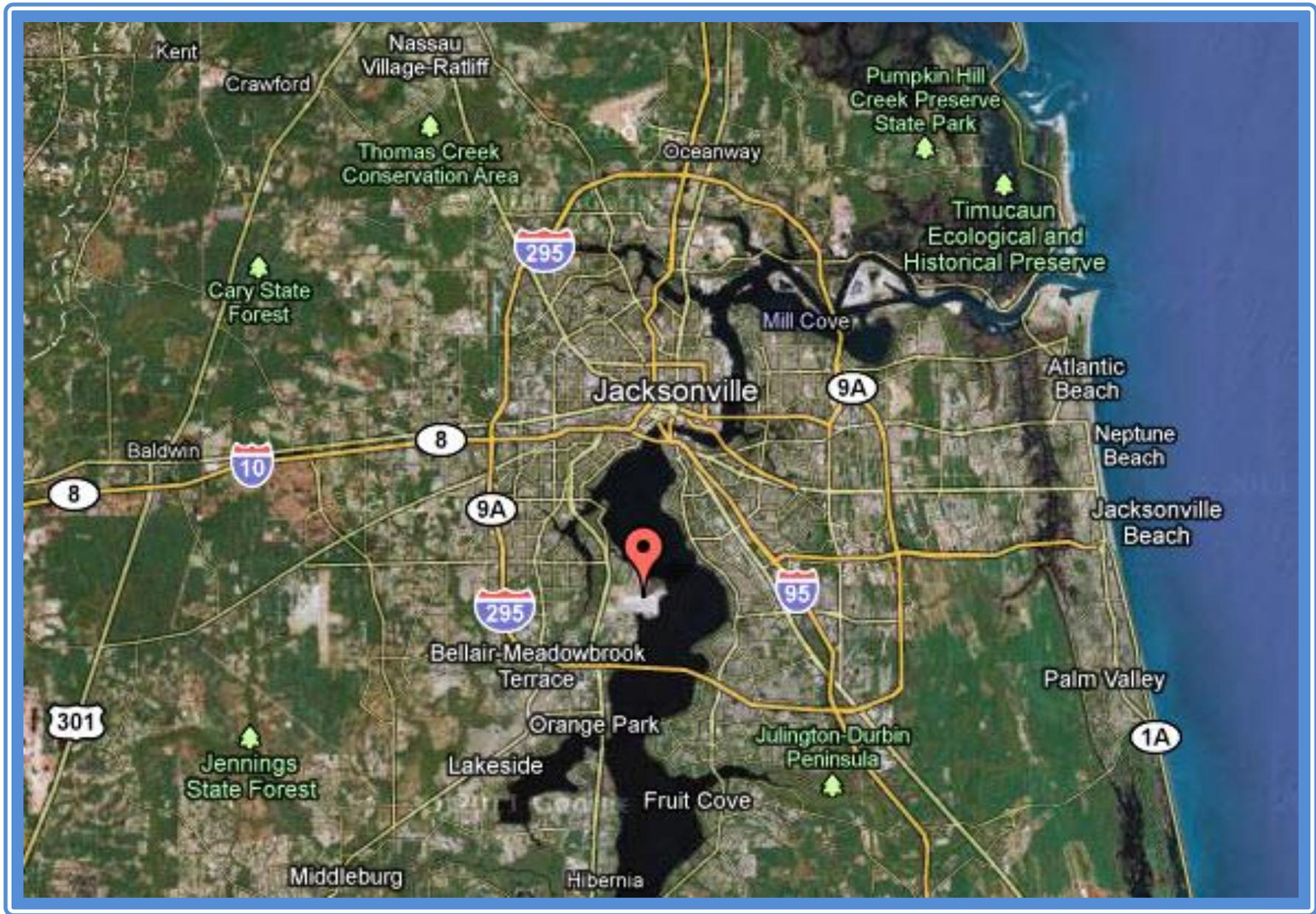


**Green Infrastructure at
Naval Air Station Jacksonville**

***City of Jacksonville
Environmental Symposium
15 August 2014***





Naval Air Station Jacksonville ("NAS Jax"):

