Restoration **Rally Cry**
for the Big Cypress Swamp

Robert V. Sobczak, Hydrologist
Big Cypress National Preserve

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As originally presented at **GEER 2015**

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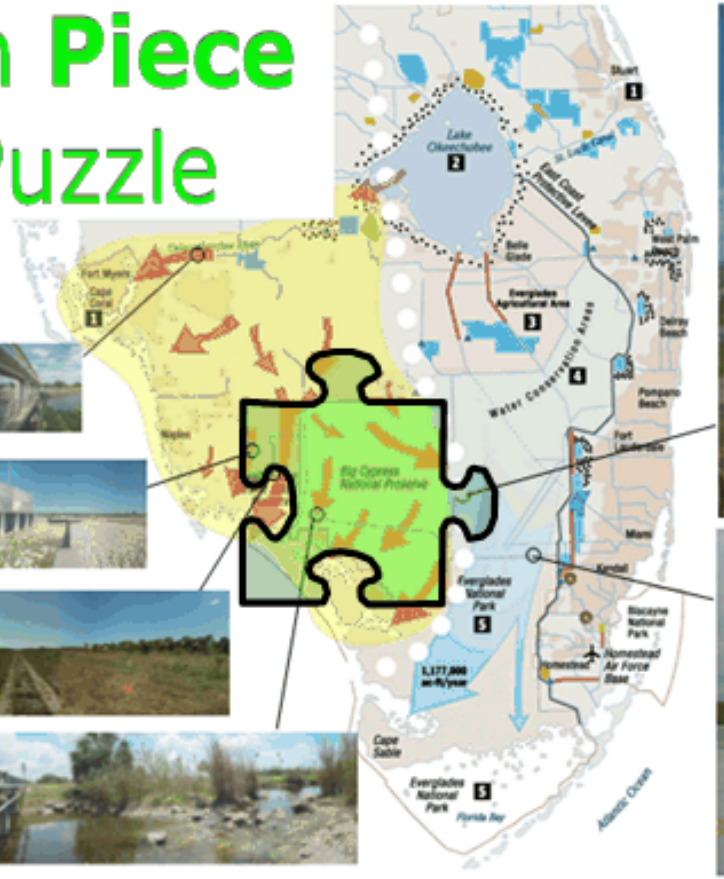
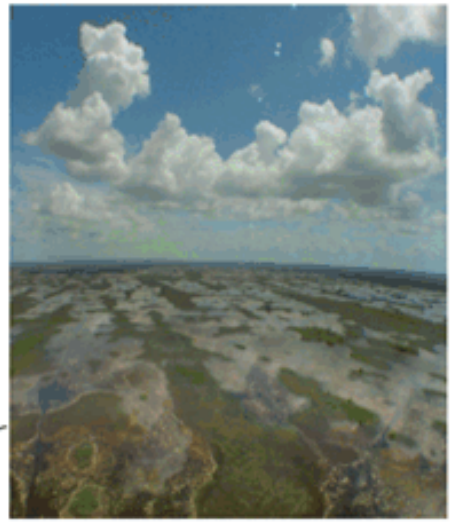
And presented to **WG/SCG** Meeting Today
September 23, 2015

Denesia Cheek
Kevin Godsea
Greg Suszek
Eduardo Patino
Renee Rau
Mike Duever
Jim Burch
Kim Dryden
Ron Clark
me
We are
HERE
The Authors

Forgotten Piece of the Puzzle





Big Cypress Swamp/**Southwest FL** Side of the Greater Everglades Ecosystem

River of Grass **East** Coast Side of the Greater Everglades Ecosystem

Types of threats to Big Cypress

Some **dominate** the discussion

Types of threats to Big Cypress

Some **dominate** the discussion

Back Country trails
are **not** a hydrologic a problem

It's the **Trail**
under this buggy that is

Turner River Road

Many more like it

Upper Wagon Wheel Road

Many more like it

All in the **front** country

Birdon Road

Many more like it

All in the **front** country

All cause ecological **impacts**

What is their **impact?**

What is their **impact?**

Deepest **natural** flow systems
are two feet deep

And often
discontinuous

Canals are **5-10 feet** deep

And continuous for **miles** long

Pinelands are **natural** high ground

Pinelands are **natural** high ground

But usually by only a **few inches**

Thus allow water to **pass through**

Levees are **3-15 feet** tall

And run
unculverted
for **miles**
on end

Birdon Road Canal

And run unculverted for **miles** on end

Birdon Road Canal

And run unculverted for **miles** on end

Worse yet, these canals are connected **to tide**

Birdon Road Canal

Thus **accelerating** drainage
of freshwater straight to coast

Halfway Creek Canal

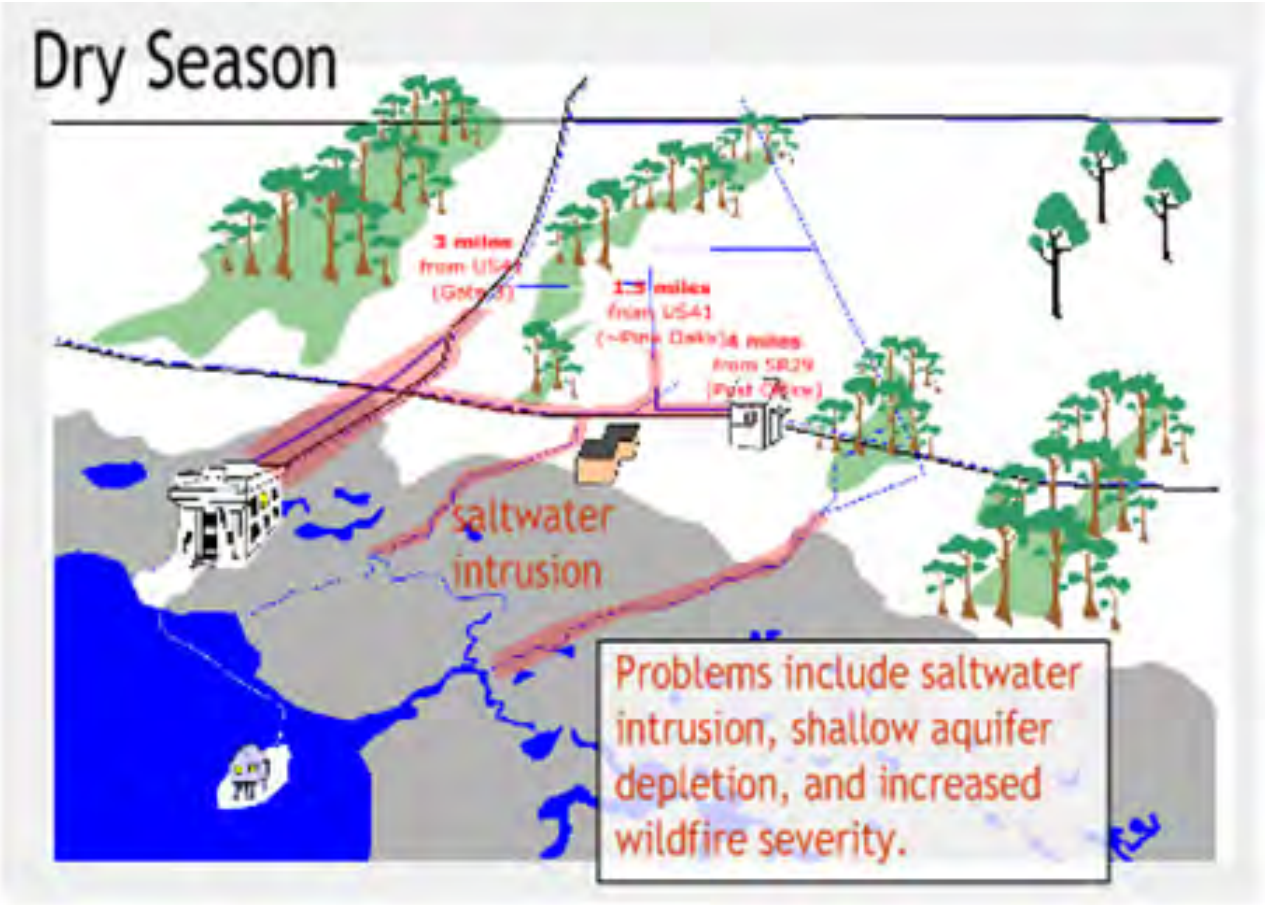
And the same channel
that allows **freshwater** to escape

Increases vulnerability to
saltwater intrusion
come spring

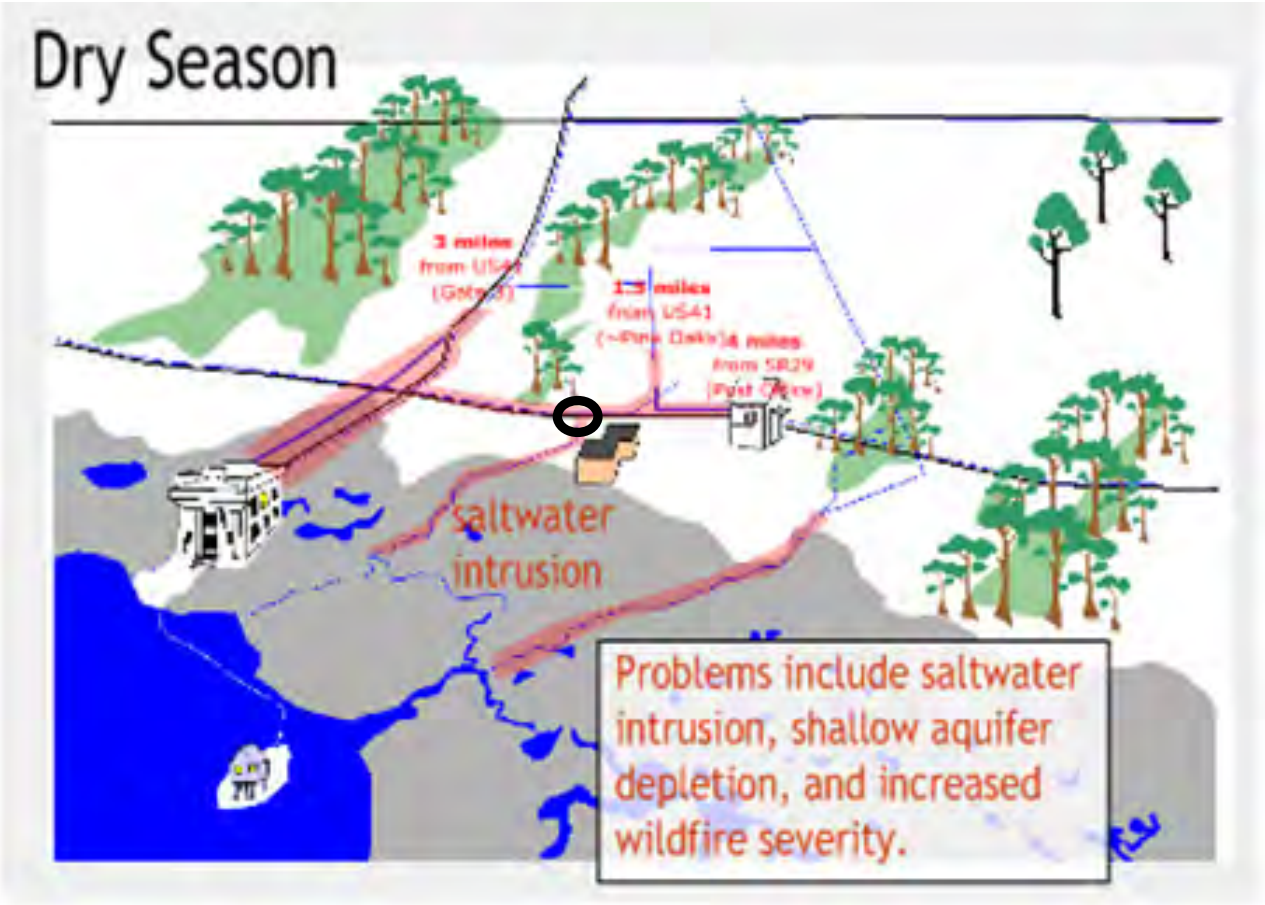
Increases vulnerability to
saltwater intrusion
come spring

How far?

