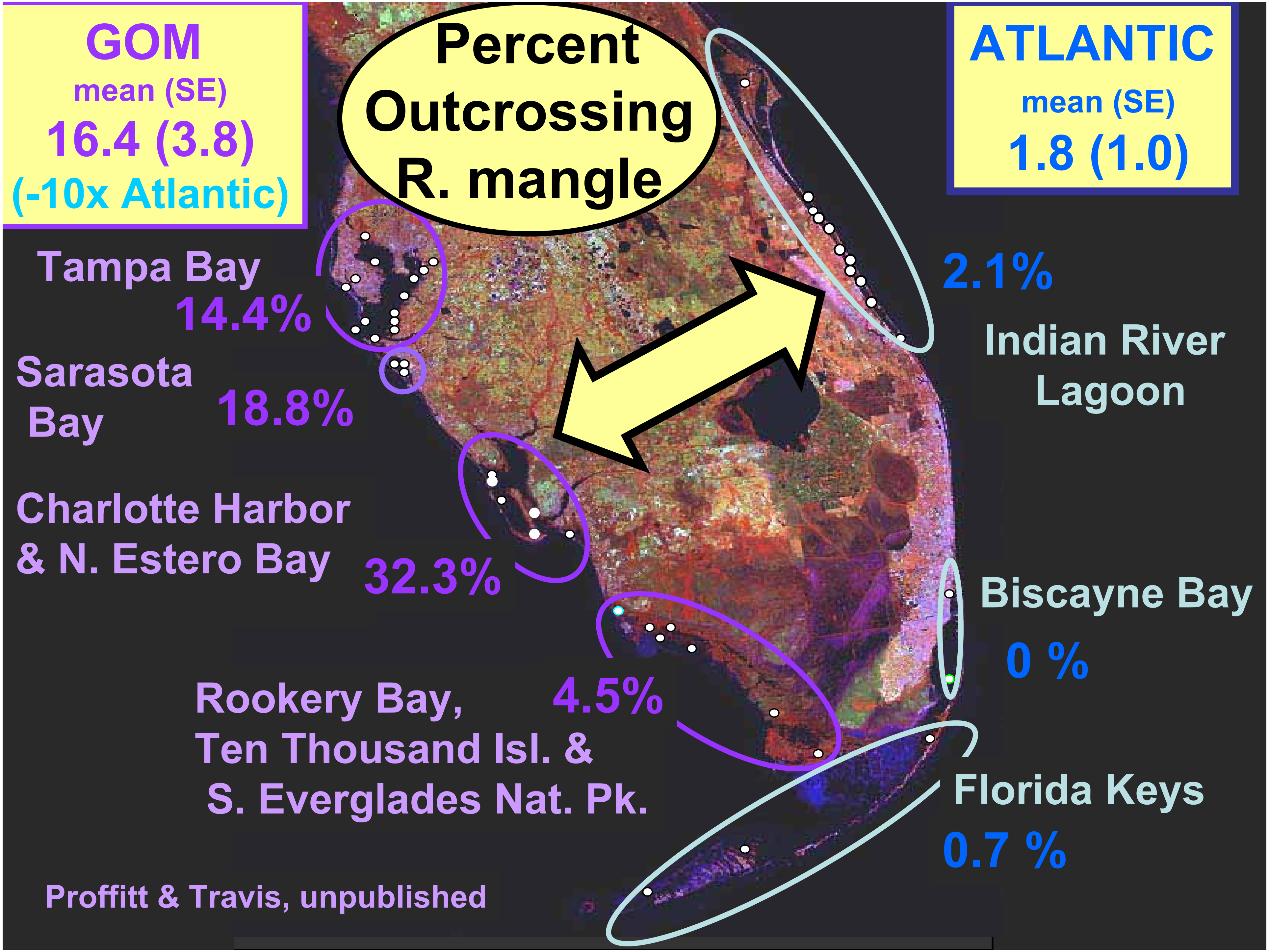
DO SEEDLING GROWTH TRAITS VARY BETWEEN RHIZOPHORA POPULATIONS FROM THE EAST AND WEST COASTS
AND
AMONG MATERNAL FAMILIES FROM EACH COAST?

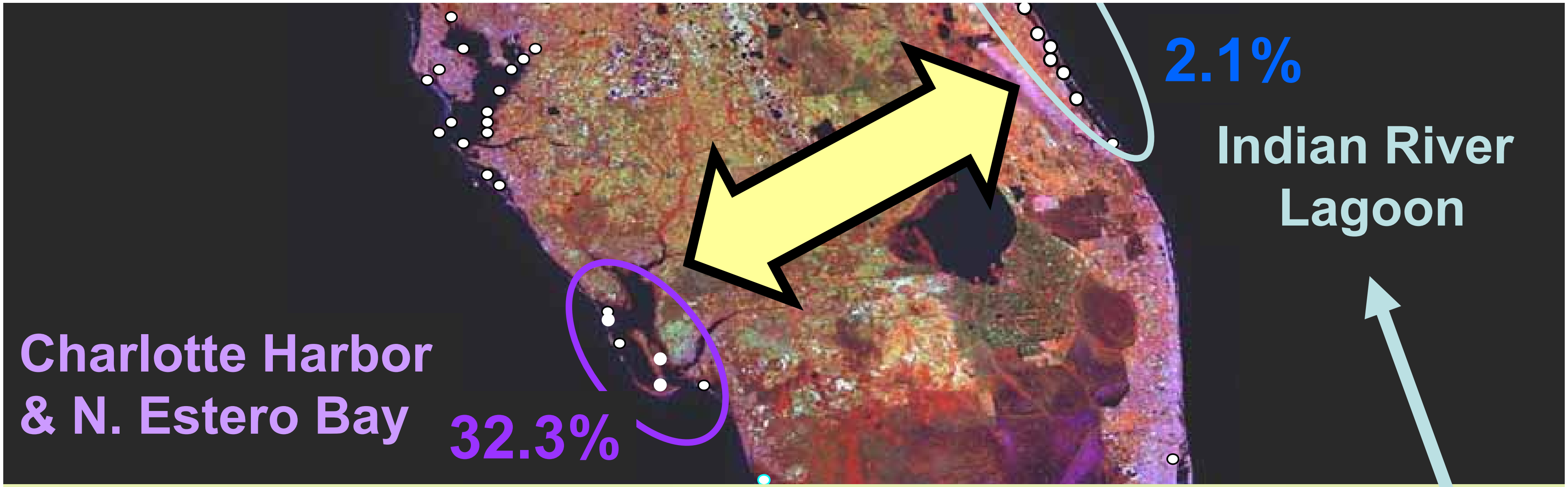
QUESTIONS (CON'T)
SPECIES INTERACTIONS

DOES FACILITATION/COMPETITION WITH OTHER SALTMARSH FOUNDATION SPECIES VARY BETWEEN THE EAST AND WEST COAST POPS & AMONG MATERNAL FAMILIES FROM THE EAST AND WEST COASTS?

QUESTIONS (CON'T)
SPECIES INTERACTIONS

DOES INFESTATION BY PARASITES VARY BETWEEN THE EAST AND WEST COAST POPS
&
AMONG MATERNAL FAMILIES FROM THE EAST AND WEST COASTS?


GOM
mean (SE)
16.4 (3.8)
(-10x Atlantic)
Percent
Outcrossing
R. mangle
ATLANTIC
mean (SE)
1.8 (1.0)
Tampa Bay
14.4%
Sarasota
Bay
18.8%
2.1%
Indian River
Lagoon
Charlotte Harbor
& N. Estero Bay
32.3%
Biscayne Bay
0 %
Rookery Bay,
Ten Thousand Isl. &
S. Everglades Nat. Pk.
4.5%
Florida Keys
0.7 %
Proffitt & Travis, unpublished