- Over 20,000 personnel and civilian employees
- 3900 acres
- Largest employer in Northeast Florida







GREEN INFRASTRUCTURE:



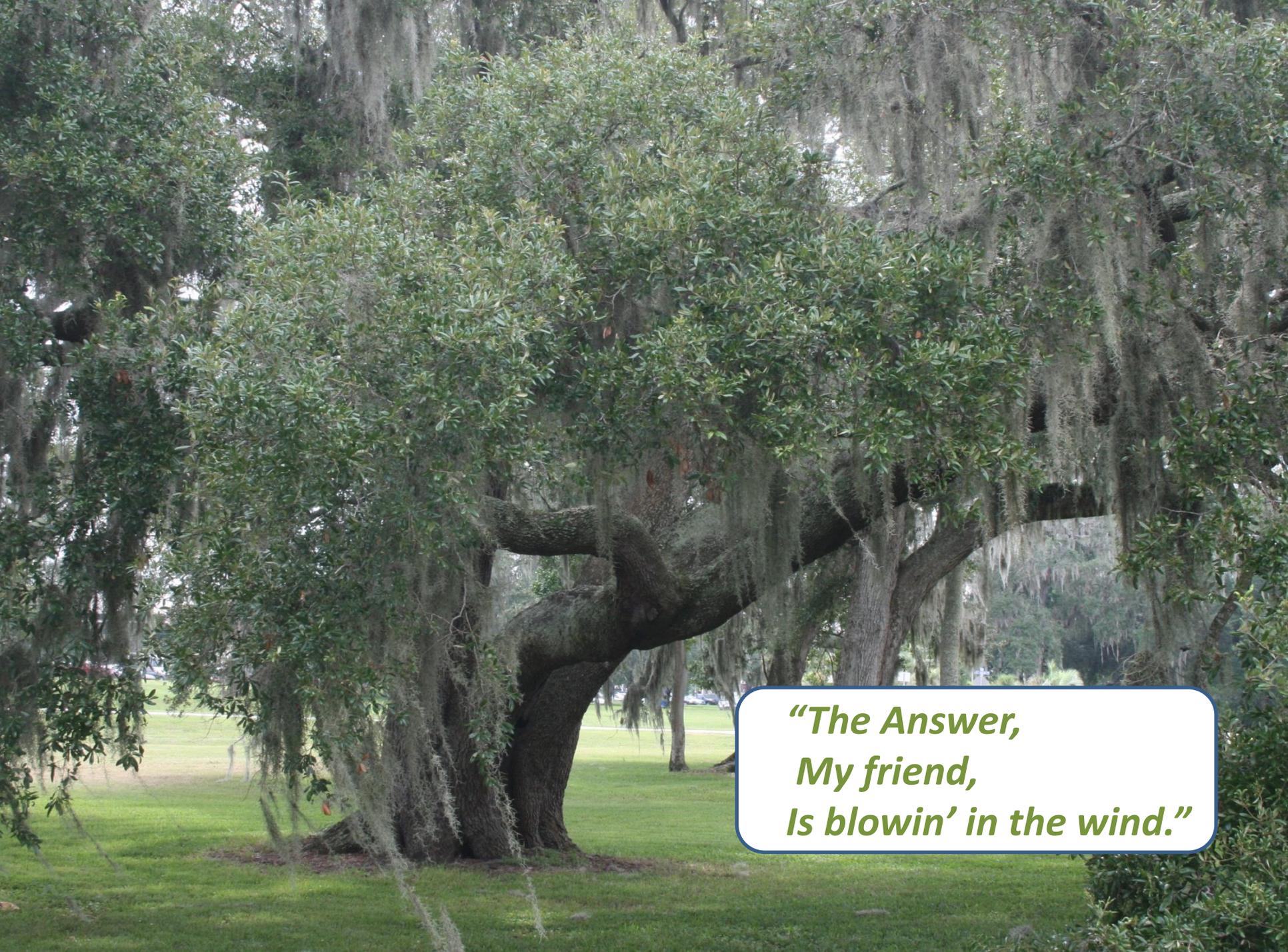
***FIRST
PRINCIPLES***



What kind of machine

- ***Manufactures oxygen***
- ***Sequesters carbon dioxide***
- ***Treats pollution***
- ***Recycles water?***