Saltwater Canals



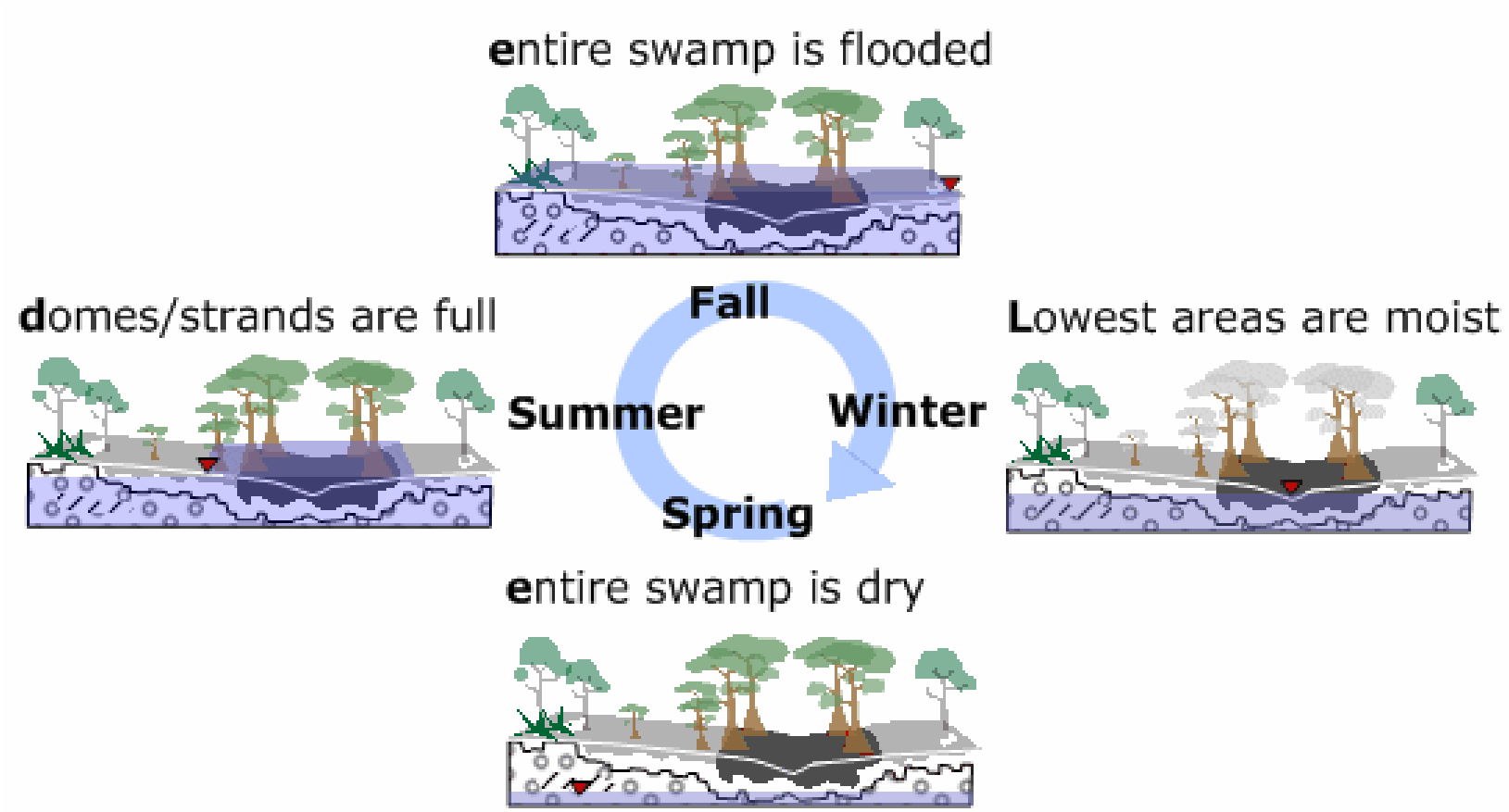
Saltwater Canals



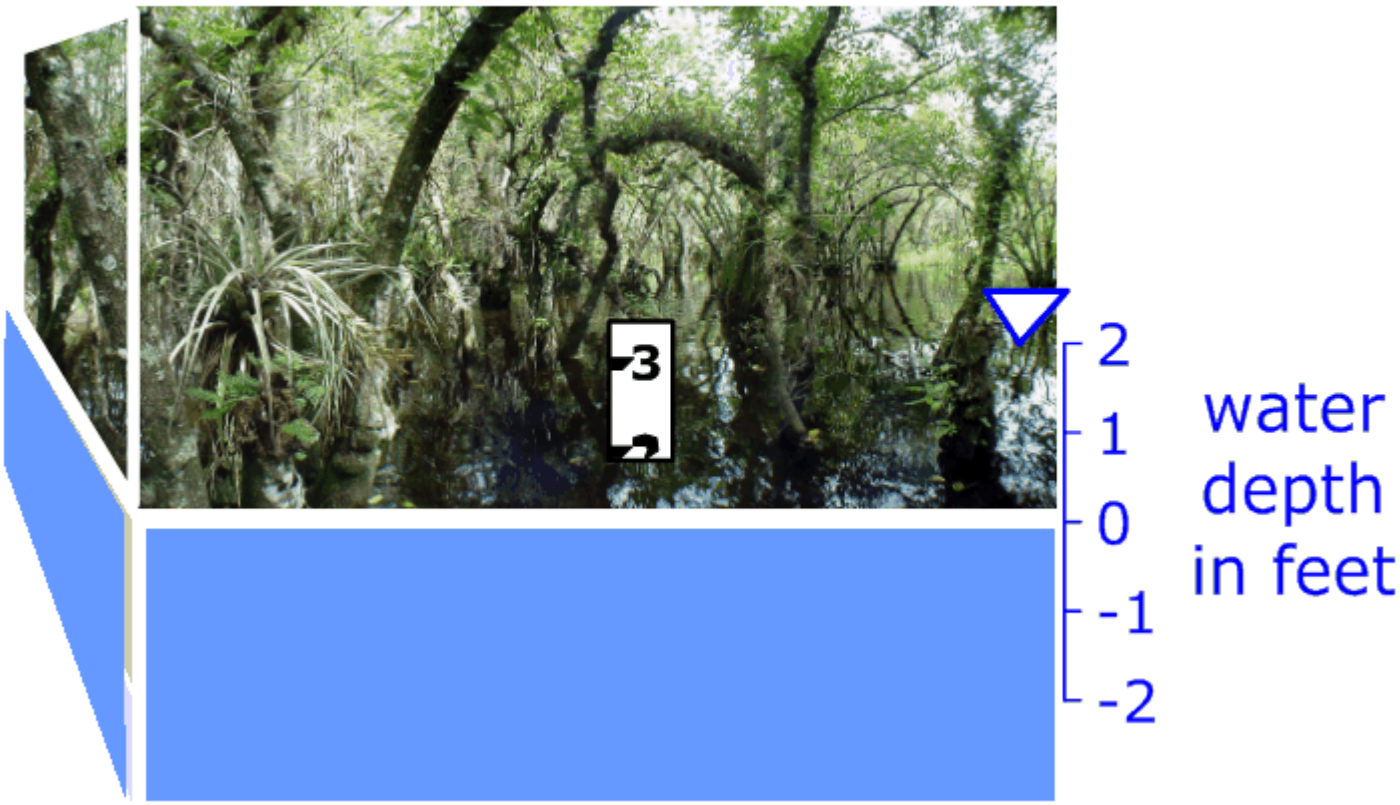
Swamp is **vulnerable** during drought

Natural **water breaks** dry up

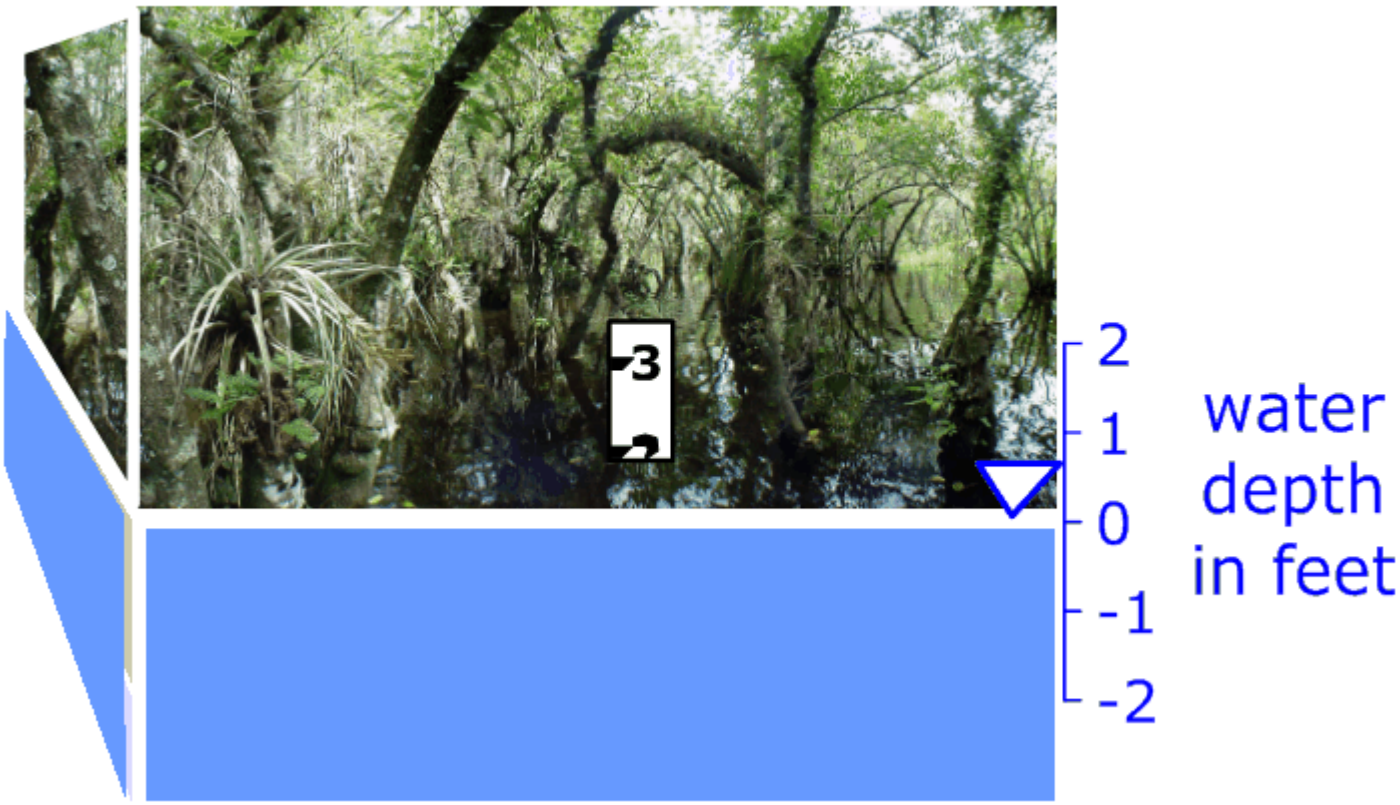
Swamp Water Cycle



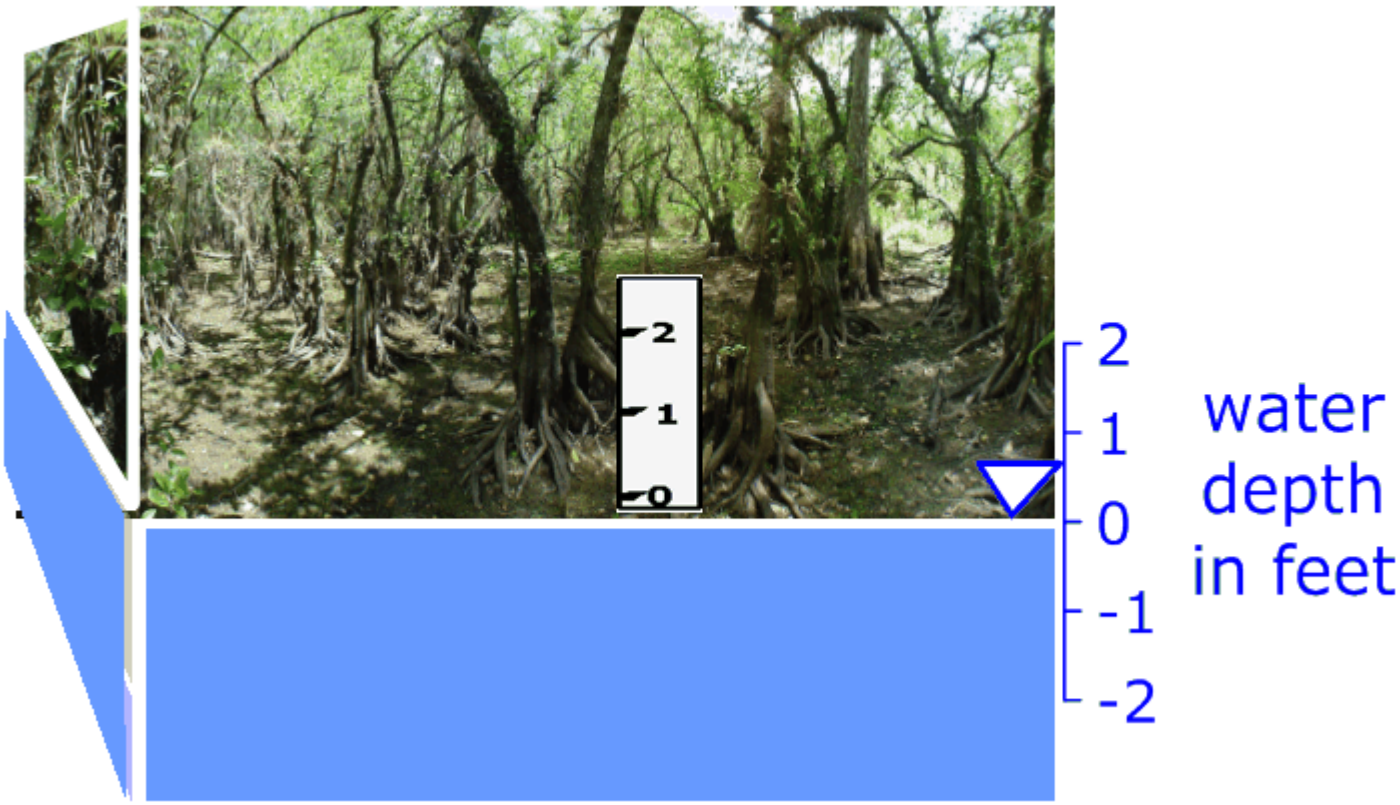
Swamp **Extremes**



