

WHEN DUNES MISBEHAVE




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The Coastal Engineering Community has become quite proficient working with the fluids of Wave, Wind and Weather, but with recent focus on construction of dunes, faces for the first time a fluid with an agenda. That is LIVING BEHAVIOR. The living dune ecosystem, can sometimes perform in unexpected ways, at times beneficial and occasionally harmful.



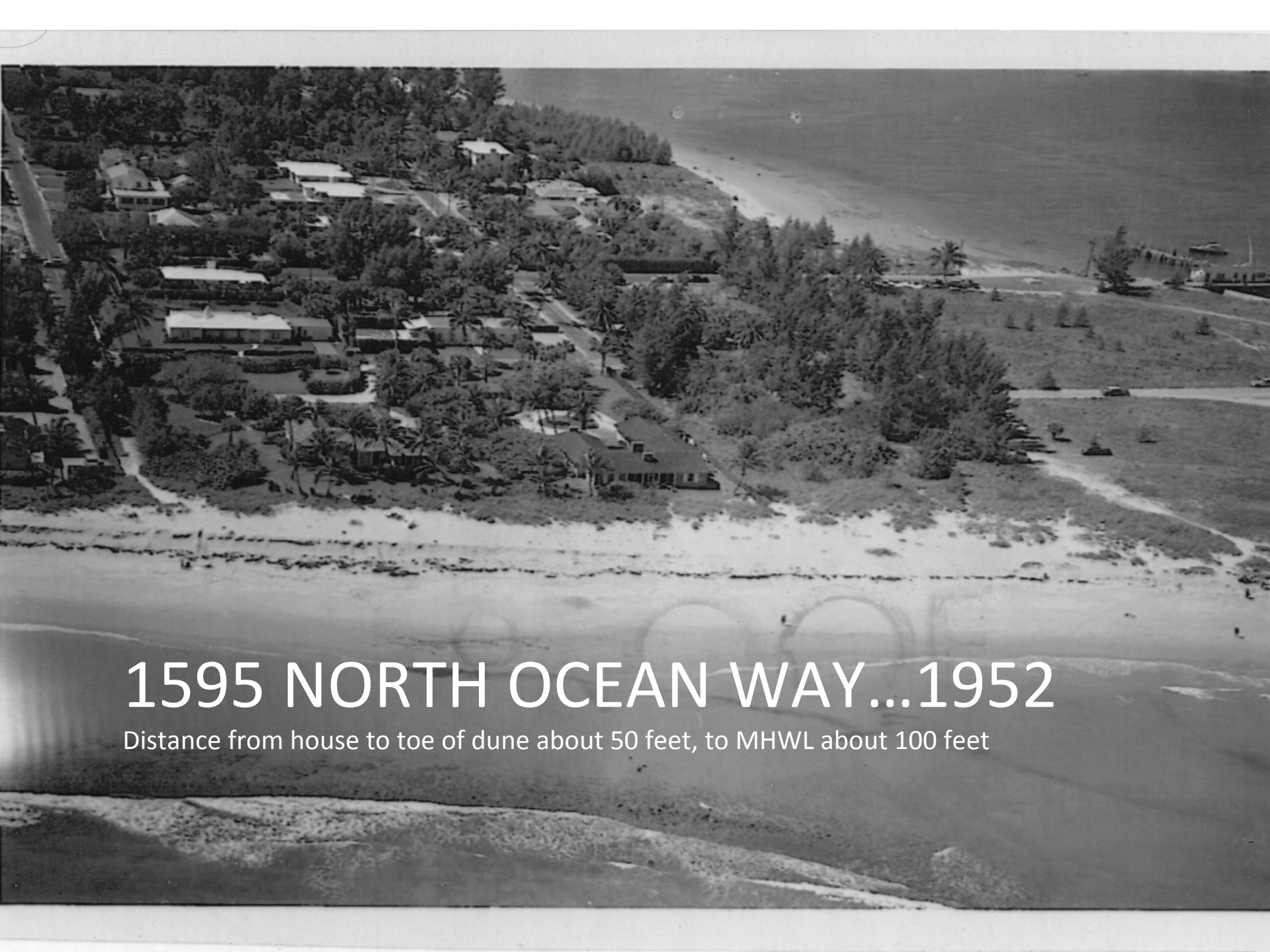
I'll talk about..