***“The Answer,
My friend,
Is blowin’ in the wind.”***





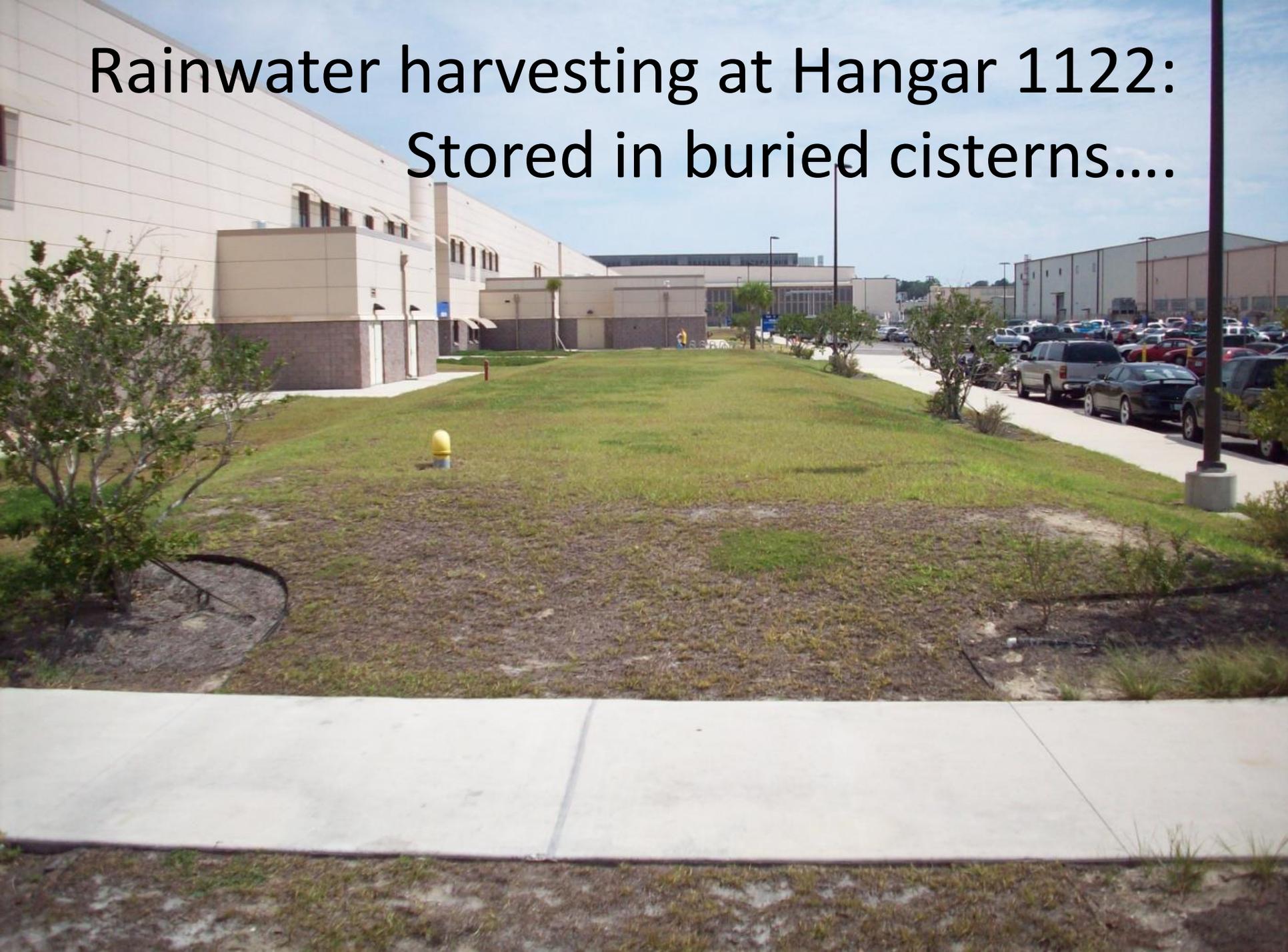
Hangar 1122 was our first project to implement UFC 3-210-10, “Low Impact Development.”