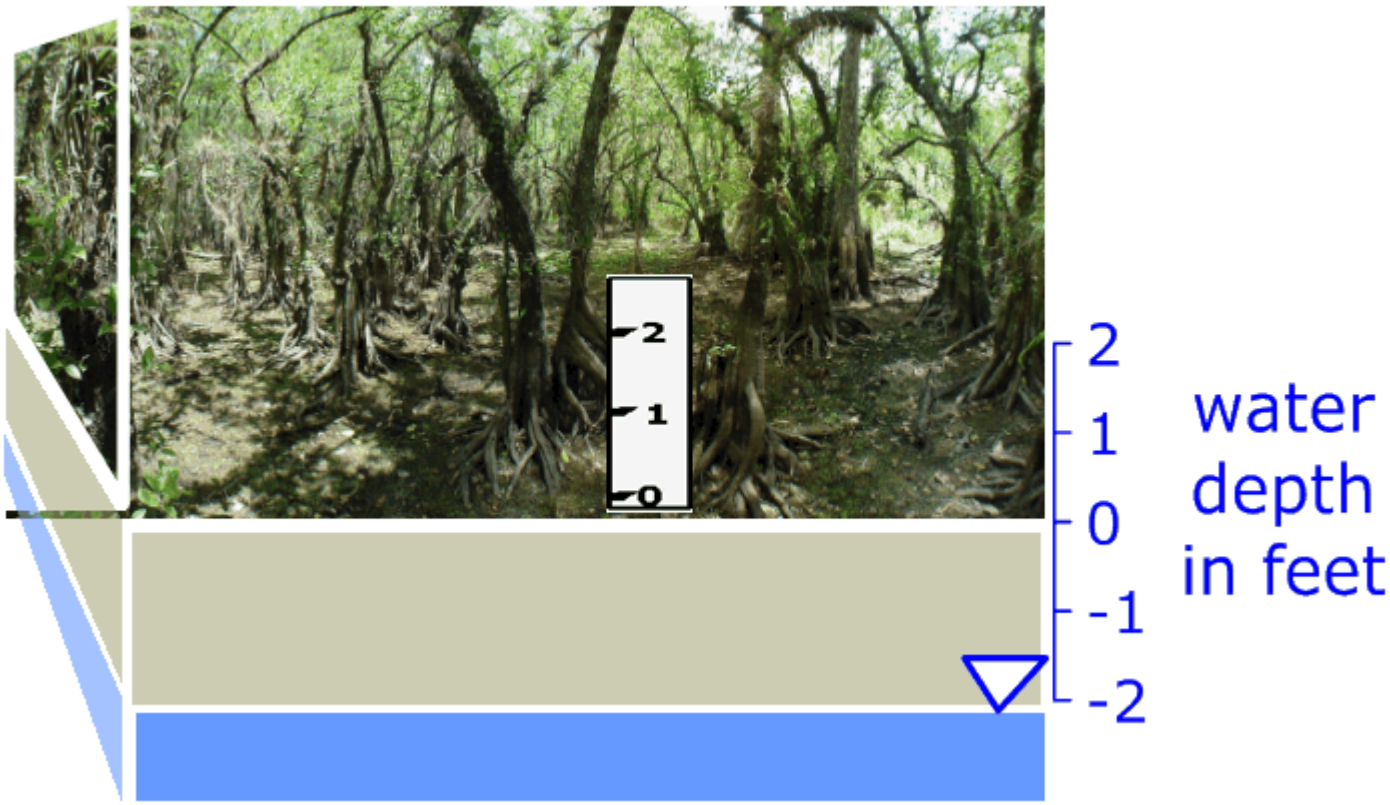
Wet



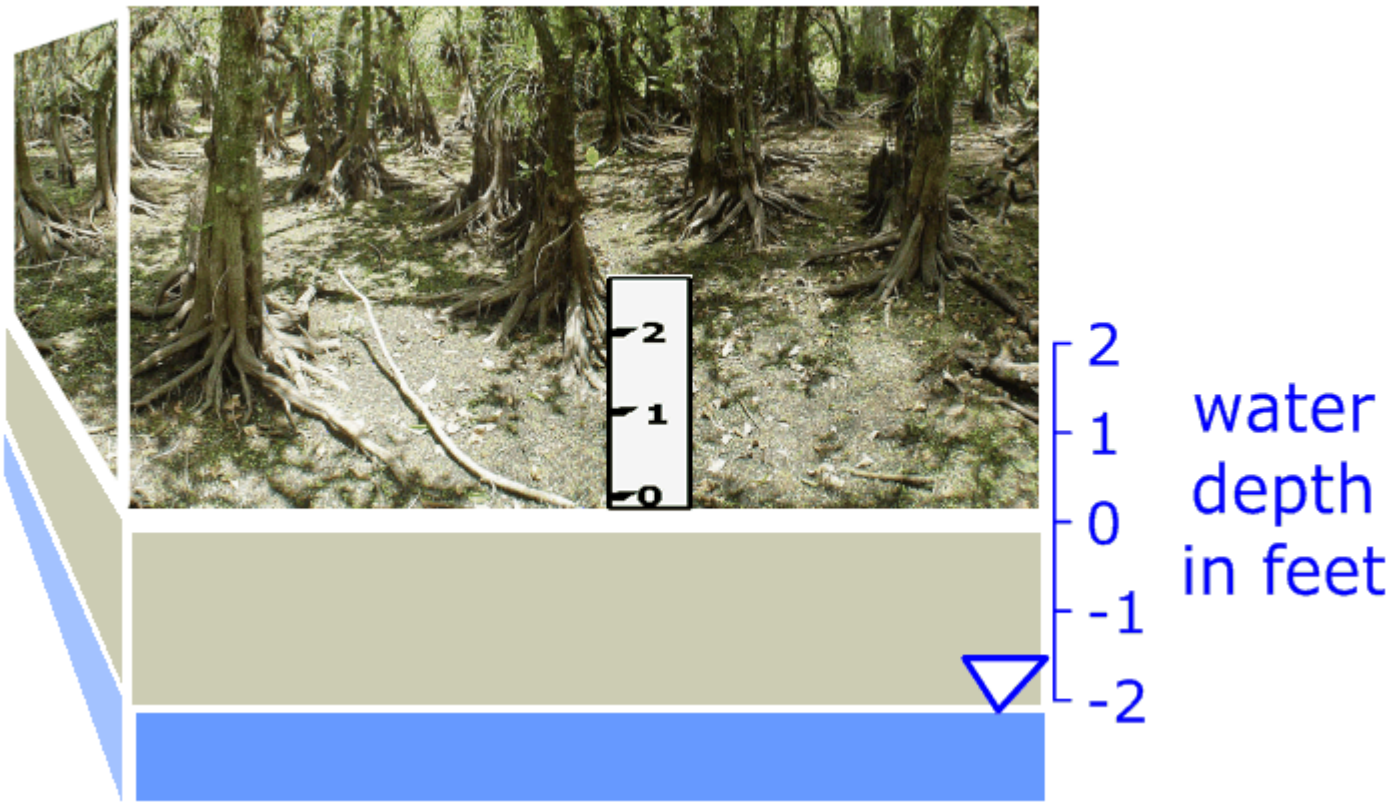
Wet



Dry

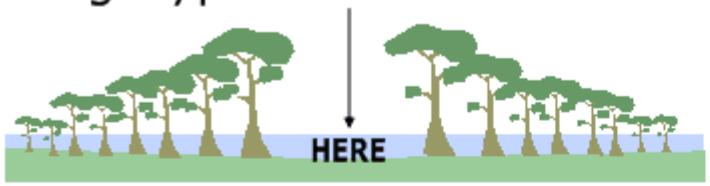


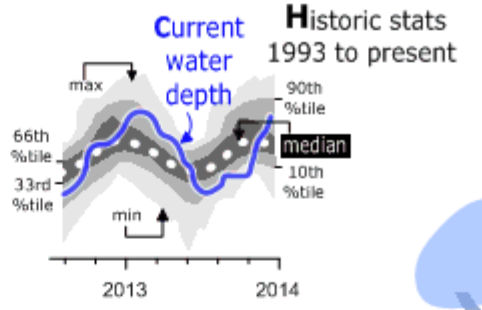
Dry

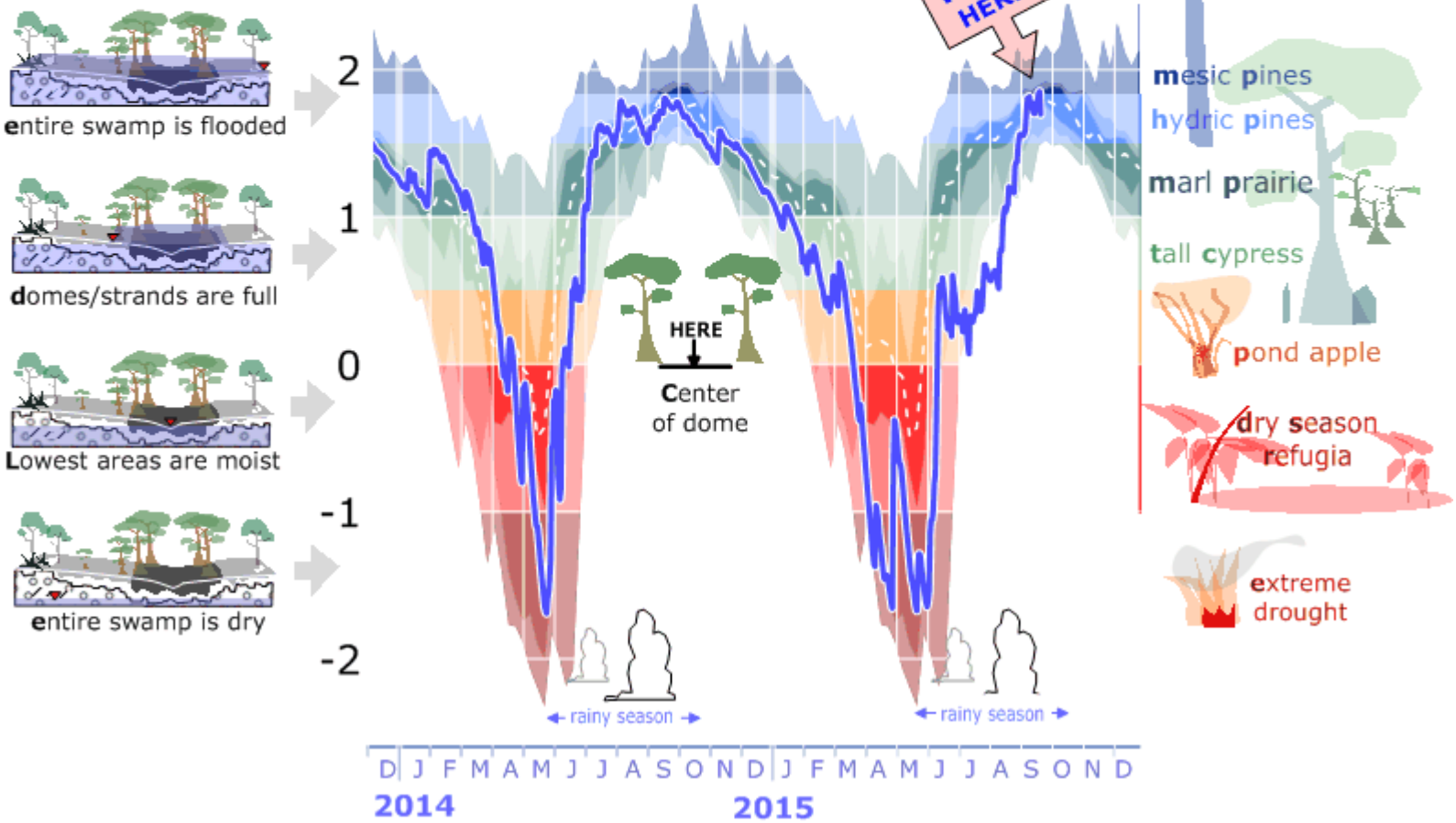


Very Dry

Cypress Dome **Water Depth** in Big Cypress Nat'l Preserve