EXPERIMENTAL DESIGN

COLLECTED PROPAGULES FROM:
5 MATERNAL TREES ON WEST COAST
5 MATERNAL TREES ON EAST COAST

PLANTED RECIPROCAL COMMON GARDENS
ON EACH COAST
THAT CONTAINED ALL FAMILIES

TODAY I WILL PRESENT
DATA FROM
COMMON GARDEN
EXPERIMENT
ON THE EAST COAST


TWO 175 m TRANSECTS ON EACH SIDE
EAST SITE & WEST SITE

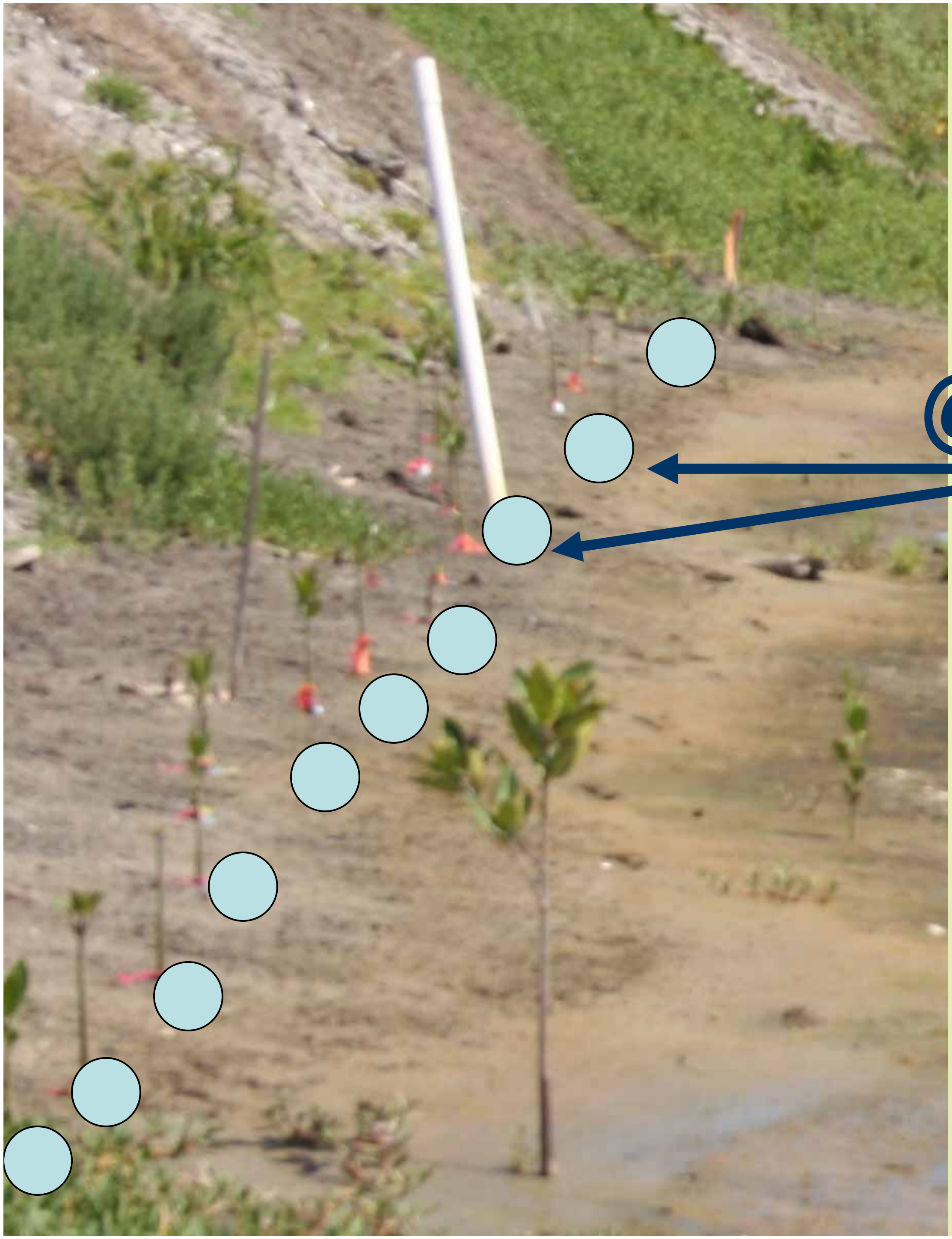
FOR EACH OF THE
10 MATERNAL FAMILIES

10-20 SIBLINGS (REPLICATES)
WERE PLANTED ALONG EACH TRANSECT AT 1 m CENTERS

175 SEEDLINGS/ TRANSECT

TOTAL:

350 SEEDLINGS
(20 – 40 SIBLINGS FROM EACH MATERNAL FAMILY)



PLANTED SEEDLINGS @ 1m CENTERS

RANDOMIZED BY FAMILY ALONG EACH TRANSECT

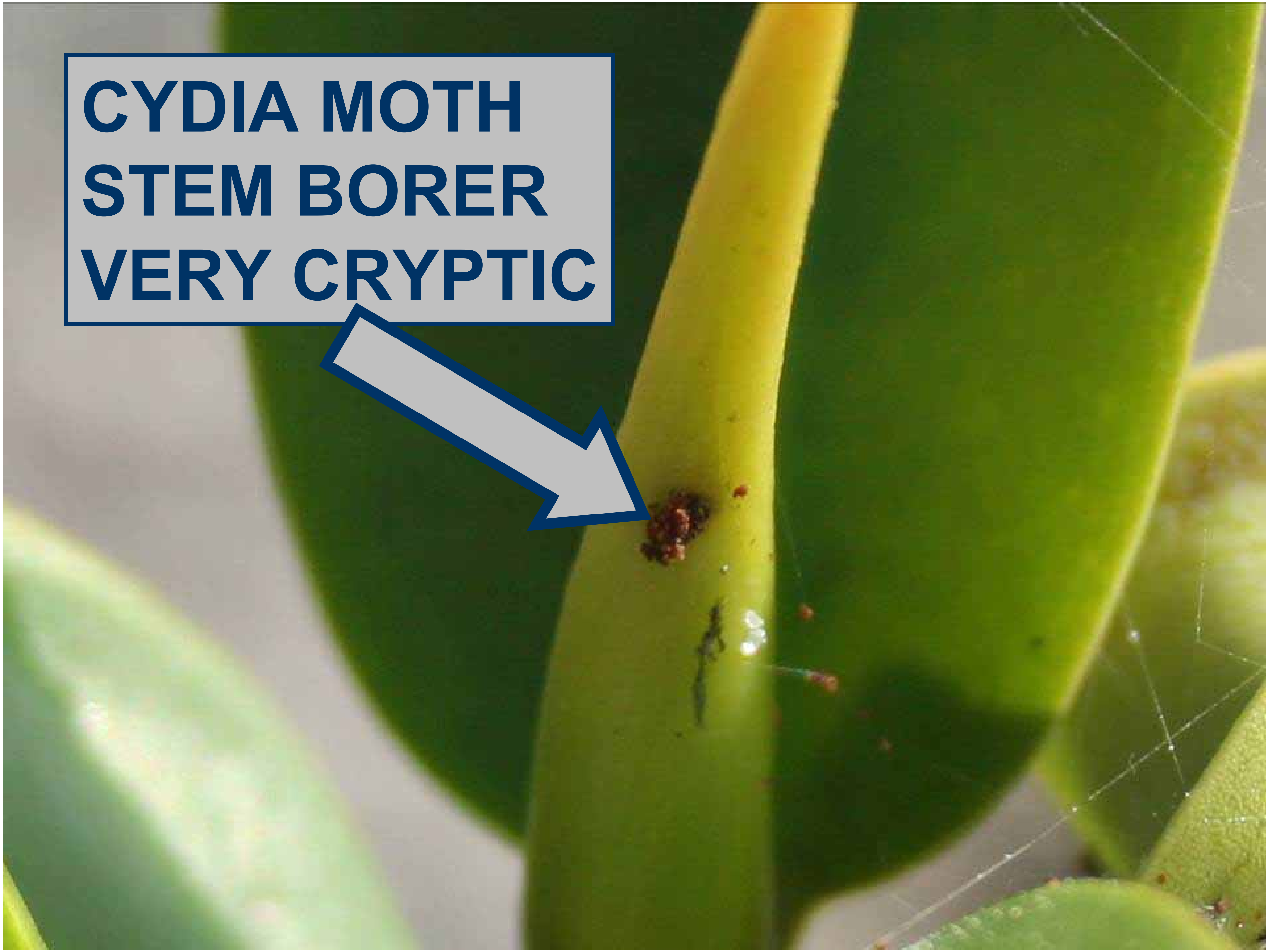

NOT OURS

HERBACEOUS COMPETITORS/FACILITATORS

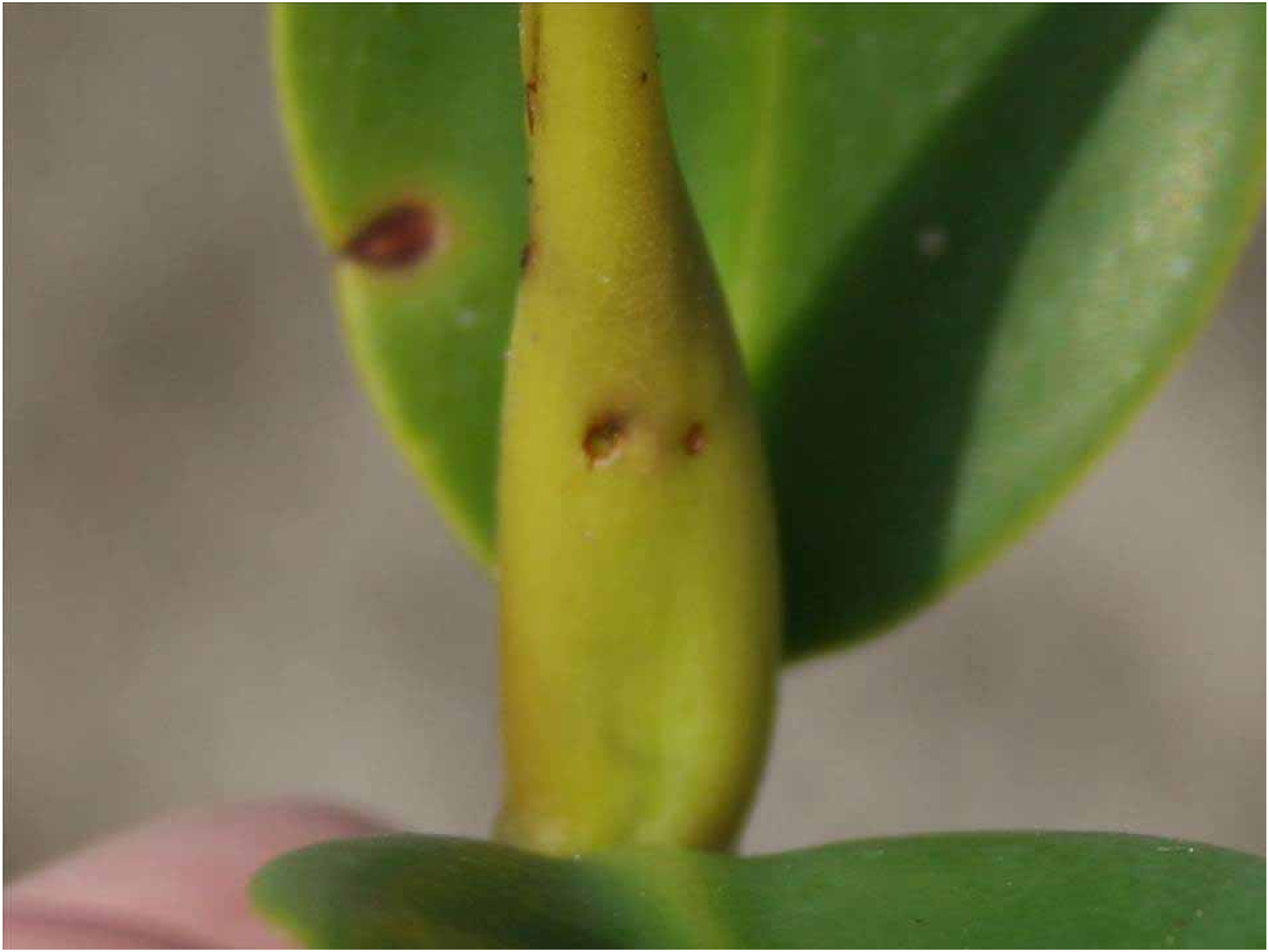
DISTICHLIS
SESUVIUM
IPOMAEA
IVA

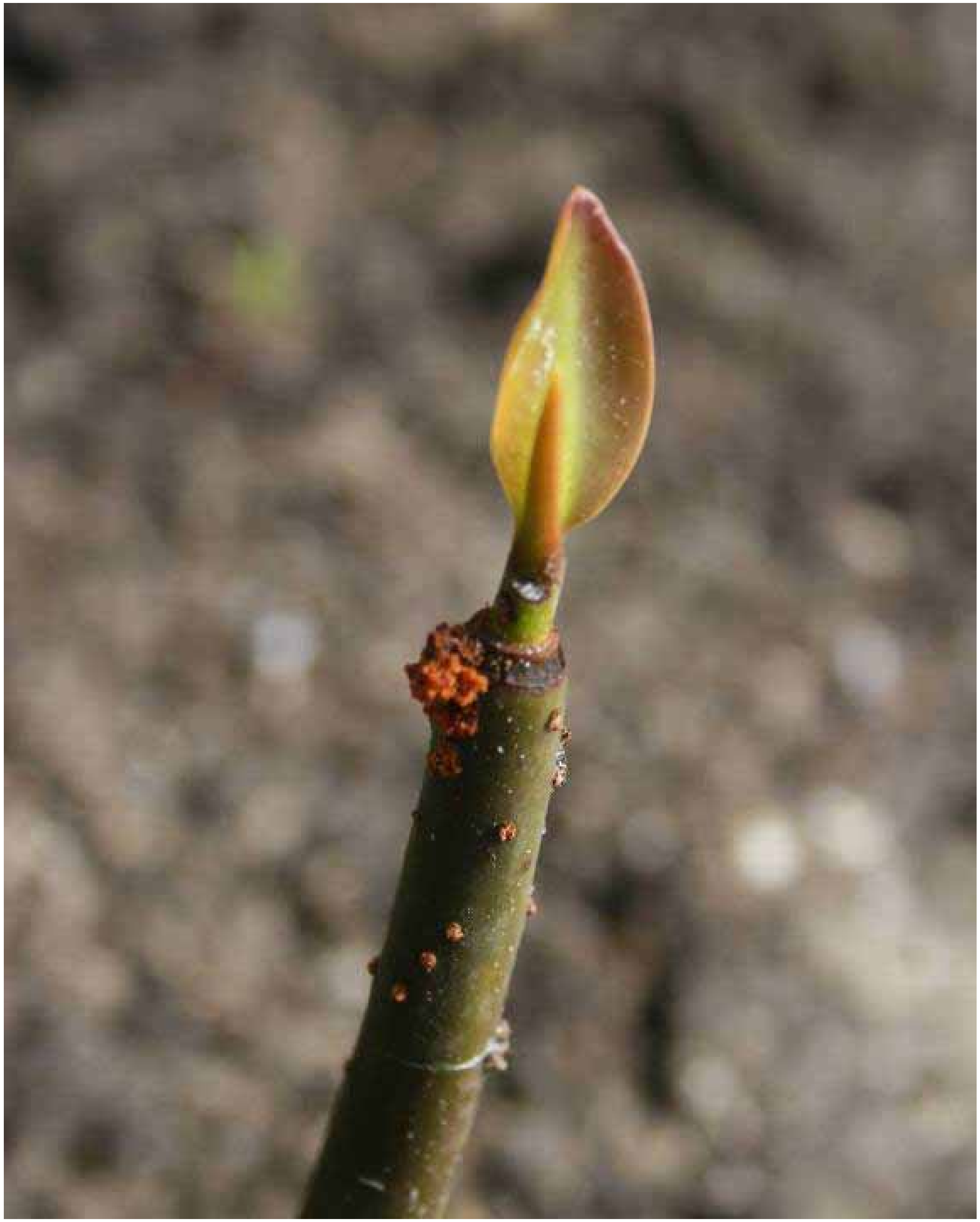
RESPONSE VARIABLES

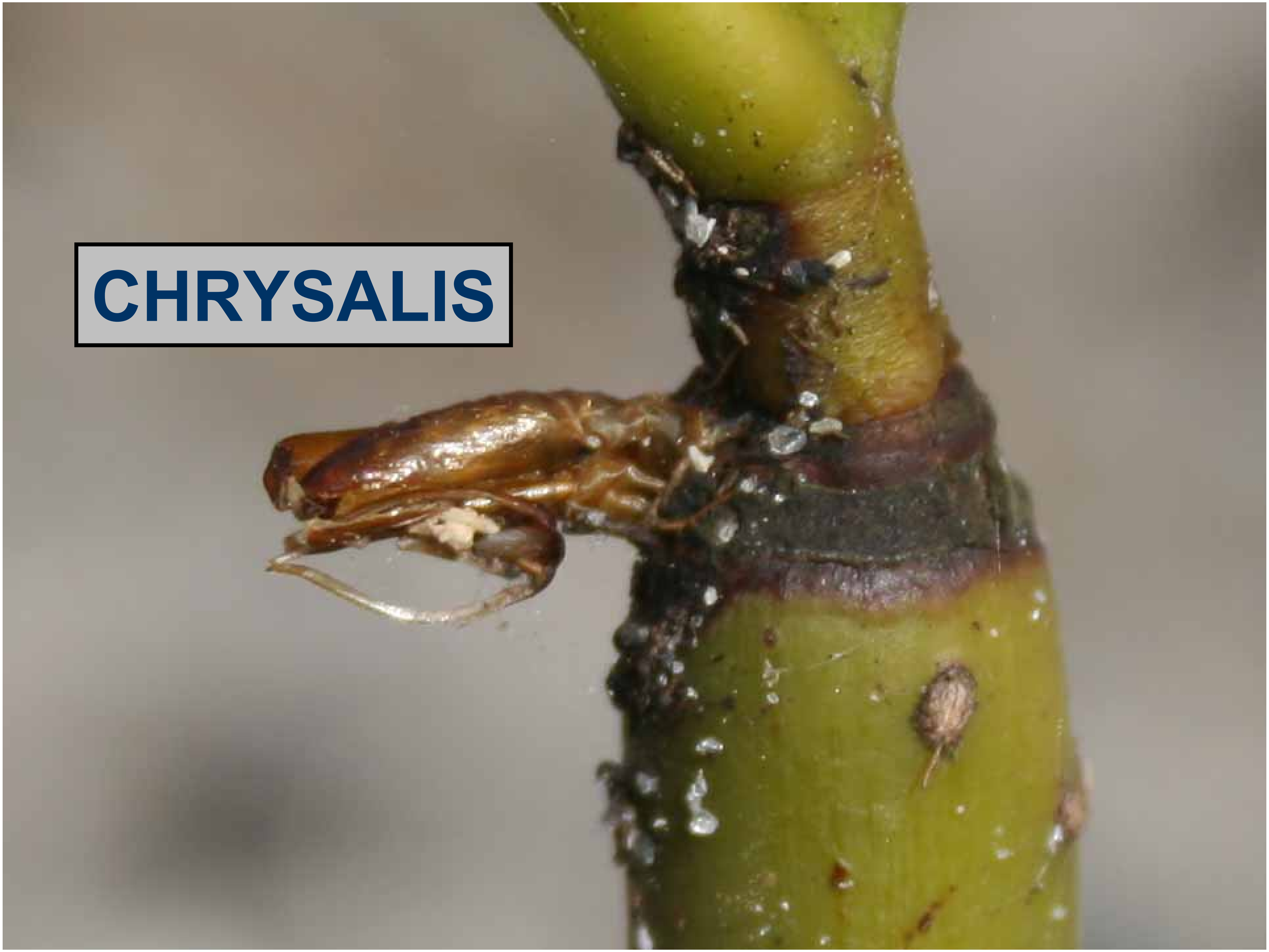
- INFESTATION ←
- LEAF PRODUCTION
- HEIGHT