“Hello Naval Air Station Jacksonville. Thank you, Secretary Mabus, for the introduction and for your service. I know we’ve got a lot of naval aviators here. And Ray is a former surface warfare officer. But don’t hold that against him. Because Ray Mabus is doing a terrific job as Secretary of the Navy.”

-President Barack Obama,
Naval Air Station Jacksonville, 26 Oct 2009



Rainwater harvesting at Hangar 1122: Stored in buried cisterns...





... and used to wash
helicopters.



Hangar 1122 Pervious Parking Lot – Pervious Asphalt With base layer detention



Hangar 1122 parking lot, 2004: Pervious asphalt





Wear at wheel pivot points



Wear in drive aisle



Solution: thin standard asphalt drive aisle and auto pivot points,
Permeable detention space remains even under the asphalt:
No changes to stormwater permit



Pervious Paver Parking Lot – Hangar 511, 2005





LID Parking Lot? Not entirely - Standard traffic control islands



LID Islands, but landscaping fell out of the process.
Fumble!



The Integrated Training Center (ITC)
pervious lot also has underground
detention. 2009 design.

All Hands Club (2011):

finally getting our ducks in a row!





Another Pervious Parking System: Pavers at The All-Hands Club



Pervious concrete pavers: Concrete without the fine aggregates



The BAMS Maintenance Training Facility

The Holy Grail: A Fully Realized LID Parking Lot!