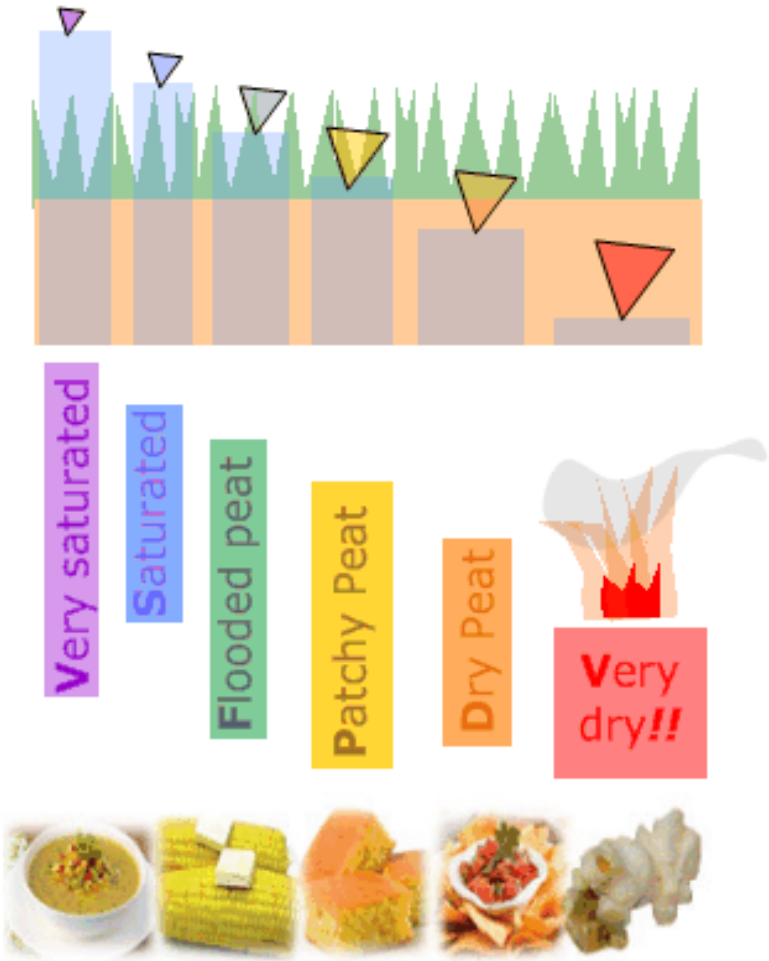


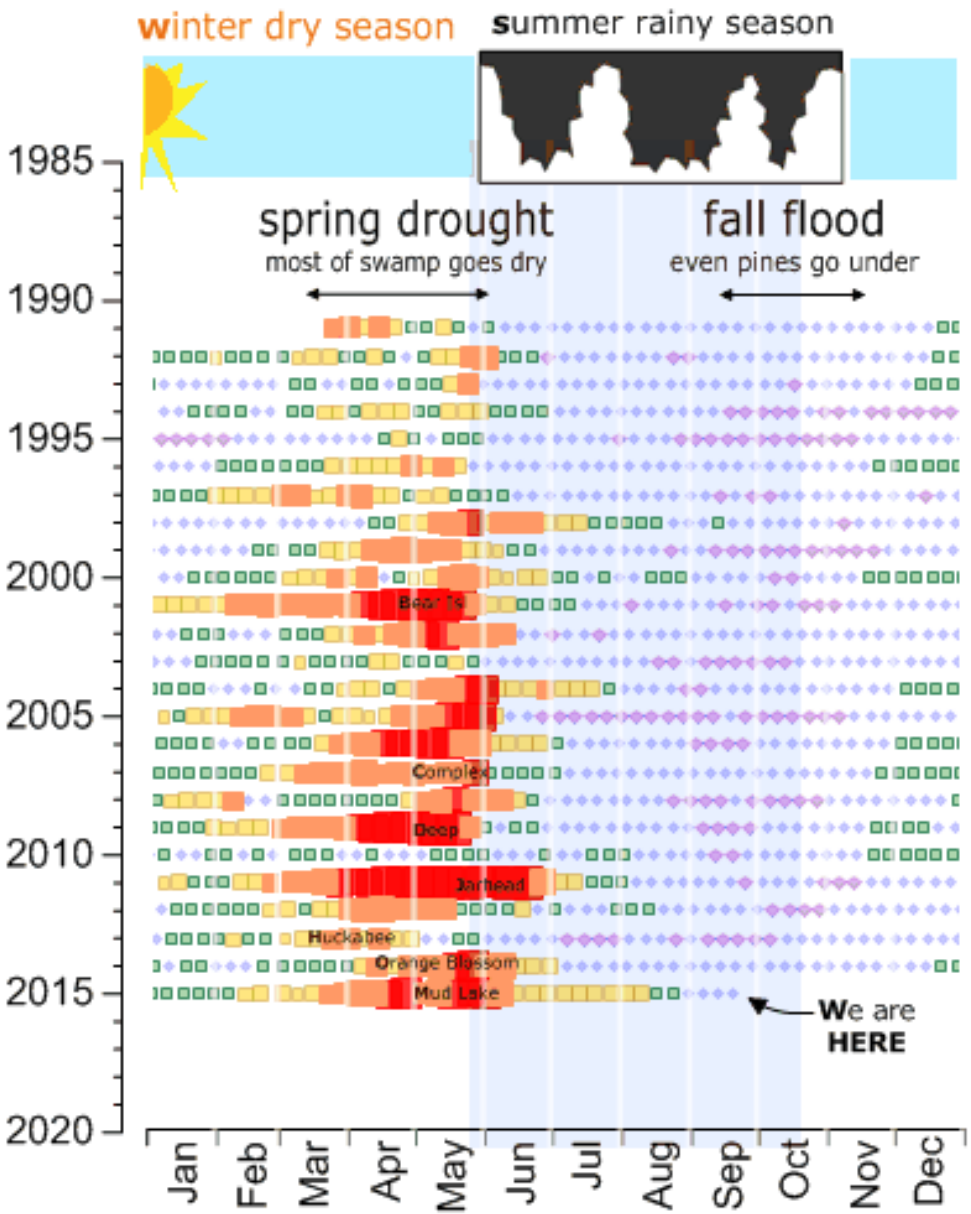


Soil **Saturation** Index

for Big Cypress Nat'l Preserve

1992-present





Soil Saturation Index

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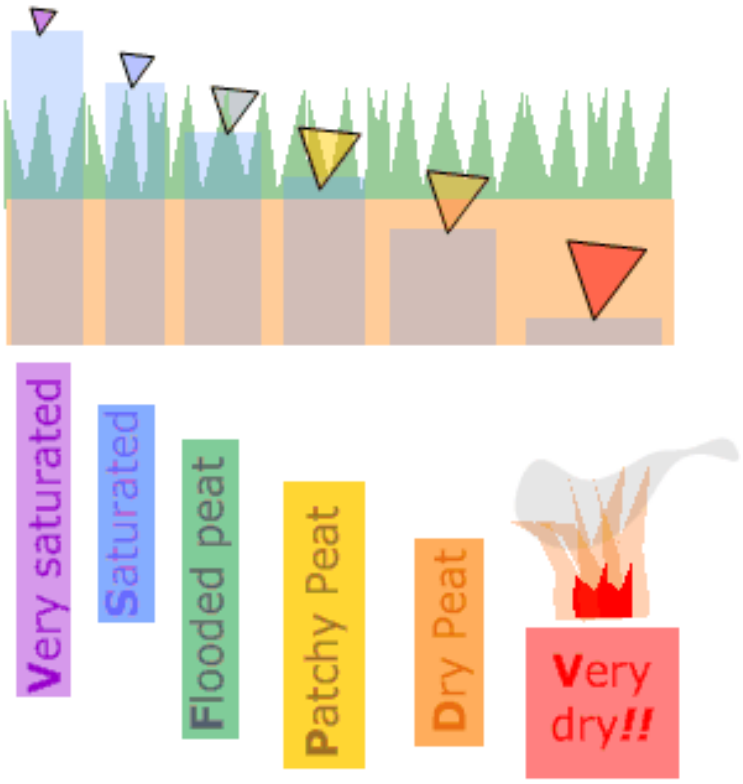
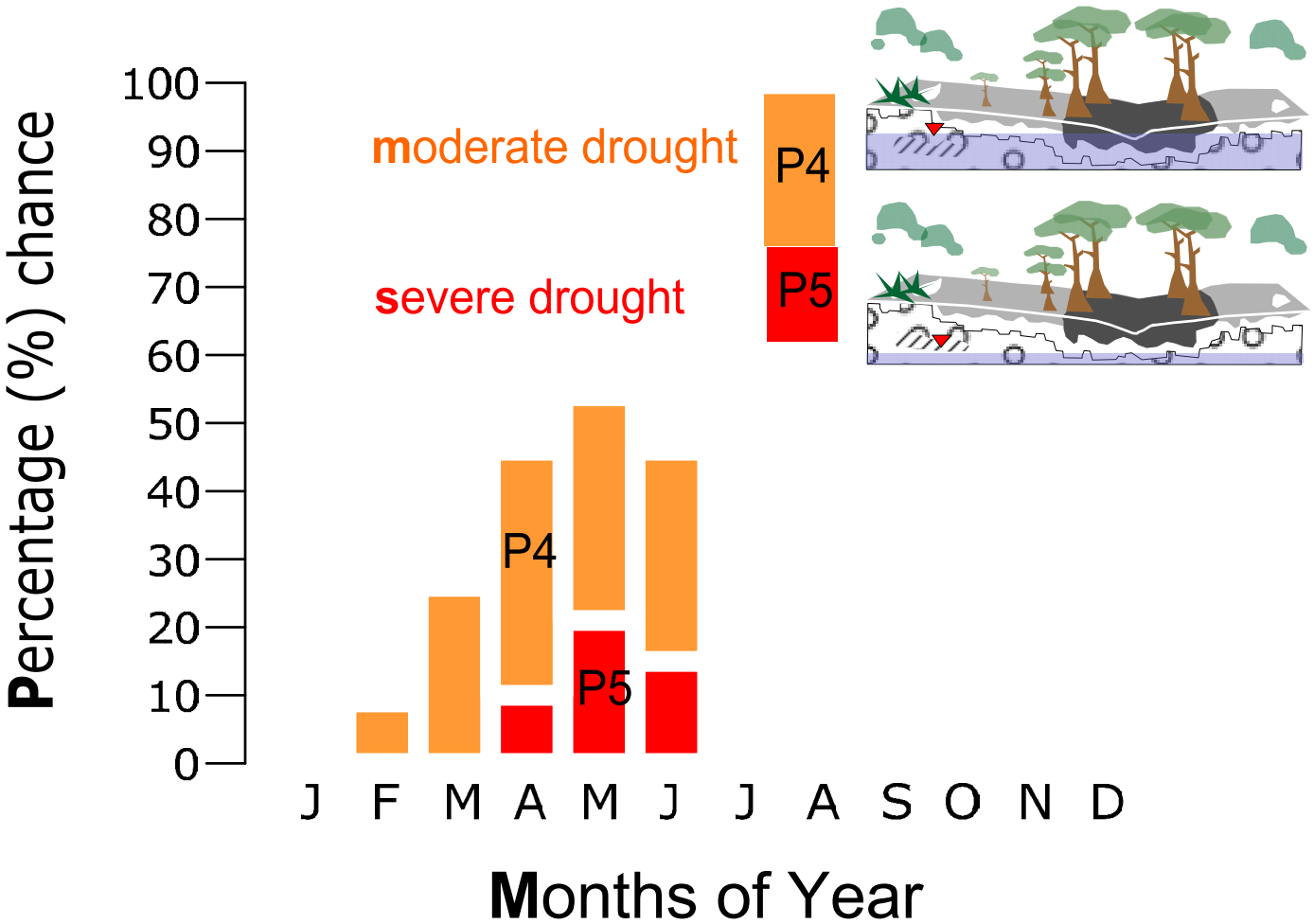