CYDIA MOTH
STEM BORER
VERY CRYPTIC


FRASS ONLY WAY
TO POSITIVELY IDENTIFY
THE ENTRANCE HOLE





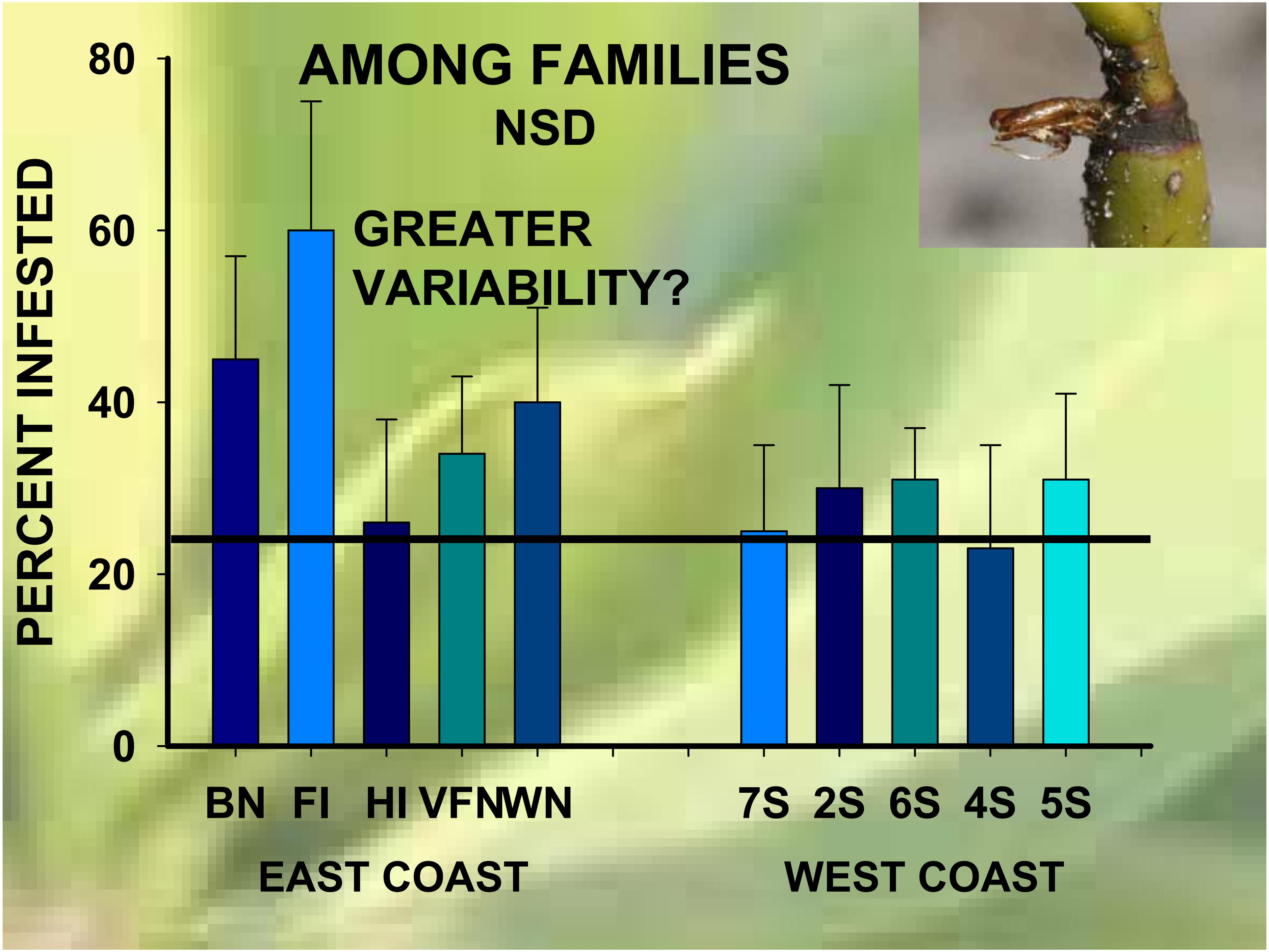

CHRYSALIS

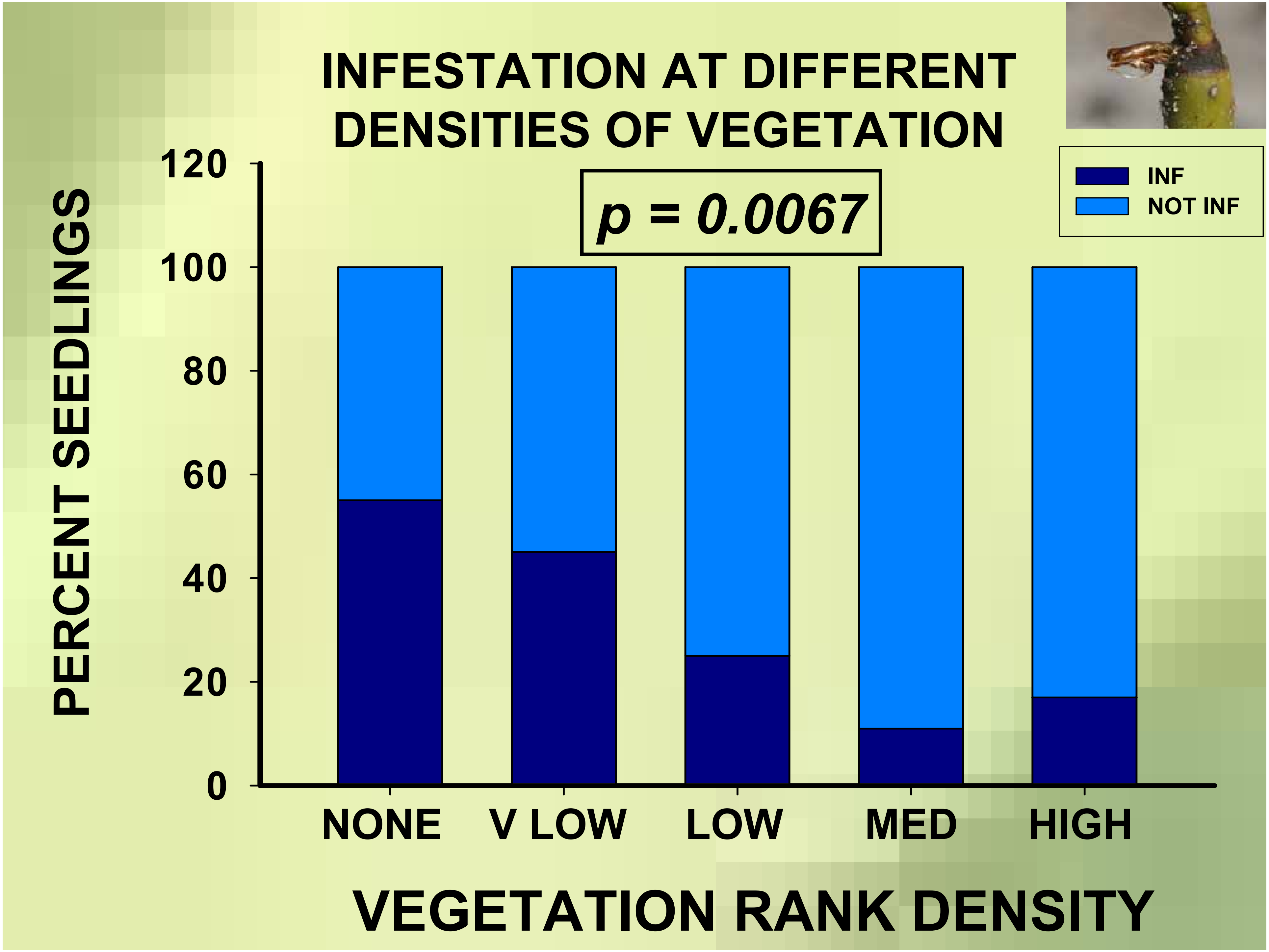
EXIT HOLES ON LOWER SEEDLING OFTEN BURIED