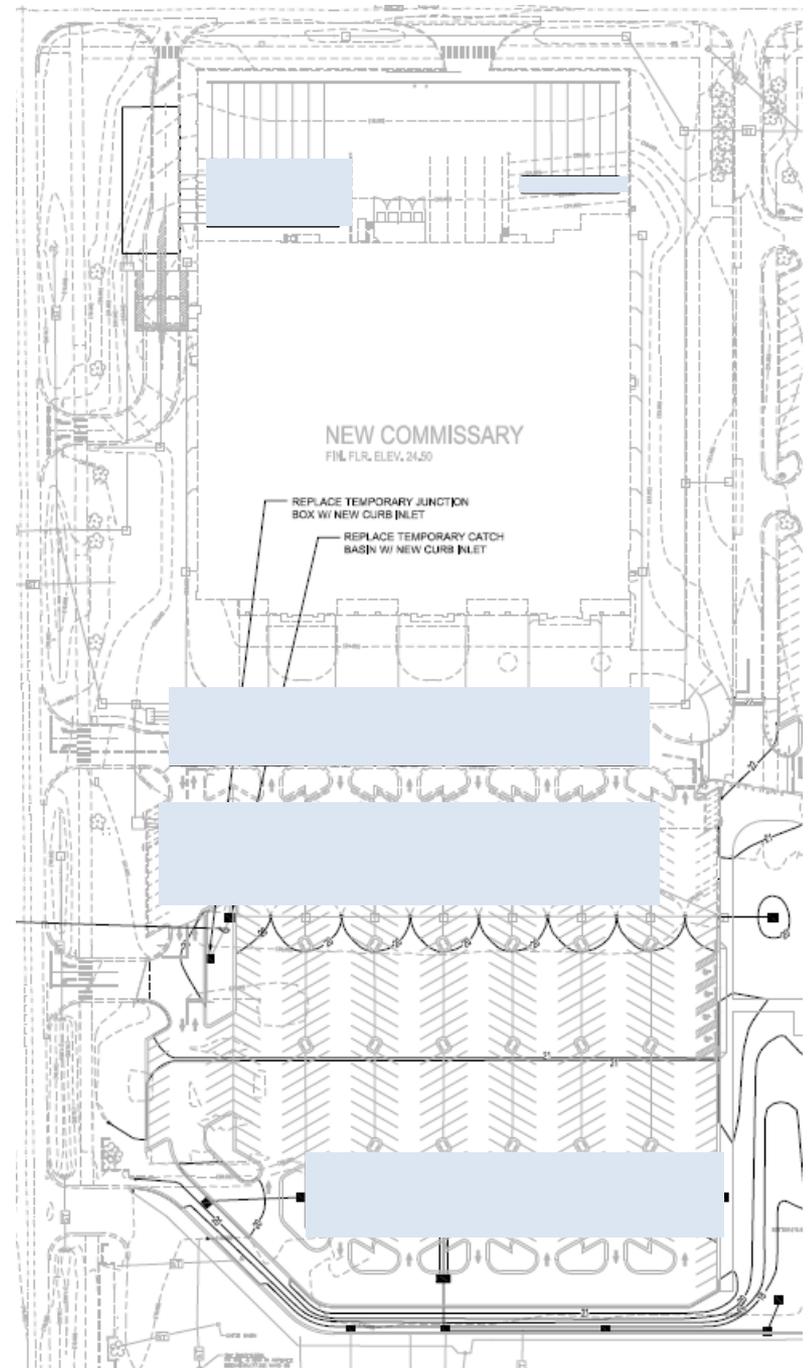


Q: Does Green
Infrastructure
have to be ugly?

A: No, but it
helps.



New Commissary: Underground Detention System



Corrugated Metal or Concrete Pipe



Figure 5 Corrugated metal pipe (CMP). Figures courtesy of the following companies: ACF Environmental, Contech, GeoStorage, ITS, Raintank. Image 8 of 17

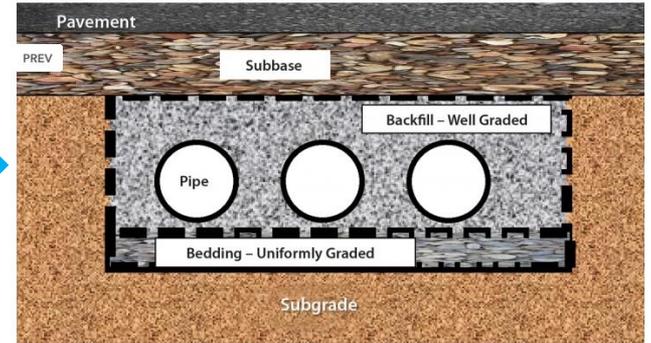


Figure 6 Schematic of corrugated pipe storage system. Figures courtesy of the following companies: ACF Environmental, Contech, GeoStorage, ITS, Raintank. Image 9 of 17

Plastic Arch (Allows infiltration)



Figure 7 Installation of corrugated arch system. Figures courtesy of the following companies: ACF Environmental, Contech, GeoStorage, ITS, Raintank. Image 10 of 17

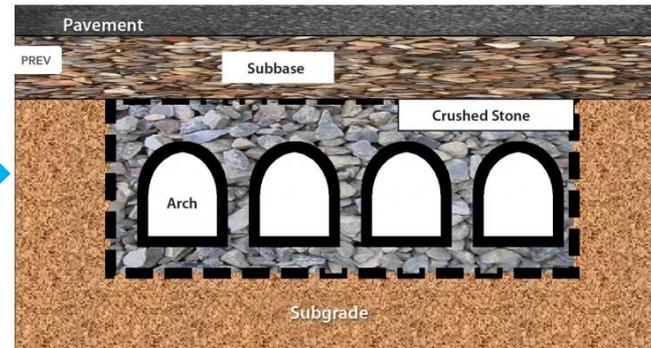


Figure 8 Corrugated arch installation details. Figures courtesy of the following companies: ACF Environmental, Contech, GeoStorage, ITS, Raintank. Image 11 of 17