- **UNEXPECTED HORIZONTAL SPREAD**
- **UNEXPECTED VERTICLE ACCRETION**
- **EXOTIC SPECIES CONTAMINATION**
- **NATIVE SPECIES DIFFICULTIES**
- **POOR PLANTING PERFORMANCE**

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Ca 1940, just South of Palm Beach Inlet




1595 NORTH OCEAN WAY...1952

Distance from house to toe of dune about 50 feet, to MHWL about 100 feet


Photo from same approximate position, with now 650 feet to water line. How bout' them inlets?





2017..400 foot advance to veg line






Hillsboro Beach.
No dune but interested private
owners.

Owner would only invest if FDEP permit allowed regular maintenance to limit spread to original installed footprint.

So regulatory assurance was provided



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DELRAY BEACH 1970 BEFORE FIRST NOURISHMENT..AIA threatened and protected only by rock revetment. No vegetation surviving seaward of the roadway.



Forty years later, 165 foot wide pioneer and strand zone dune , which has captured as much sand as a complete nourishment project, with up to 14 vertical feet in spots.





Sand capture and vertical development has raised elevations by 14 feet in some places and blocked vista from street level. Permits acquired to cut and fill bumps and fill low areas within comprehensive dune enhancement program. Not yet carried out.

At what point will dune volume exceed engineering goals?
How will that effect funding?

The sea oat and grass zone was planted six feet wide, and has expanded without further planting or supplementation. The system now supports more than 70 native species, including many rare and endangered. No permits were required . No turtles were harmed.



Ten year project permit allows control and occasional grading to installed footprint and limiting elevations so owner is assured the view and recreation area will not be lost.



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INVASIVE PLANT CONTAMINATION OF THE COASTAL DUNE AT DELRAY BEACH FLORIDA

PLANT SPECIES THAT FOLLOW ARE TO BE REMOVED FROM THE DUNE AREA OF THE MUNICIPAL BEACH AS AN ELEMENT OF THE COMPREHENSIVE DUNE MANAGEMENT PLAN, PER FLORIDA DEPT. OF ENVIRONMENTAL PROTECTION.

Most exotic contamination is man made.
This exotic installed at Delray Bch.



1980 Scaevola hedge

Between 1985 and 1997 the unmanaged dune grew.



View from the street was **this ..**

And the stuff had escaped to the open dune.