47

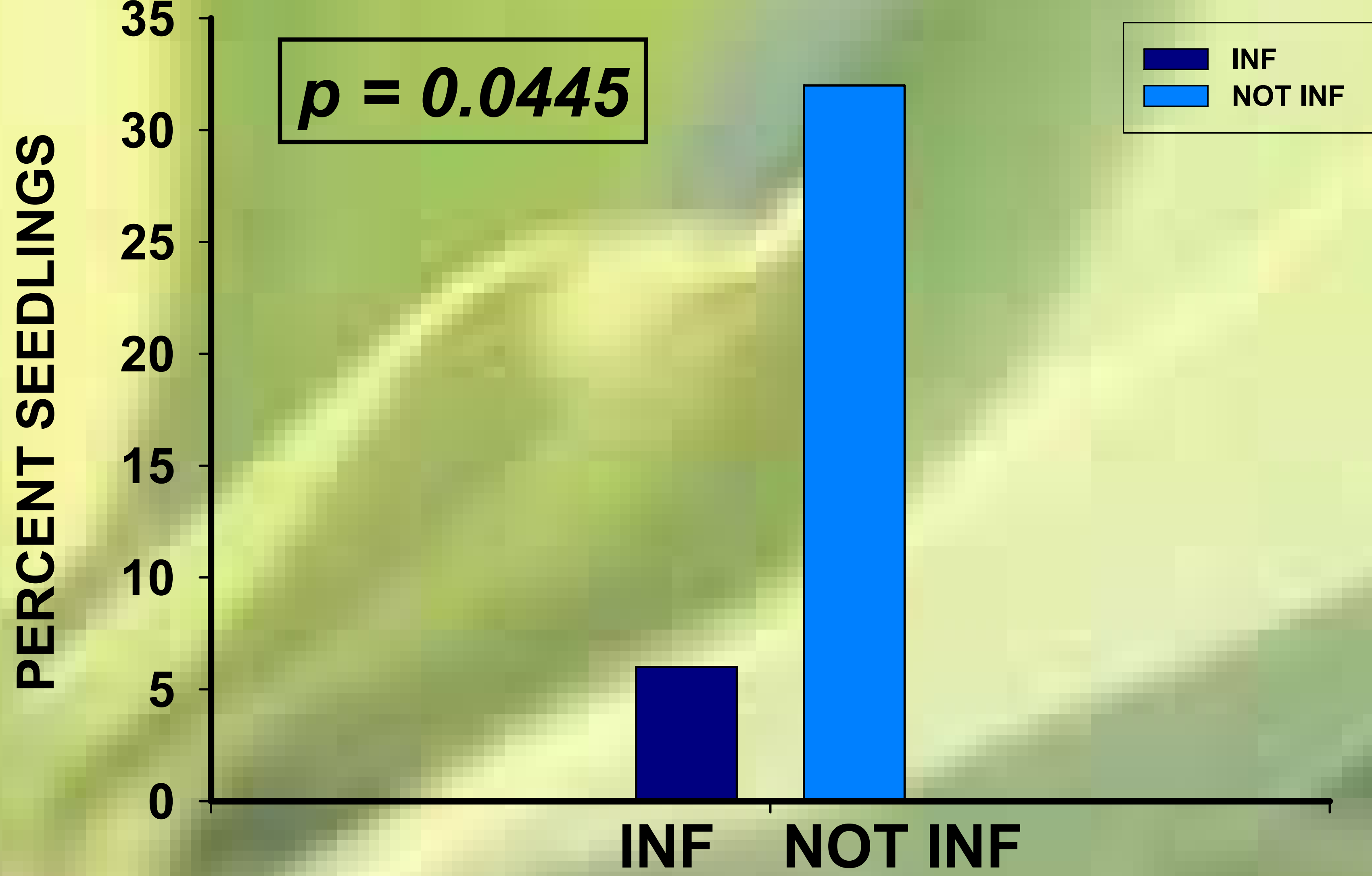
INFESTATION

LOGISTIC REGRESSION	best fit $R^2 = .2515$
	WALD *p*
COAST	0.9126
MATERNAL FAMILY	0.7593
DISTICHLIS	0.0445 *
VEGETATION DENSITY	0.0067 *
PROPAGULE WEIGHT	0.9902


AMONG FAMILIES
NSD
GREATER VARIABILITY?
PERCENT INFESTED
80
60
40
20
0
BN
FI
HI
VFN
WN
7S
2S
6S
4S
5S
EAST COAST
WEST COAST


INFESTATION AT DIFFERENT
DENSITIES OF VEGETATION
p = 0.0067
INF
NOT INF
PERCENT SEEDLINGS
120
100
80
60
40
20
0
NONE
V LOW
LOW
MED
HIGH
VEGETATION RANK DENSITY