Plastic Modules (Allows infiltration)

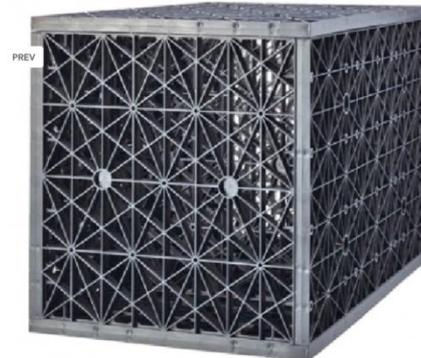


Figure 9 Example of plastic stormwater modules. Figures courtesy of the following companies: ACF Environmental, Contech, GeoStorage, ITS, Raintank. Image 12 of 17

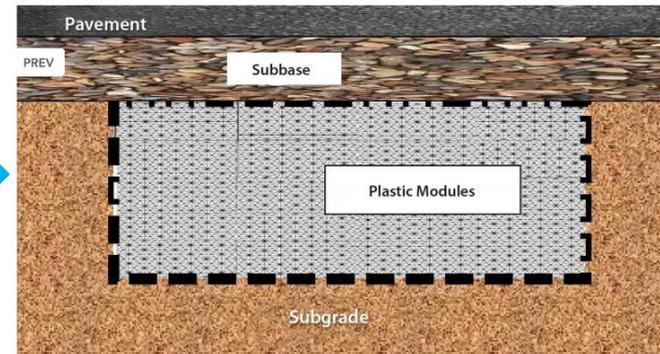
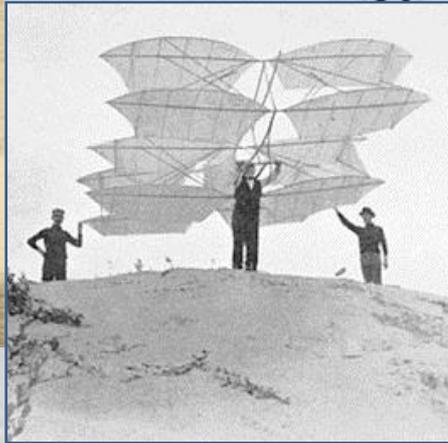
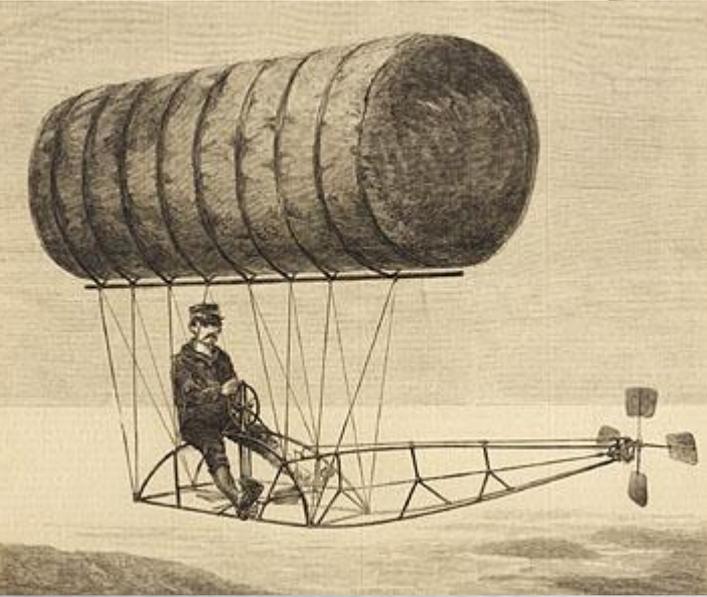


Figure 10 Typical cross section of a plastic stormwater module. Figures courtesy of the following companies: ACF Environmental, Contech, GeoStorage, ITS, Raintank. Image 13 of 17

THE FUTURE: THE FLYING CAR

“WILL WE EVEN NEED PARKING LOTS?”