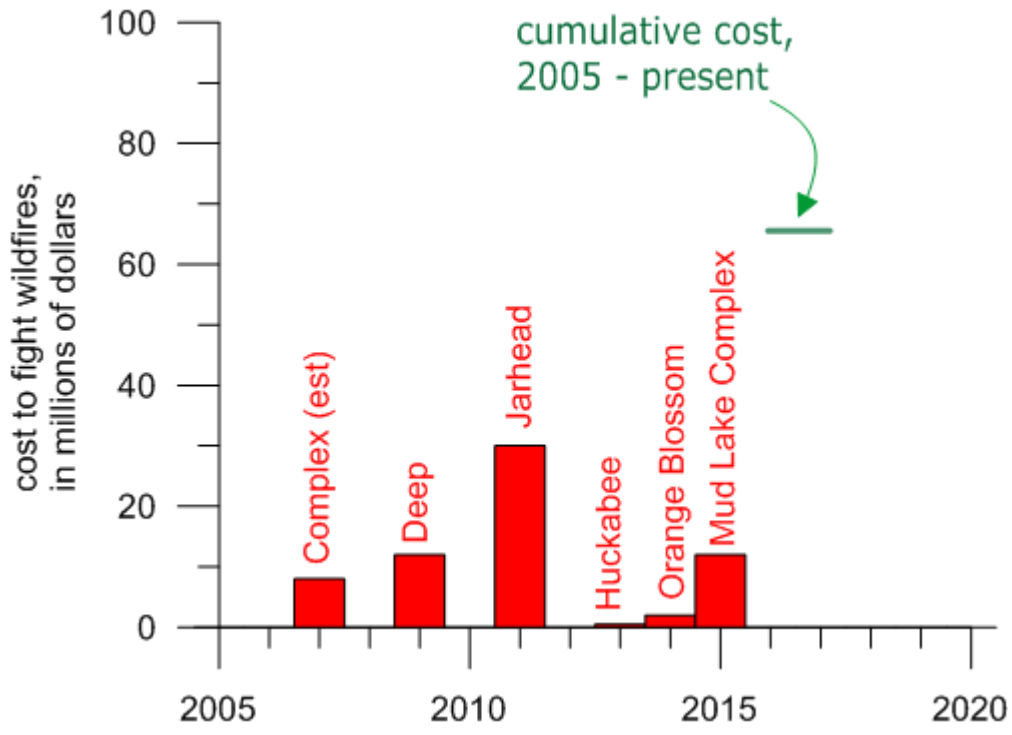
1992-present



Monthly Probability of Moderate and Severe Drought



And wildfires are <u>very</u> **expensive,** too.



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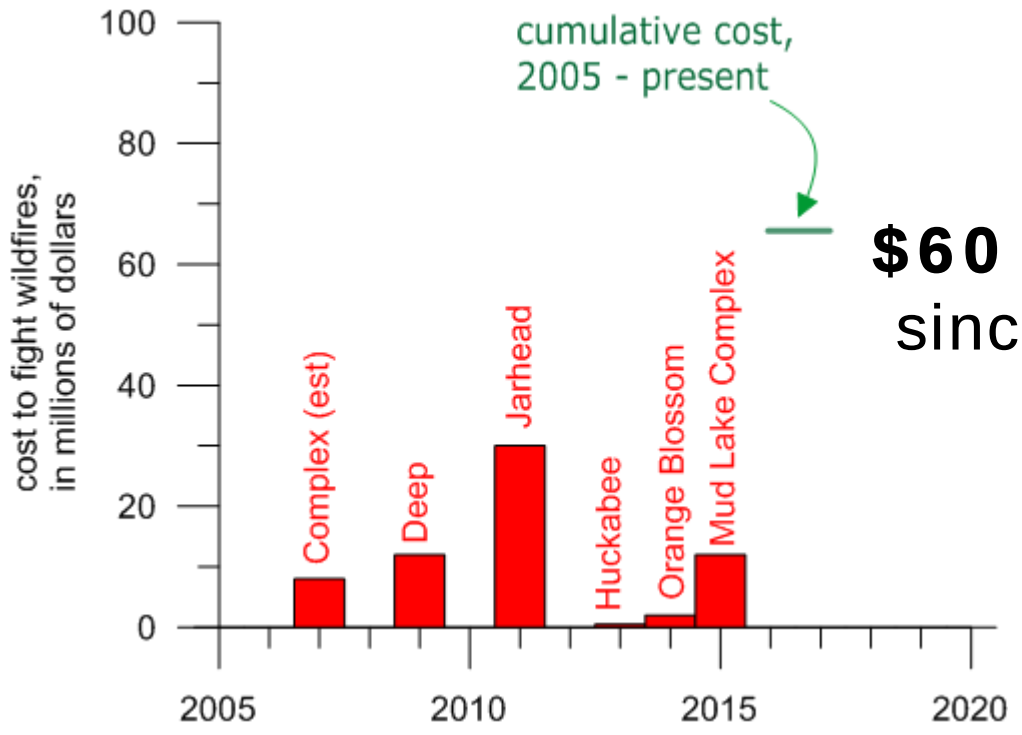
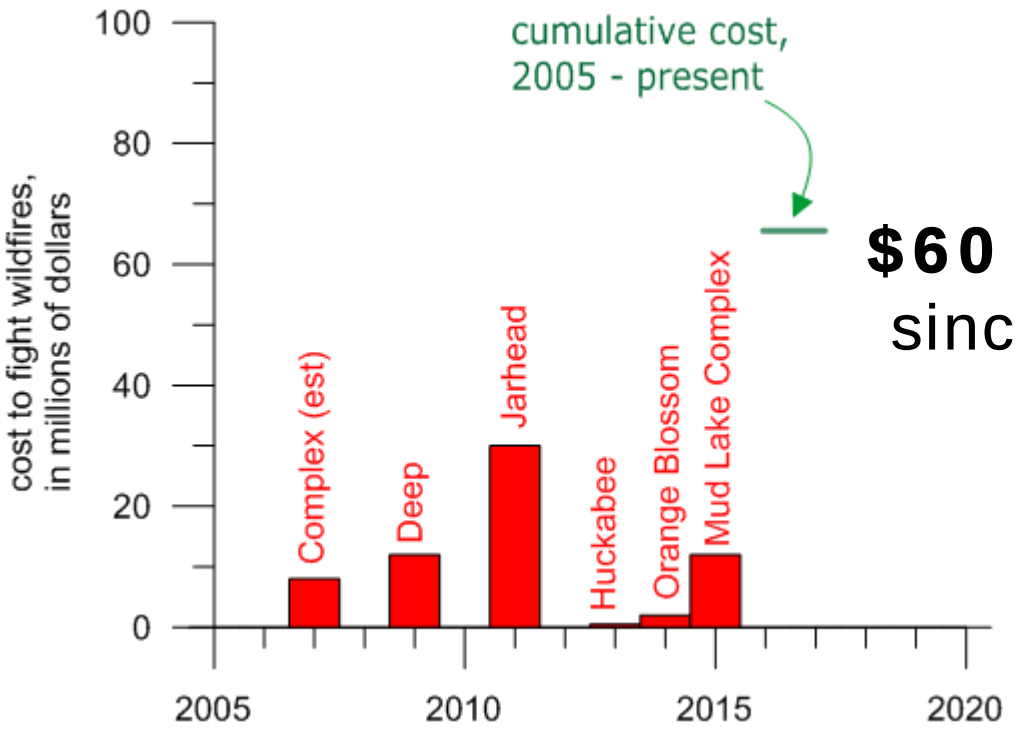