SEEDLING INFESTATION WITH DISTICHLIS PRESENT



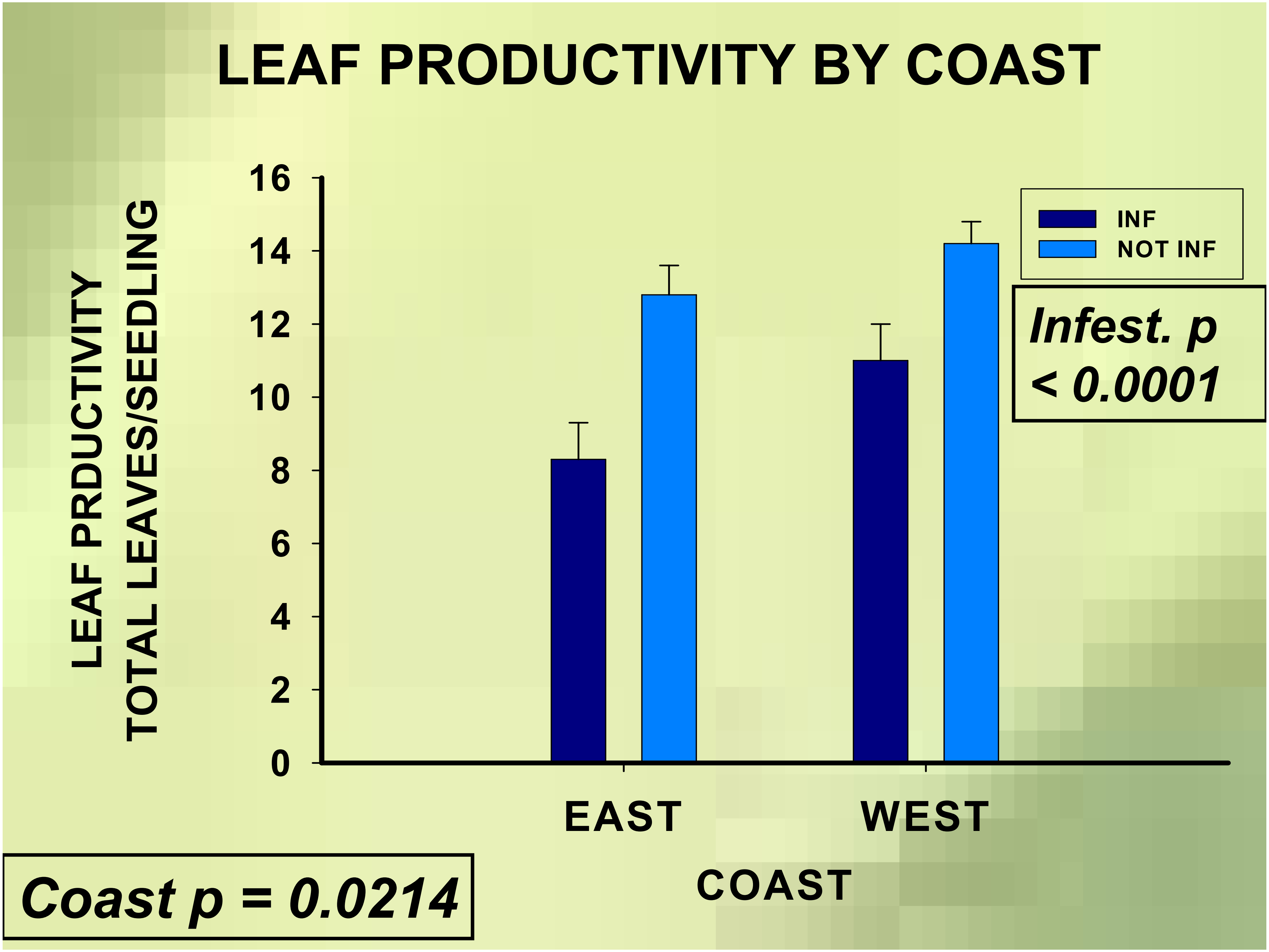
LEAF PRODUCTIVITY

* INFESTATION
*COAST
*MATERNAL FAMILY
* INF * SITE * COAST

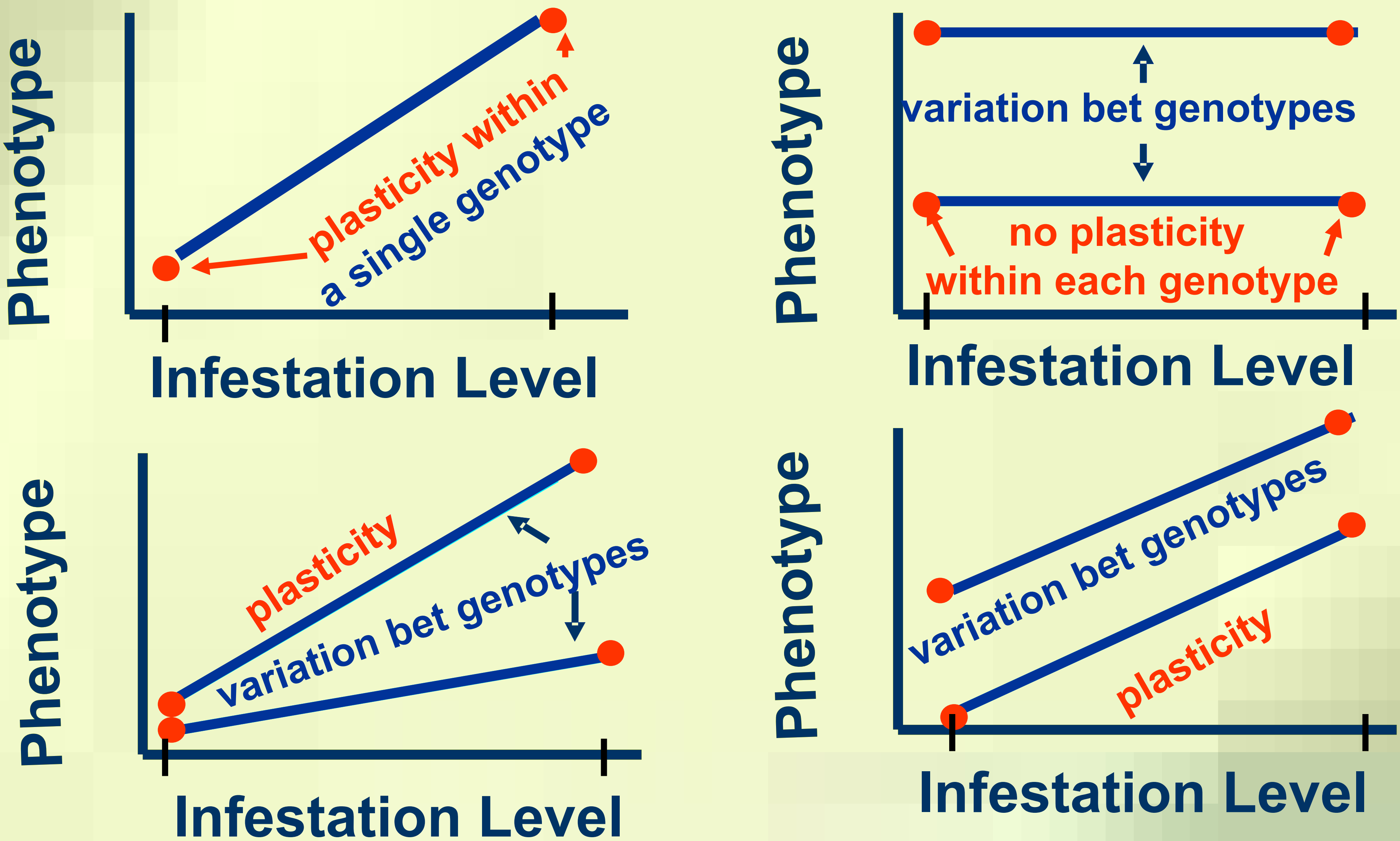
PRODUCTIVITY (TOTAL LEAVES PRODUCED)

ANOVA $R^2 = 0.281$

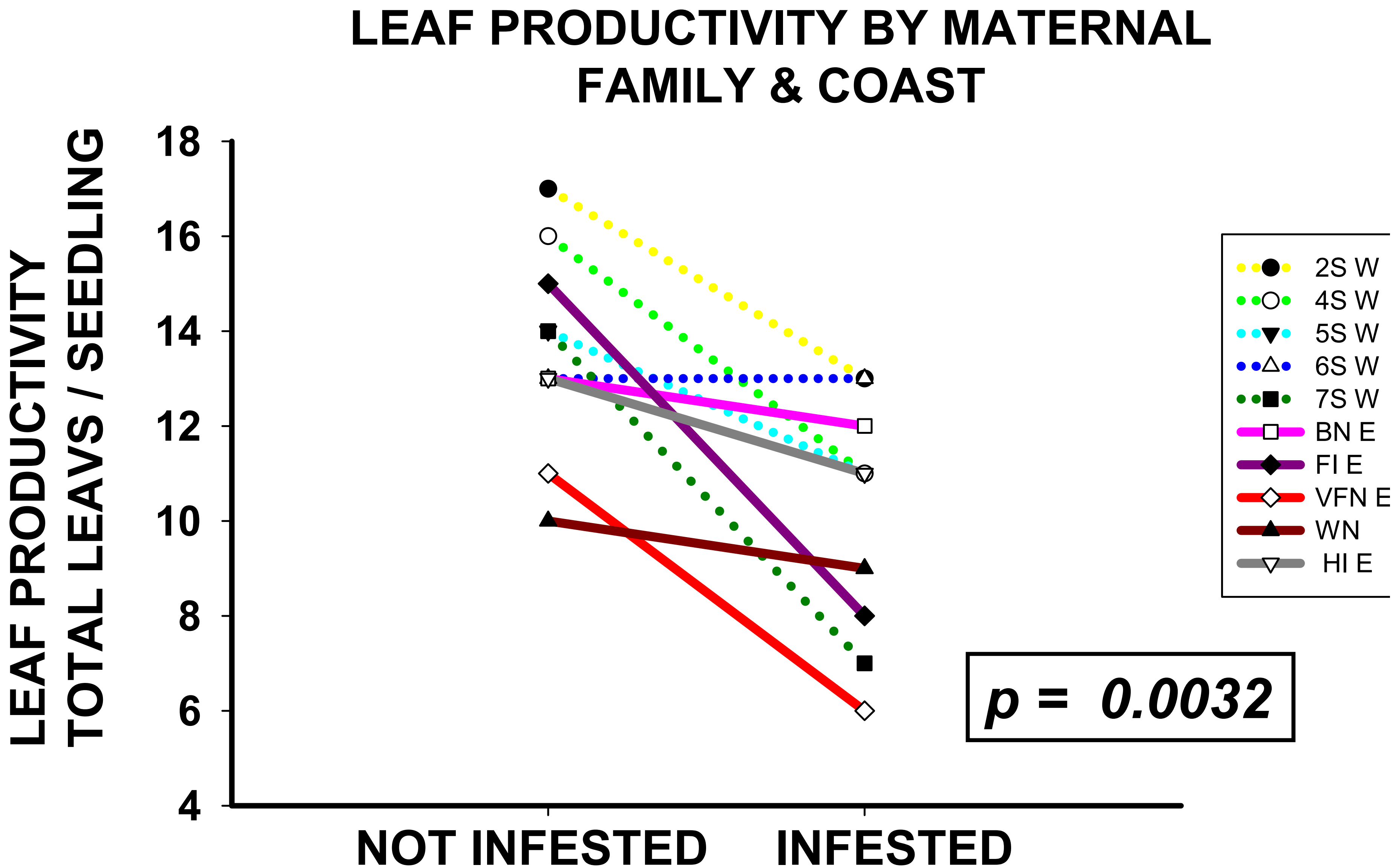
SOURCE	Pr > F
INFESTATION	<.0001 *
EXP. SITE	0.2329
COAST OF ORIGIN	0.0214 *
MATERNAL FAMILY	0.0219 *
INFEST * COAST	0.4202
INF * SITE * COAST	0.0032 *
prop wt (covariate)	<.0001



LEAF PRODUCTIVITY BY COAST
LEAF PRDUCTIVITY
TOTAL LEAVES/SEEDLING
0
2
4
6
8
10
12
14
16
INF
NOT INF
Infest. p < 0.0001
EAST
WEST
COAST
Coast p = 0.0214