GREEN INFRASTRUCTURE:

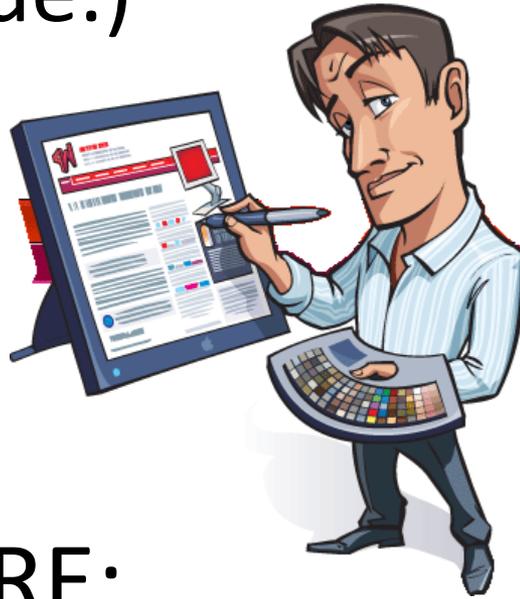


***FIRST
PRINCIPLES***

Nature is not flat....



At least not until this guy shows up.
(Nice ride.)



BEFORE:



AFTER:



Natural landscapes
are less like this...



...and more like this.



Low Impact Development turns a century of the Flat Earth Movement on its head....

By following nature's lead to reintroduce

- Rills
- Spills
- Lumps
- Bumps
- Potholes
- Knotholes
- Depressions
- Indentations

And other ways of SLOWING DOWN water,
LENGTHENING its flow paths,
ROUGHENING the surfaces in its way...

So that **RAINWATER**
can become **GROUNDWATER**
rather than **STORMWATER.**

NAS Initiative: Reduce mowing by turning lawns to meadows.

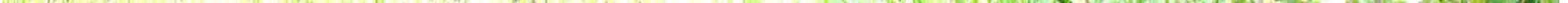


NAS Initiative: Reduce mowing by turning lawns to meadows.



NAS spends about \$750,000/year mowing 1,300 acres
Proposed: turn about 480 acres (44%) into tall grass meadow or ground cover, both mowed once a year in winter

- Four-year payback
- Reduce stormwater volume
- Improve stormwater quality
- Reduce maintenance on stormwater system (less sediment enters system)



The Bees Love It!



HOLD SHORT
HONEYBEE
FLIGHT
ZONE







Rain Garden, Child Development Center



Catch basin conveys overflow to detention pond.



Enter the Grounds Maintenance Contractor.



“What we have here is a failure to communicate.”



An epic LID design: Integrated Training Center (ITC) Rain Gardens



Large Rain Gardens – Construction Issues

#1: Soil (acid vs. alkaline). Limey soil stunts growth.



#2: Bunch grasses look a lot alike. Wrong plants in wrong places can mean dead plants and empty rows.



Large Rain Gardens – Maintenance Issues

#1 – are they “gardens” or are they infrastructure?

(Hint: Call them “biofiltration areas”!)

#2 – what if the herbicide kills your *Mimosa strigillosa*?