$60 million
since 2007

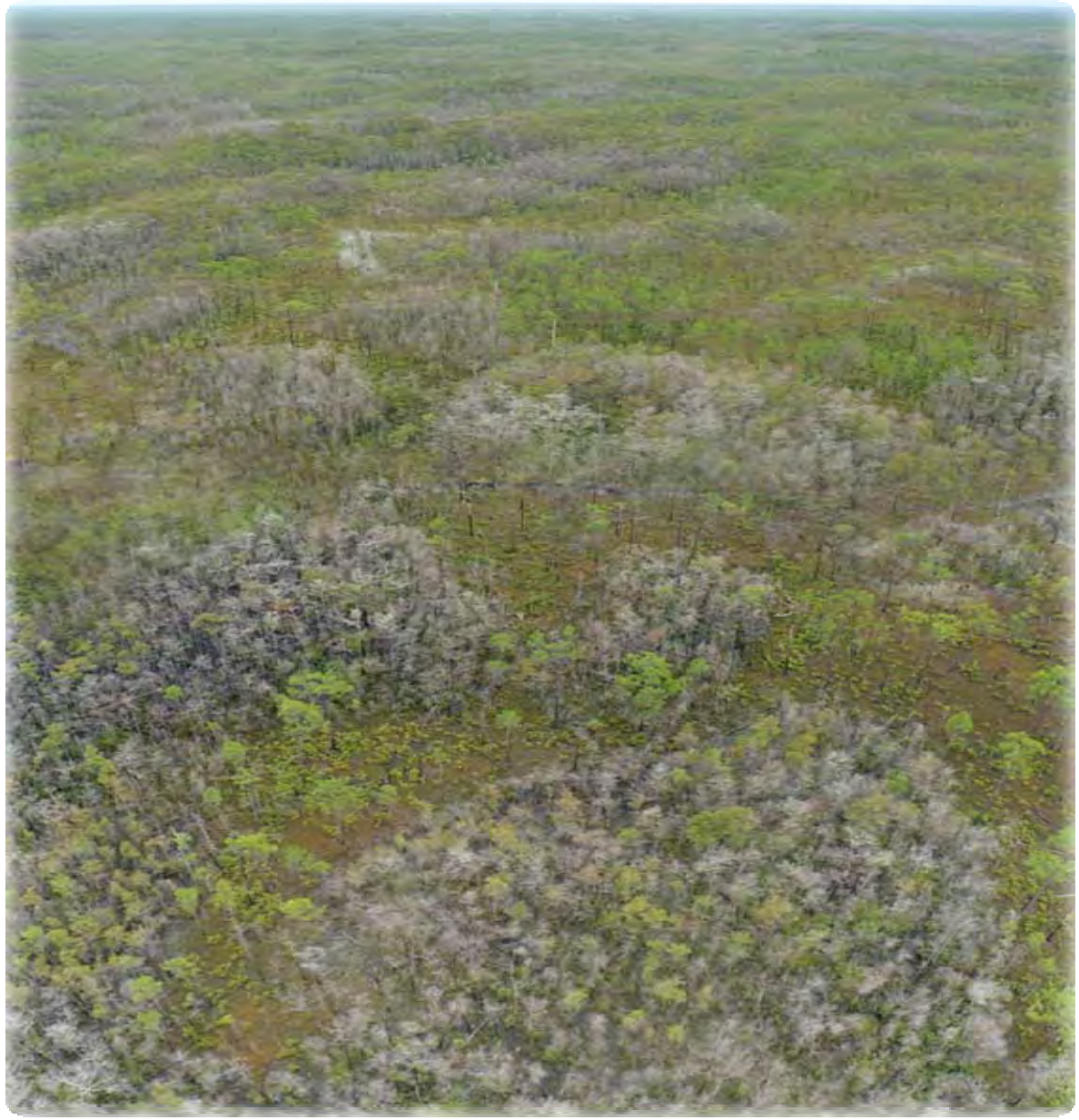
And wildfires are <u>very</u> **expensive,** too.



$60 million since 2007

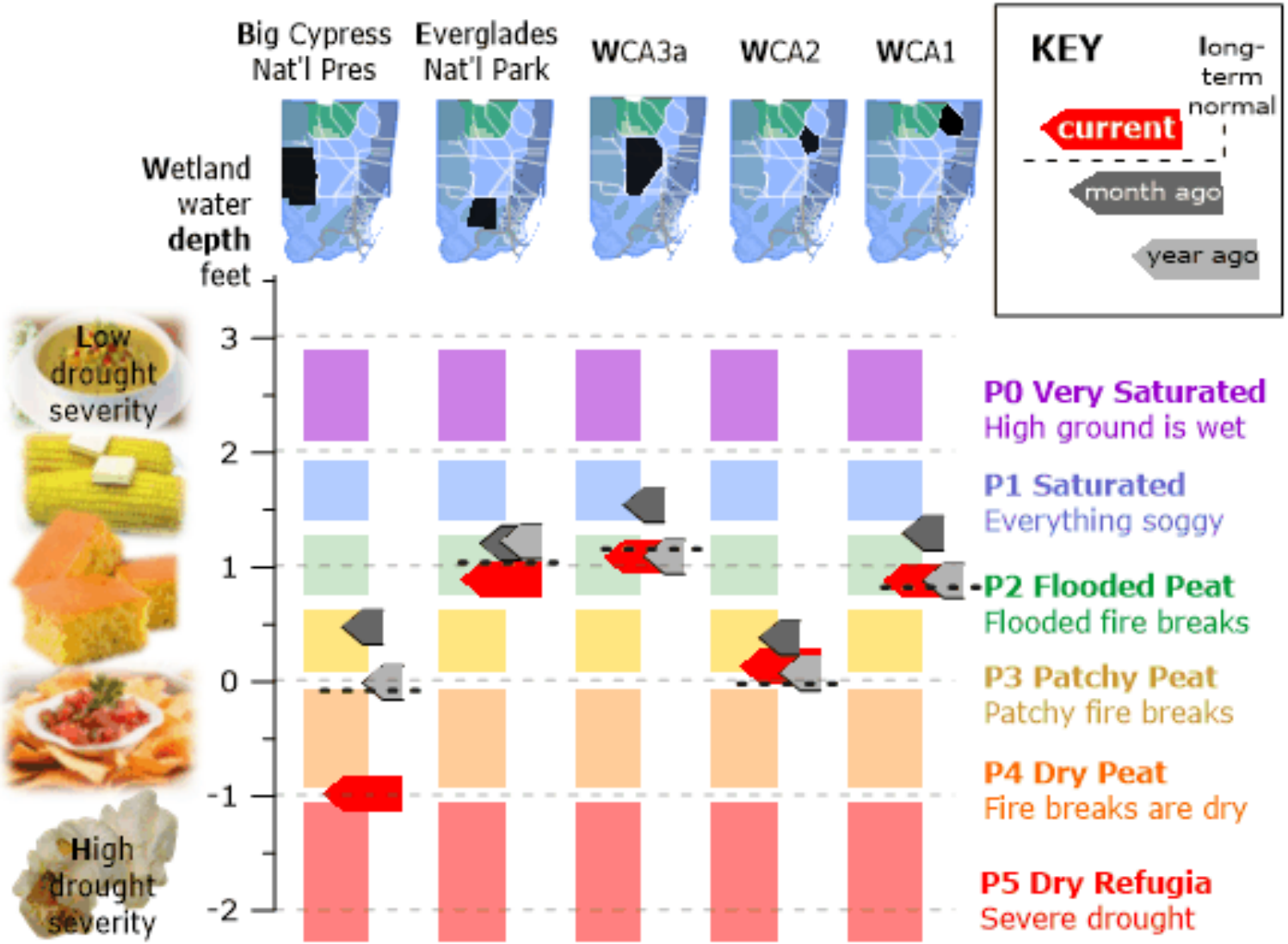
Yet translates into **$0** for increasing swamp's long-term <u>natural resilience</u> to fight wildfire