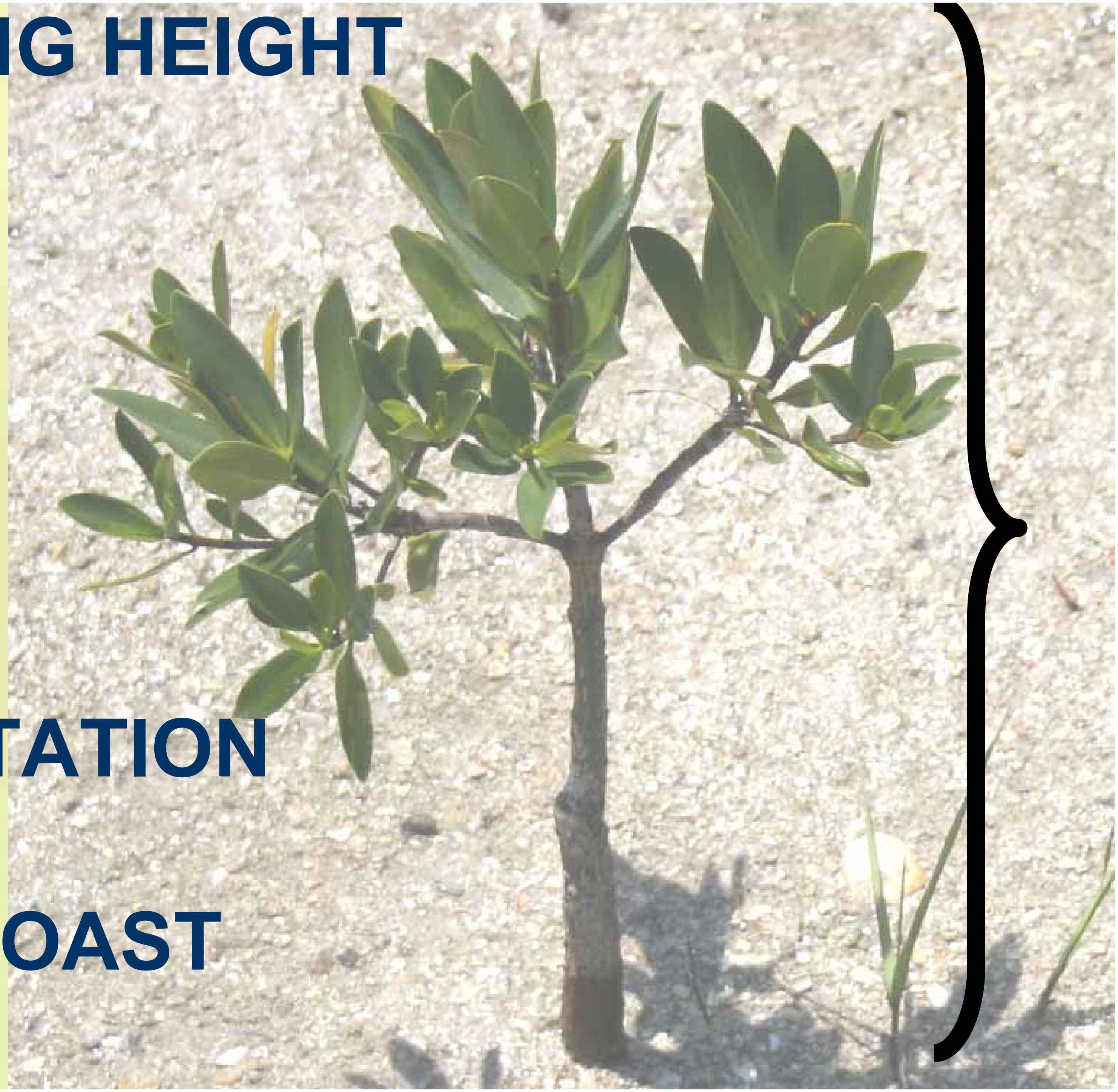


NORMS OF REACTION



LEAF PRODUCTIVITY BY MATERNAL FAMILY & COAST
LEAF PRODUCTIVITY
TOTAL LEAVS / SEEDLING
18
16
14
12
10
8
6
4
NOT INFESTED
INFESTED
2S W
4S W
5S W
6S W
7S W
BN E
FI E
VFN E
WN
HI E
p = 0.0032

SEEDLING HEIGHT

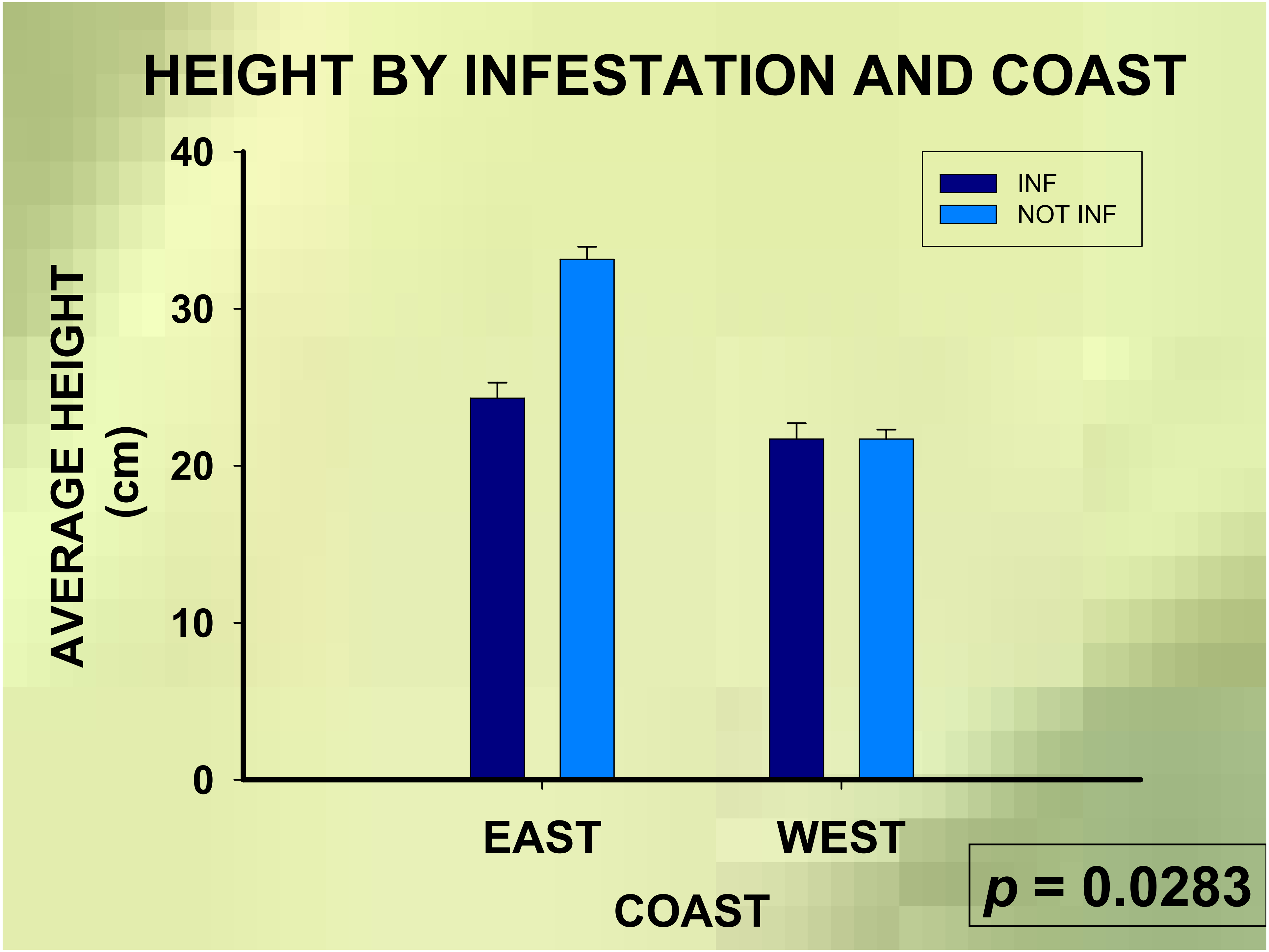


*** INFESTATION**
***COAST**
*** INF * COAST**

TOTAL HEIGHT

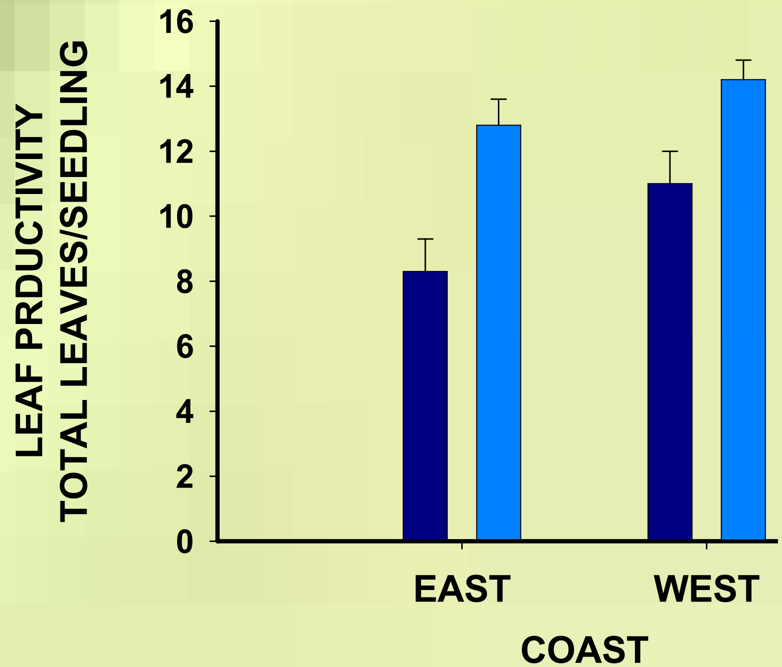
ANOVA $R^2 = 0.51$

Source	Pr > F
INFESTATION	<.0001 *
EXP. SITE	0.5574
COAST	<.0001 *
MATERNAL FAMILY	0.0884
INFEST * COAST	0.0283 **
INFEST * EXP. SITE*	0.8098
propagule weight (covariate)	<.0001