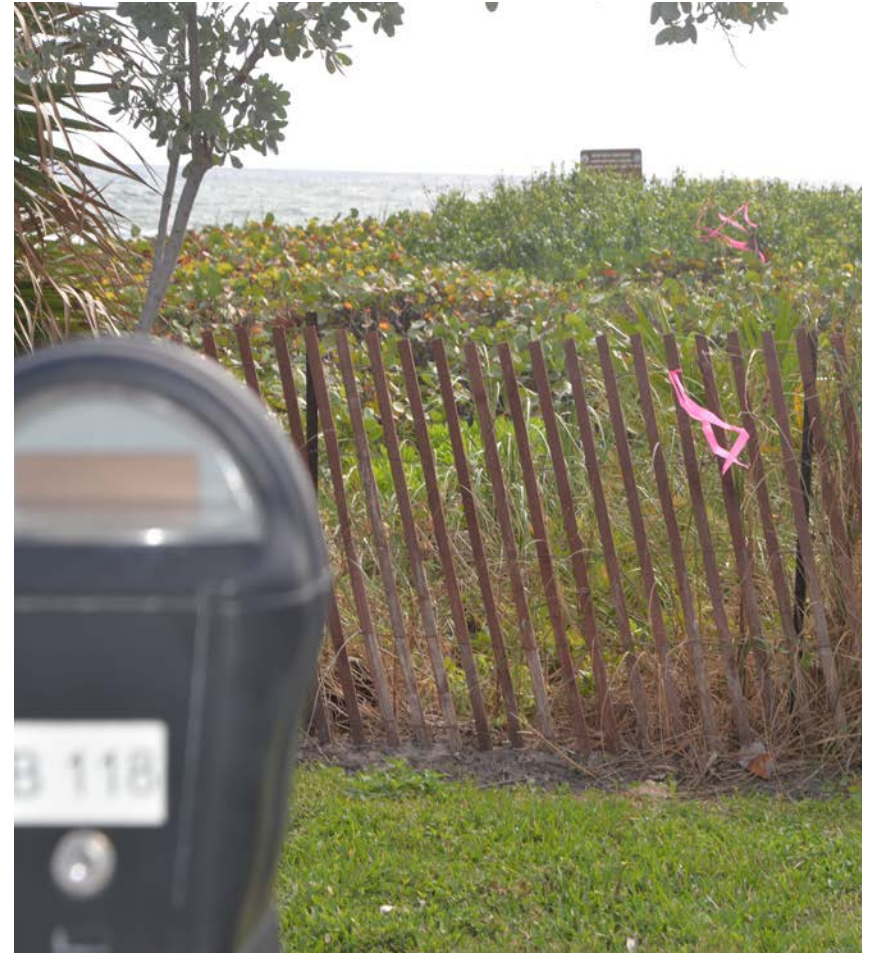



12/3/14 INSPECTION 500 FT. NORTH END Invasive exotic *Scaevola taccada*, 2 to 3 year old cluster. Cost to remove maybe \$150, this Cluster but \$30K to eradicate overall.

BRAZILIAN PEPPER, *Shinus terebinthifolia*, a sprawling shrub and heavy seeder, infests coastal and inland areas. Specimen across from the Marriot main entrance. FLEPPC Category 1 invasive exotic species.



LATHER LEAF, *Colubrina Asiatica*. A profuse seeder, like most of the other invasives, overshadows and displaces natives with typically single plant masses. Specimen at meter B-119. FLEPPC Category I.



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Dahlbergia e. at Ocean Village




Storm wave
disbursed seed

Dalbergia ecastophylum (coin vine) infestation.

Contaminating over 500 square yards this two year old infestation is only three individual plants, largest of which had 26 leads radiating out as much as 36 feet with laterals out to fifteen feet. These completely overshadow the native dune grasses and strand species below. First noticed in August of 2009.