Dome **Killing** Wildfires



Invasion of the Sabal Palm

South Florida **Parchedness** Index for 4/16/15



Mud Lake Complex Wildfire

Photo by Cory Dutton

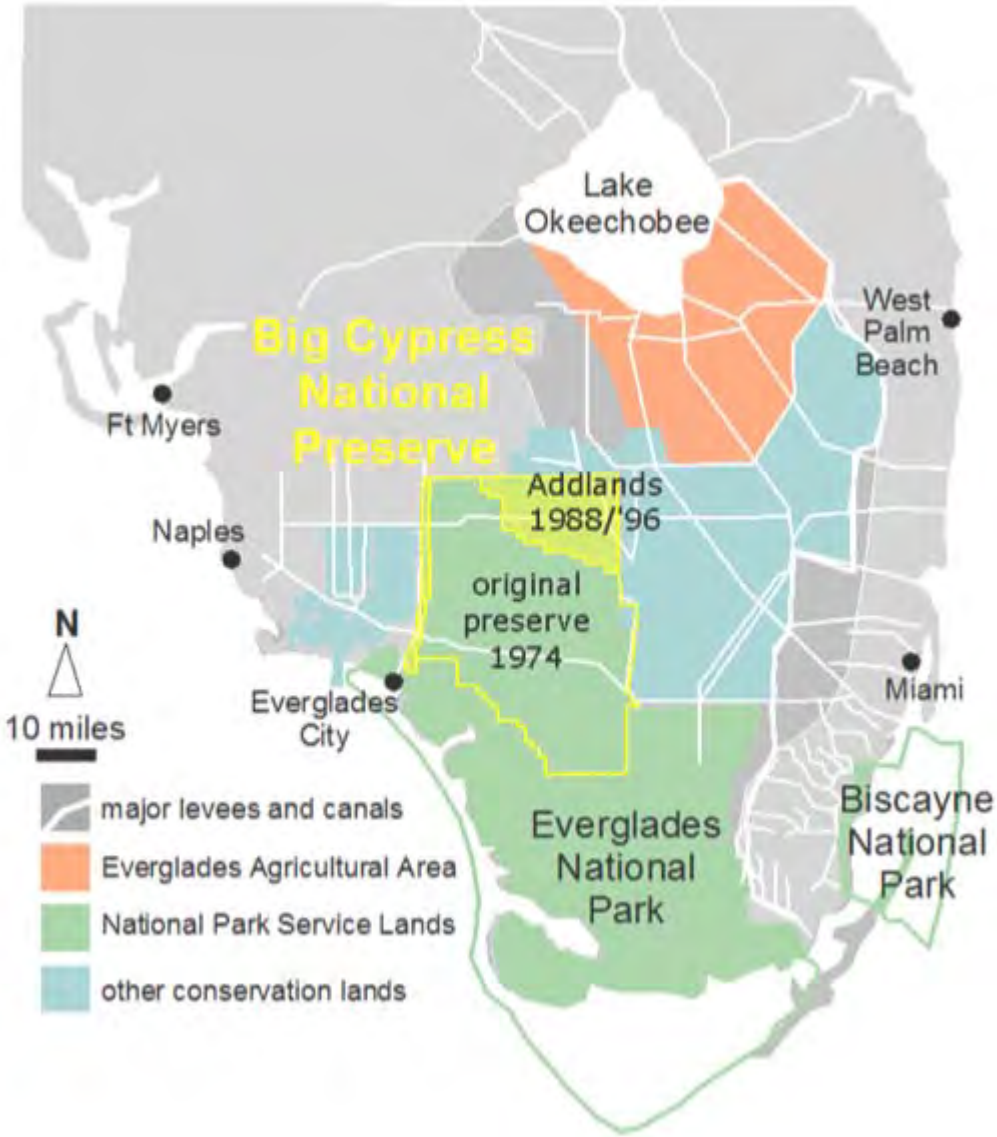
Month-long Wildfire in 2015

Month-long Wildfire in 2015

Rain-filled marsh

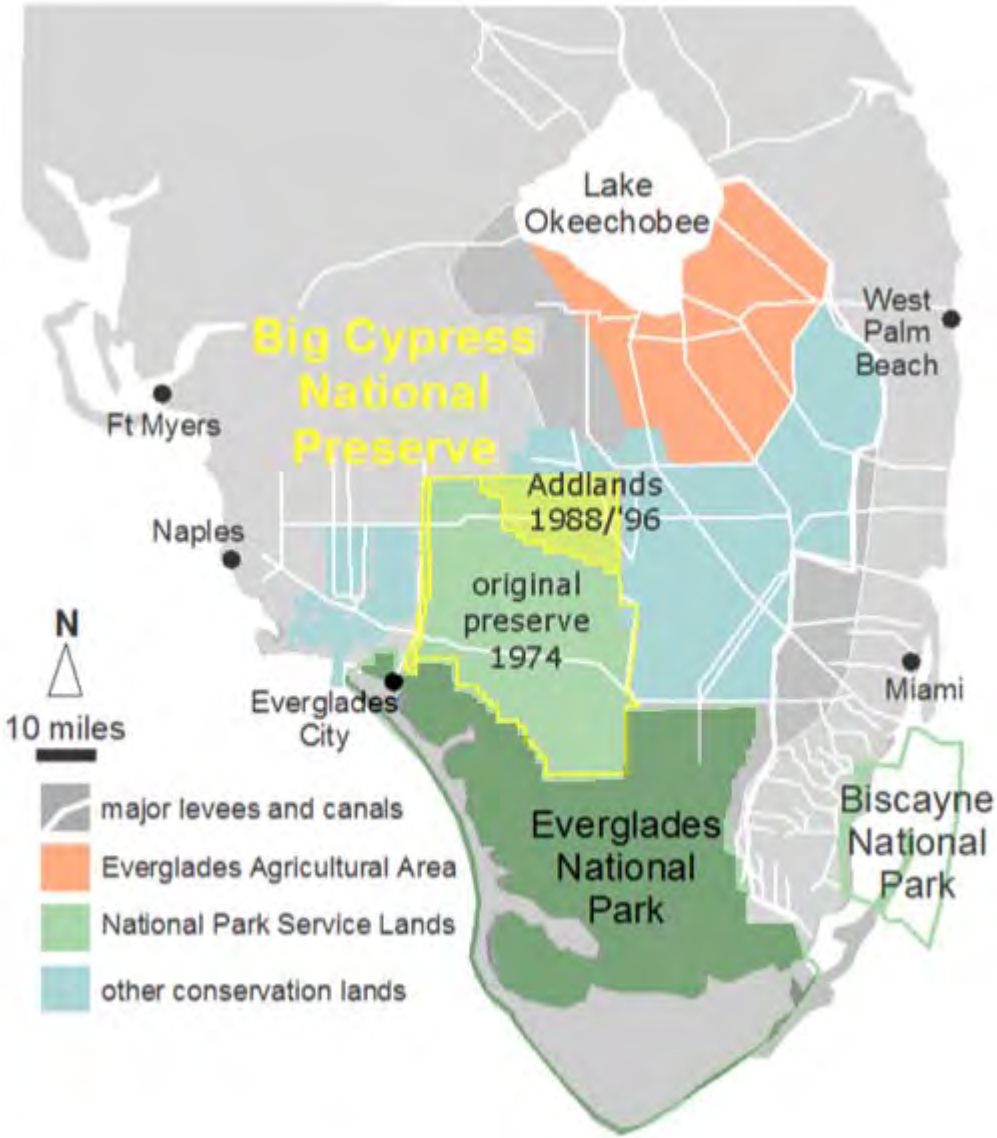
Rain-filled marsh

Why was The Big Cypress **Conserved?**



Why was The Big Cypress **Conserved?**

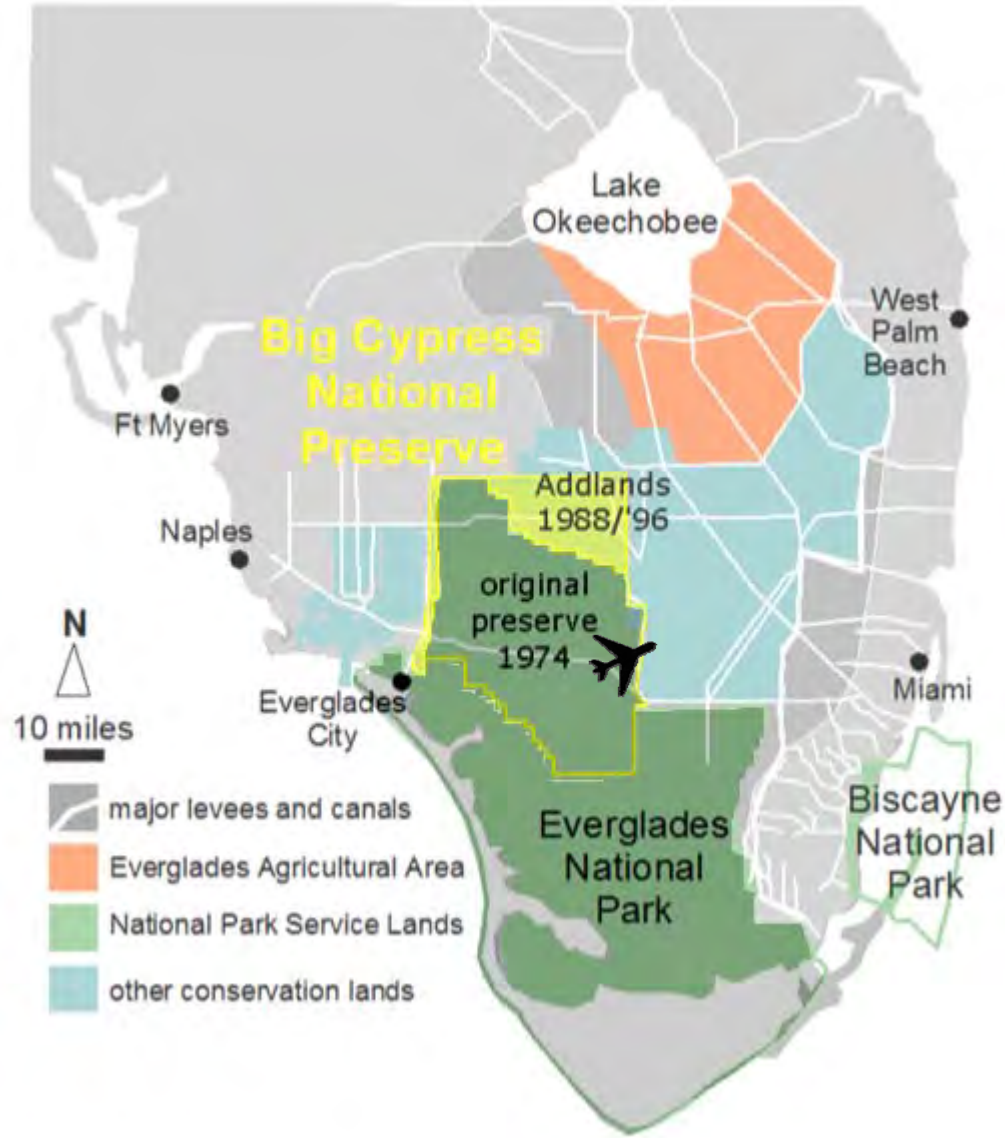
Protect freshwater flows into EVER's western **estuarine** arm …



Why was The Big Cypress **Conserved?**

Protect freshwater flows into EVER's western **estuarine** arm …

By preserving the upstream **watershed**



Why was The Big Cypress **Conserved?**

Protect freshwater flows down-stream estuaries

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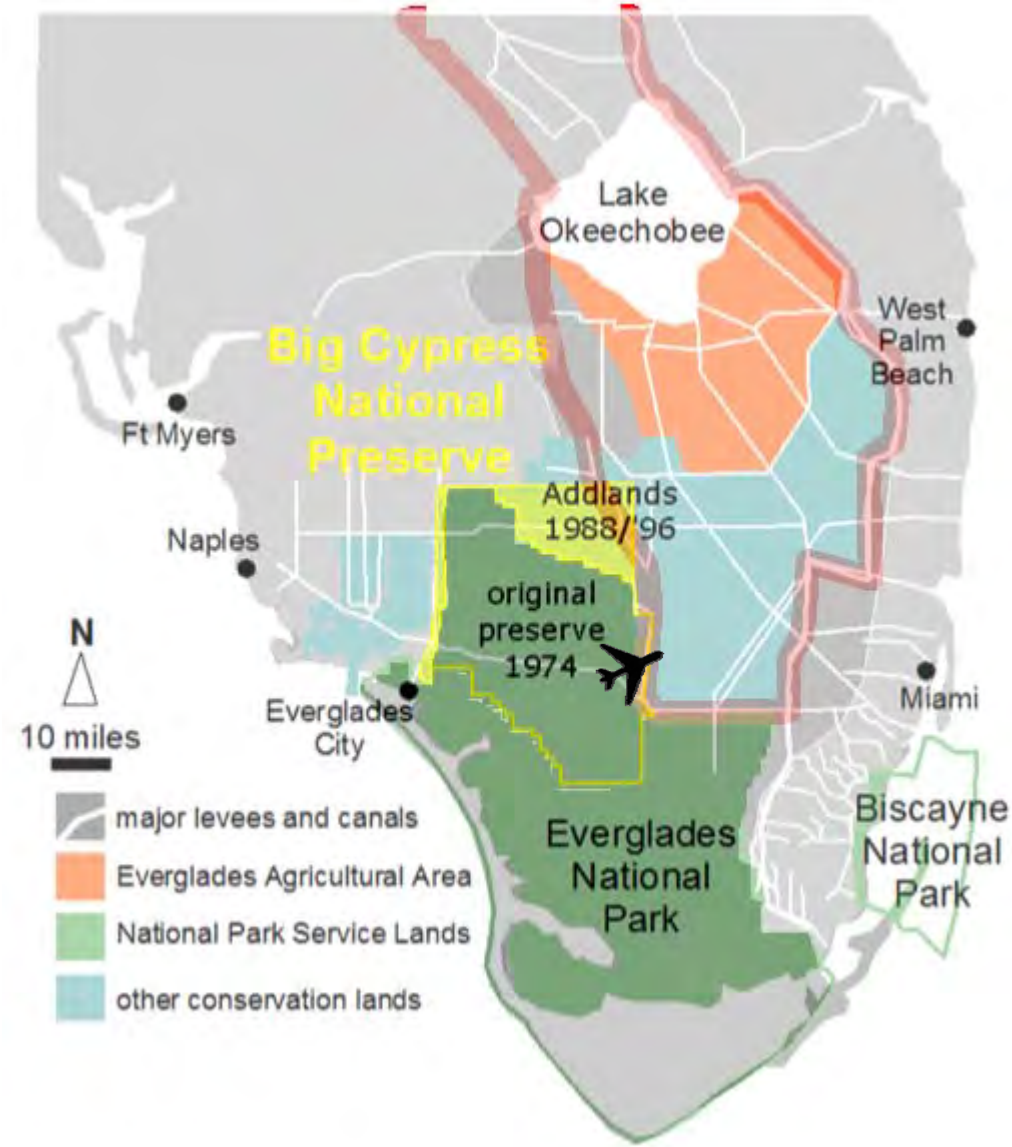

In doing so, prevent what happened on the Park's **east** side

Why was The Big Cypress **Conserved?**

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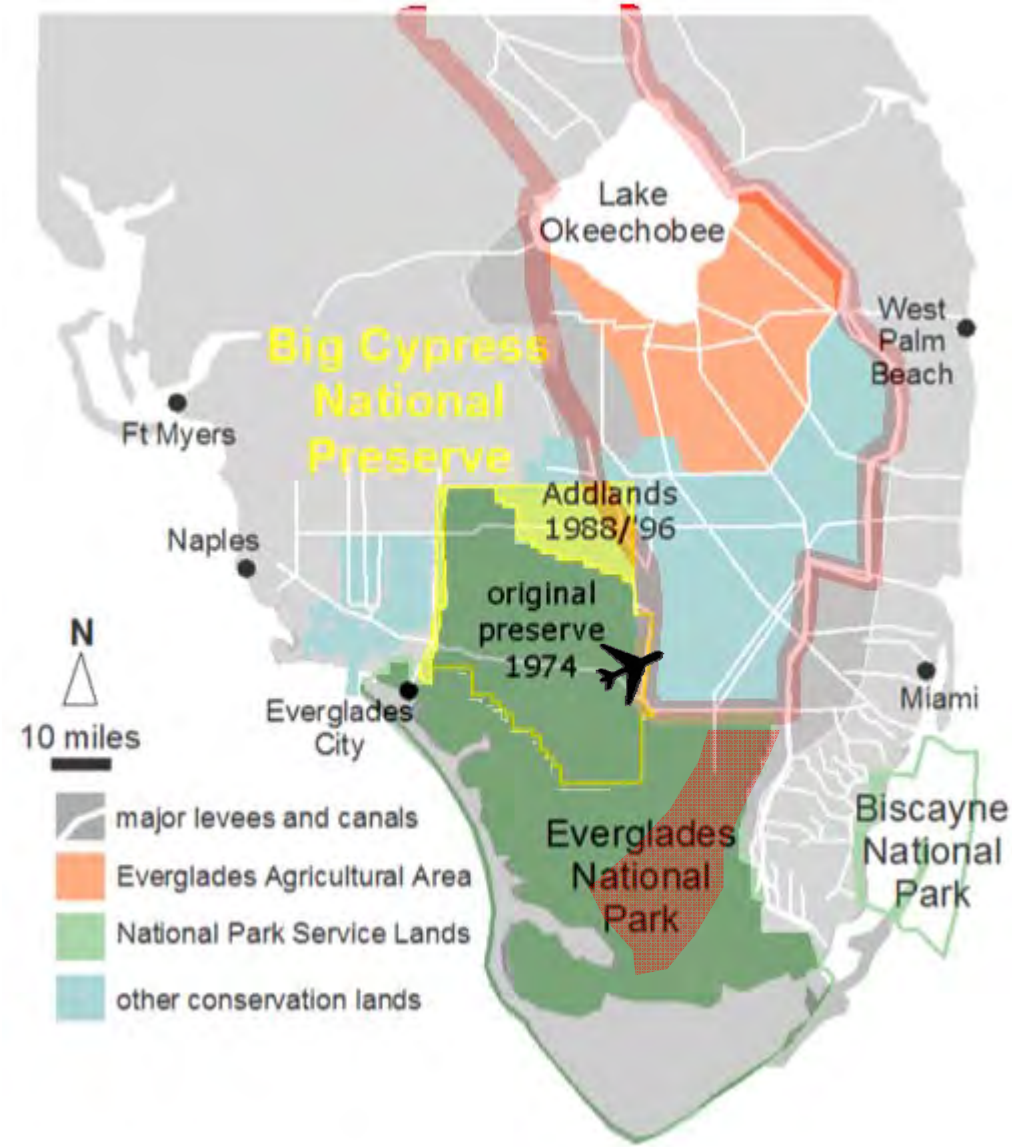