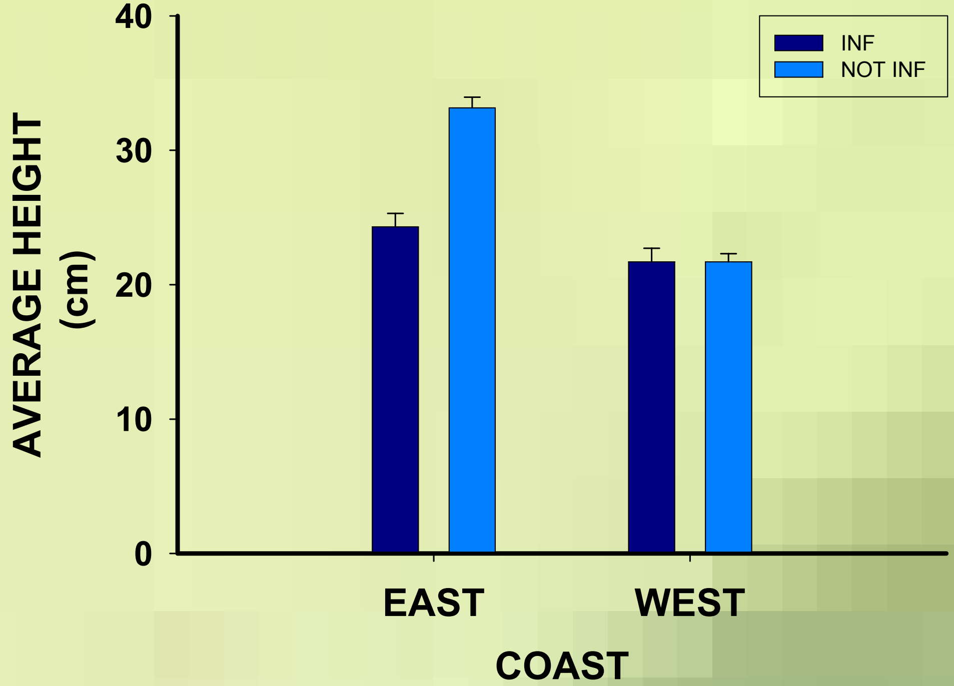

HEIGHT BY INFESTATION AND COAST
AVERAGE HEIGHT (cm)
40
30
20
10
0
INF
NOT INF
EAST
WEST
COAST
p = 0.0283

SEEDLING ARCHITECTURE

LEAF PRODUCTIVITY



SEEDLING HEIGHT



WITHIN-SPECIES BIODIVERSITY (MATERNAL FAMILIES) OF THE FOUNDATION SPECIES *RHIZOPHORA MANGLE* AFFECTS ONE ECOLOGICAL FUNCTION --- PRODUCTIVITY

MATERNAL FAMILY DIVERSITY ALSO AFFECTS OUTCOMES OF INTERACTIONS BETWEEN *RHIZOPHORA*

AND HERBACEOUS PLANTS

AND PARASITIC INSECTS

ALSO FOUND AN INDIRECT FACILITATIVE EFFECT OF HERBACEOUS SPECIES (*DISTICHLIS*) BY REDUCING THE RATE OF PARASITISM


THANKS TO:
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SUPPORT
FIELD HELP BY:
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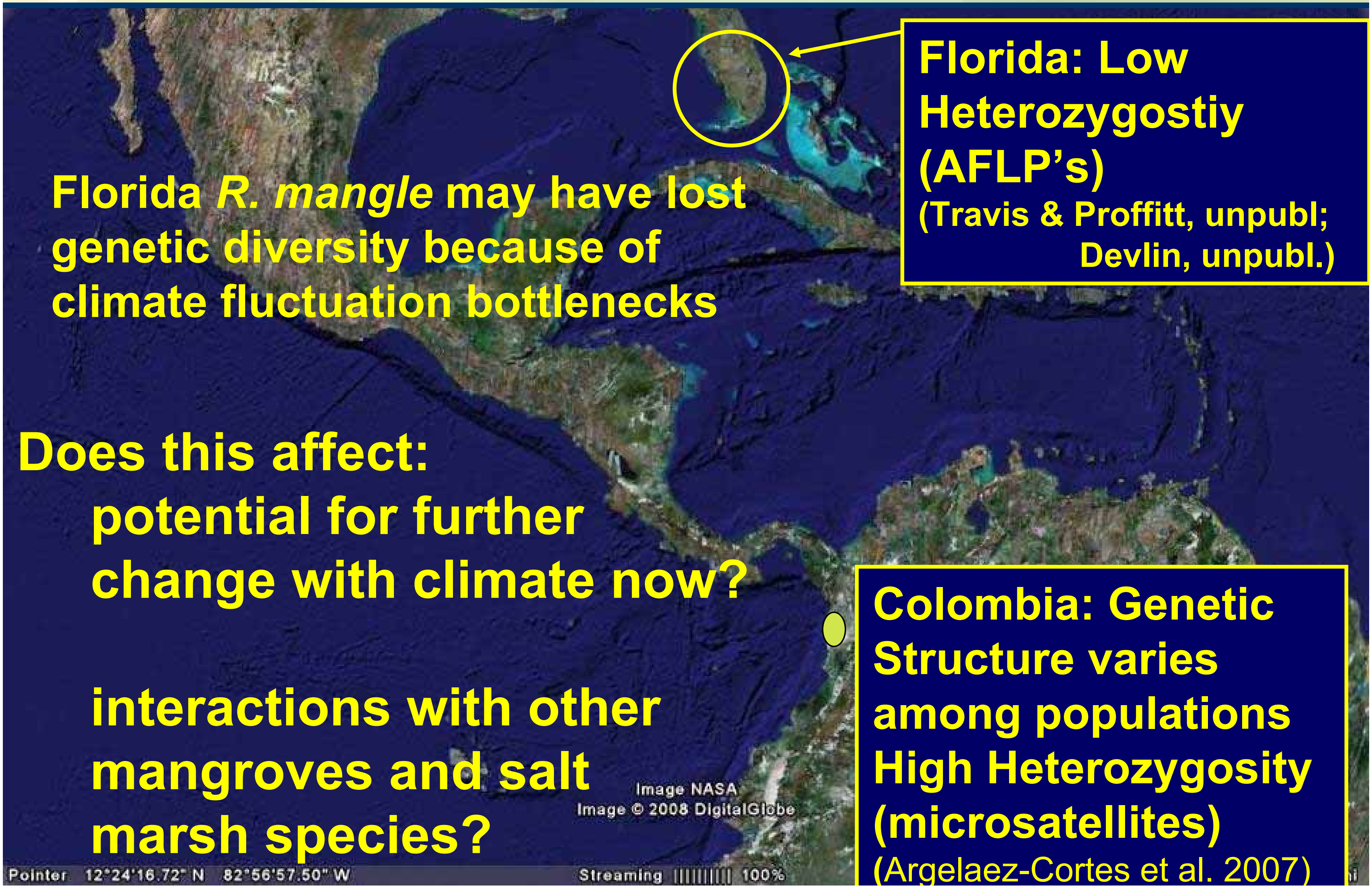
Red Mangrove Genetic Diversity



Florida: Low Heterozygostiy (AFLP's)
(Travis & Proffitt, unpubl; Devlin, unpubl.)

Florida *R. mangle* may have lost genetic diversity because of climate fluctuation bottlenecks

Does this affect:

- **potential for further change with climate now?**
- **interactions with other mangroves and salt marsh species?**

Colombia: Genetic Structure varies among populations High Heterozygosity (microsatellites)
(Argelaez-Cortes et al. 2007)