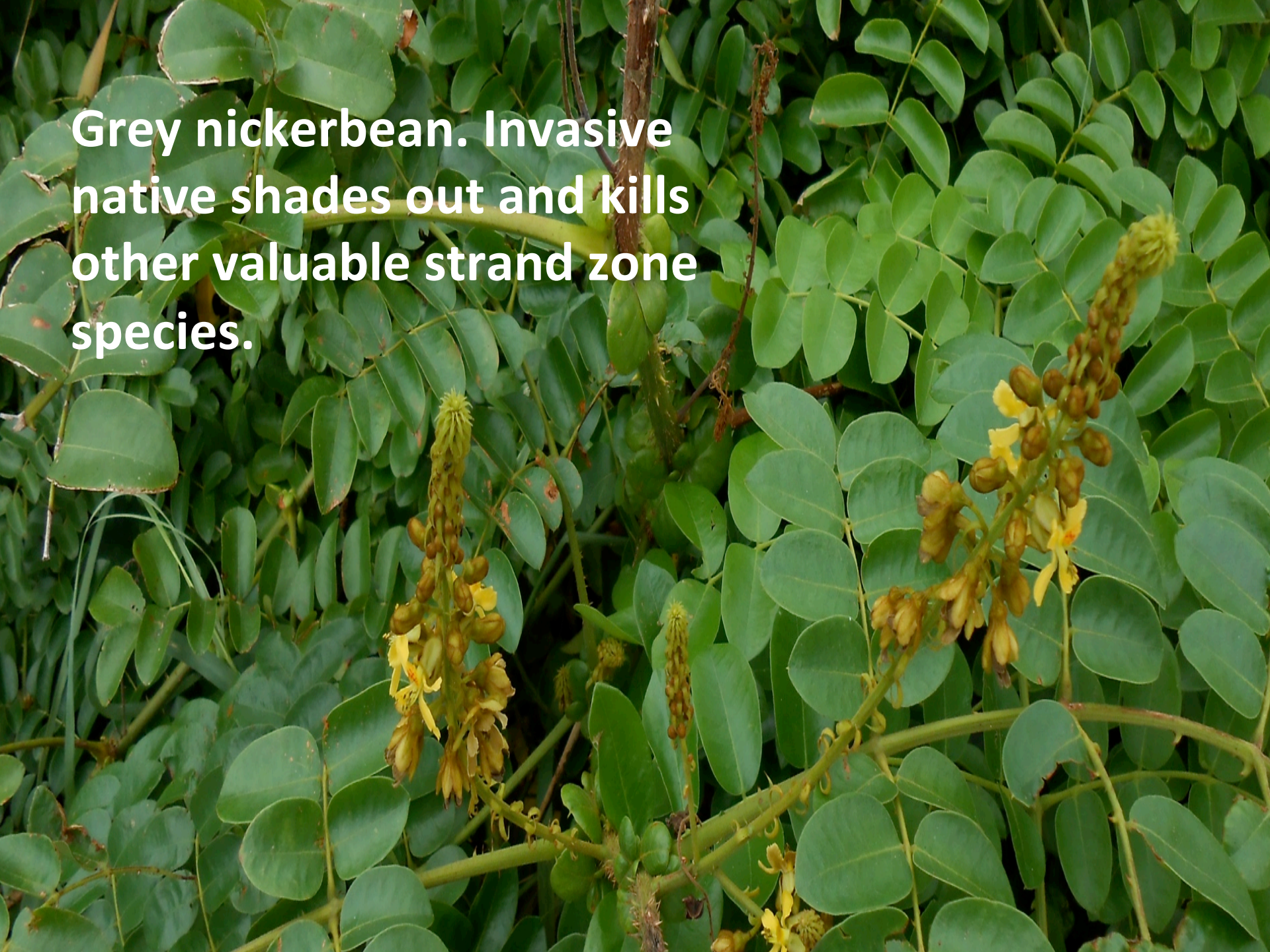
Coin vine infestation, 3
years from germination..2
individual plants covering
500 square yards of dune
overshadowed and killed,
requiring removal and
replanting. \$7,500 cost.
TOPB same situation
\$17,600 cost


Coinvine killing Midtown dune.

Easy and cheap to control, but costly if allowed to establish.



**Grey nickerbean. Invasive
native shades out and kills
other valuable strand zone
species.**





Replanting will cost minimum of
\$4/square yard.

CDB exotic removal contract \$27K after five
years of neglect.

Original seagrape plantings in small clusters
at beach access points.