M. strigillosa at NAS Jax ITC 2012 (below) and today after being knocked back by “maintenance” (right).

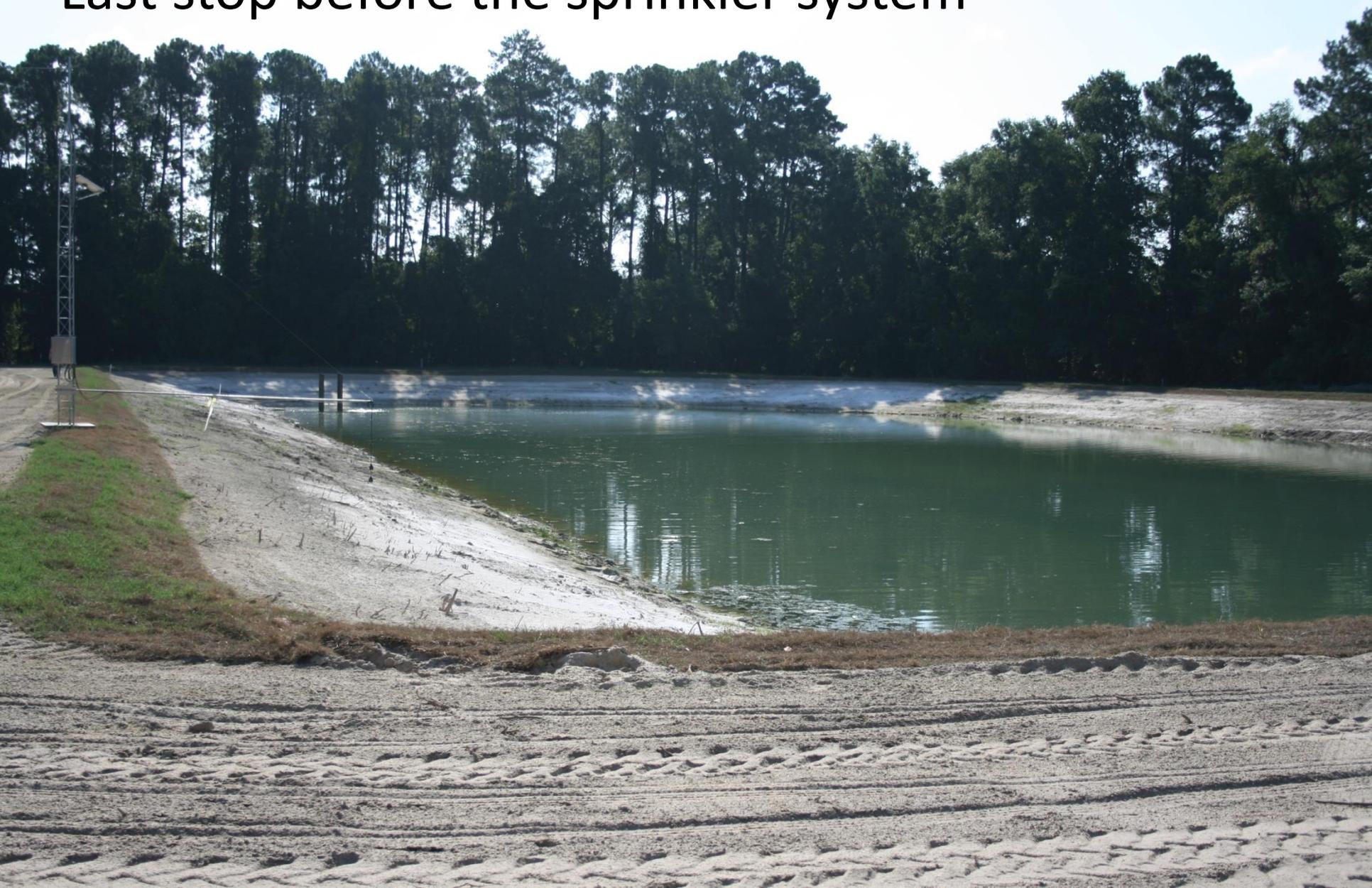


Wastewater Effluent Reuse Project





The Ten Million Gallon Pond: Last stop before the sprinkler system



We Like To Show Off All We've Done – Come and Have A Look!



Get fit!



Questions? (Go ahead, have a field day!)



Contact Information At NAS JAX:

John K. Young, Stormwater Program Manager

john.k.young@navy.mil

Direct Line: (904) 542-4220