Section 17 Seagrape expansion since 1985

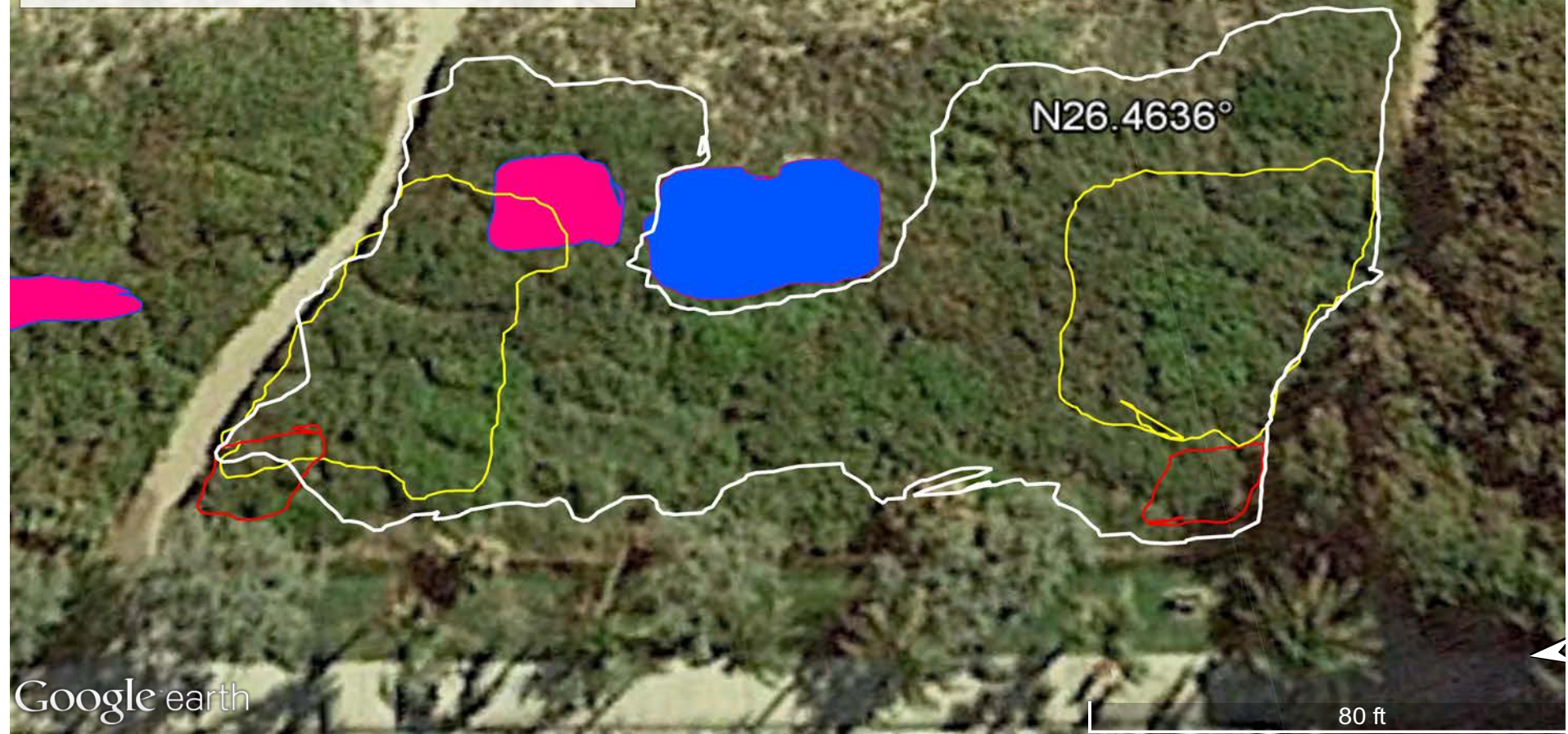
Red line is approximate footprint of seagrape clusters as installed to trap sand at access points 1982; about 300 sq ft.

Yellow is footprint at time of 2001 FDEP pruning permit; about 4,500 sq.ft.

White line is seagrape footprint at 2015 FDEP exotic removal permit; about 10,500 sq. ft.

35X increase since planting, 2.3X increase since pruning began. 7% /year, expansion since pruning began.

SEAGRAPE !!!



March 2017, FDEP permitted
Coppicing, exotic removal,
species enhancements to SER
standards

Seagrape shades and kills everything below.

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150 to 200 man days each year to prune and maintain at FDEP permitted hip height above grade. Expanding by 5-10 per cent each year. Cost with remedial projects more than \$200K Annual cost to maintain \$40K.

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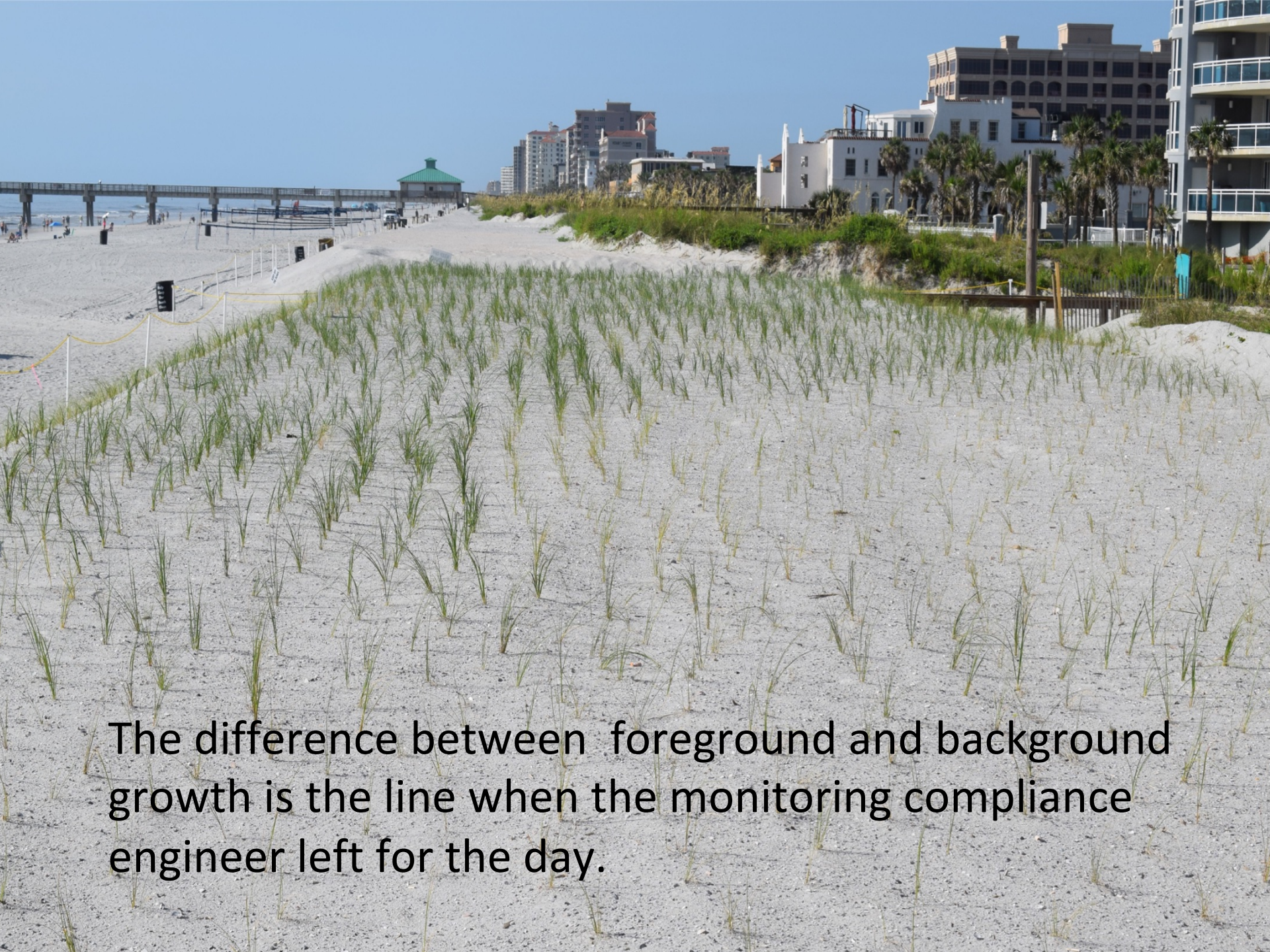
SOPHOMORIC DESIGN

Faulty plant choices, ineffective irrigation, shallow planting.





Dune planting specifications typically call for planting depths of 6 inches to get plants into zone of constant moisture. Most projects fail to achieve this, yet still get paid.
THE RESULT IS POOR PLANT SURVIVAL AND FAILURE TO THRIVE.



The difference between foreground and background growth is the line when the monitoring compliance engineer left for the day.



Left of rope..private work to spec..

Right of rope. Public project..not so much.

Local project..
Yesterday morning

Spec was top of
root ball to 6 inches
below grade. Most
plants measured at
2 to 4 inches.





So the rootballs of the new plants dry out every day. Result is maybe survival but failure to thrive. Wasted investment.


Same plants, what's different?

HYDROPHILIC GEL

no gel, planted deeper 4 weeks later, wetted in

Gel, shallow, no water in

STOP USING GELS!!

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- So.. How to do better??
 - Add an experienced plant person to your design team.
 - Write and enforce better project specifications.
 - Call out dune performance objectives and adaptive management thresholds at permitting.
 - Recognize need and fund for active dune system husbandry.
 - Allow regulatory relief to encourage private acceptance and investment in dune conservation.

THANKS FOR LISTENING

please practice redundant contraception

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