In doing so, prevent what happened on the Park's **east** side

Shark River **Slough**

The Big Cypress would replenish downstream estuaries with **sheetflow** through the trees

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Called strands,

The Big Cypress would replenish downstream estuaries with **sheetflow** through the trees

Called strands, uncontrolled by **gates**

The Big Cypress would replenish downstream estuaries with **sheetflow** through the trees

Called strands, uncontrolled by **gates**

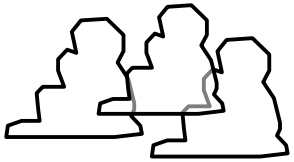
Thus started a **misconception**

Thus started a **misconception**

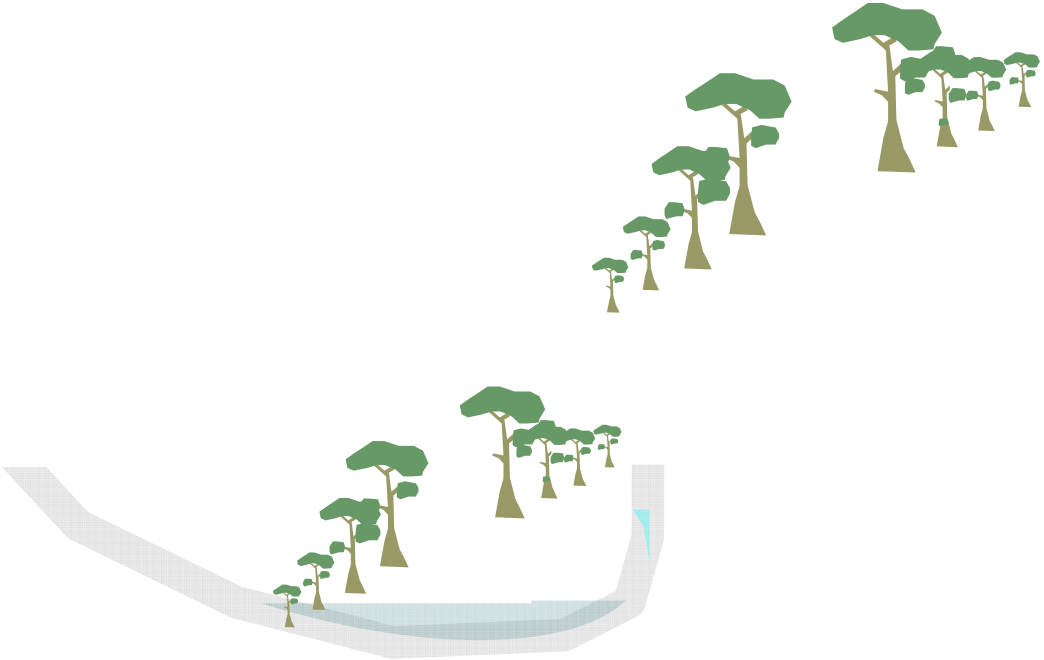
Thus started a **misconception**

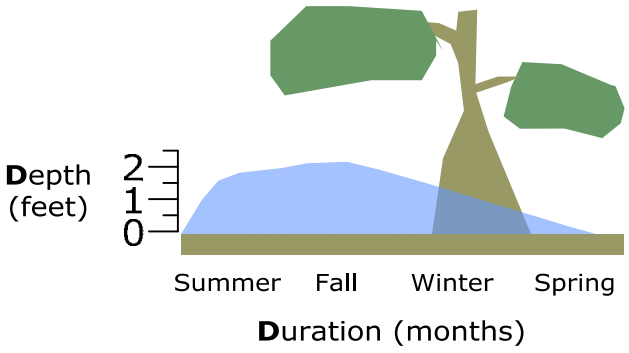
Not affected by **gates**

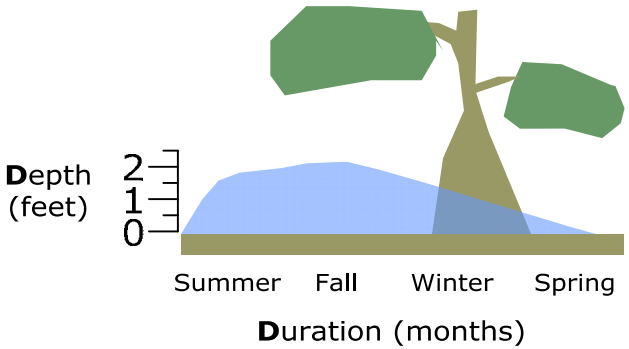
Correct Misconception with **Sophisticated** Model



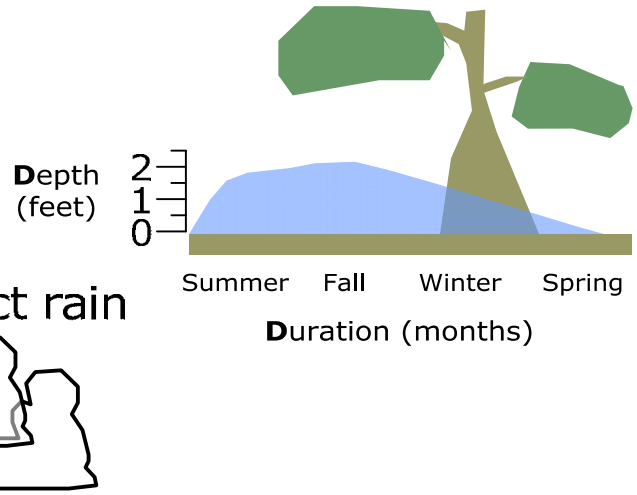
Back of **Envelope** Approach



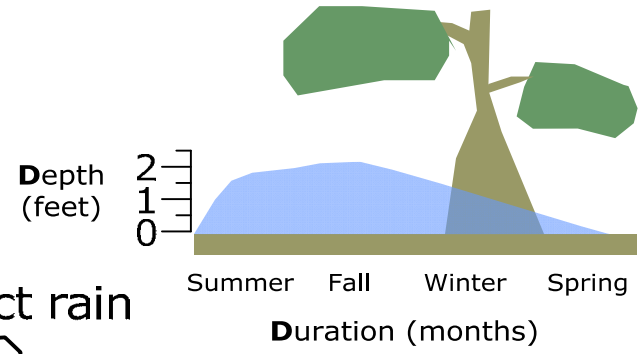

Depth
(feet)
2
1
0
Summer
Fall
Winter
Spring
Duration (months)



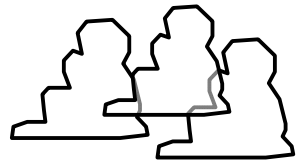
Dome depth (ft) and duration (months)



$$\text{Dome}_{\text{depth (ft) and duration (months)}} \propto \text{Direct rainfall}$$

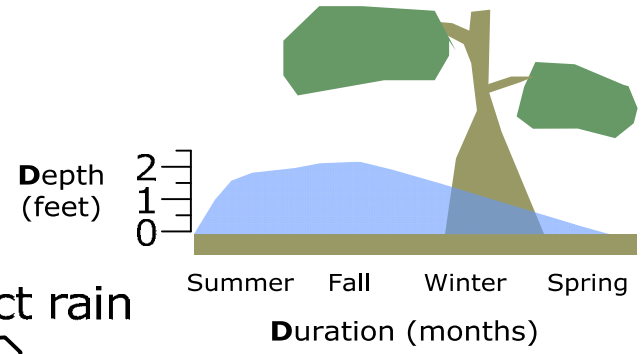


Direct rain

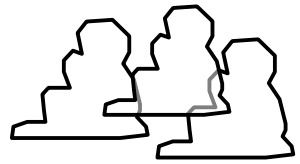


Overland flow

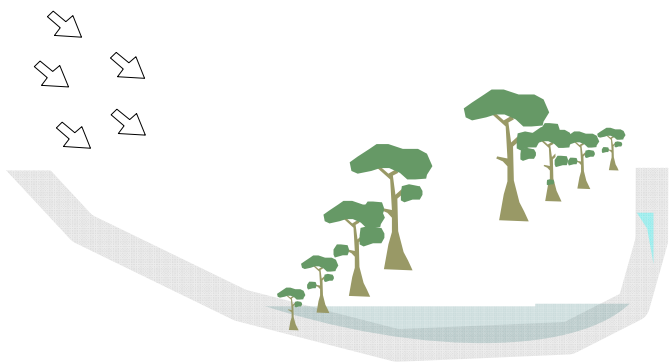
Dome $_{\text{depth (ft) and duration (months)}}$ $\propto$ Direct rainfall + Overland flow



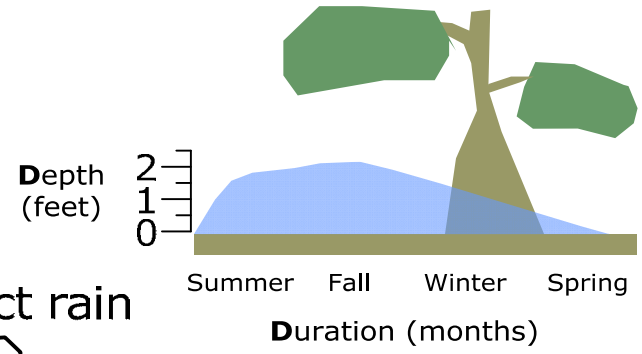
Direct rain



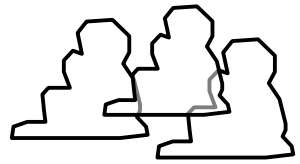
Overland flow



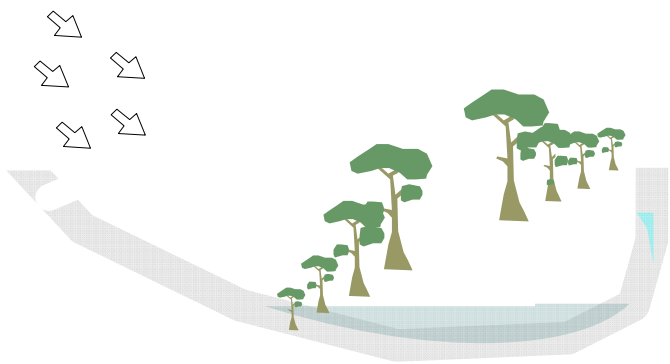
$$\text{Dome}_{\text{depth (ft) and duration (months)}} \propto \text{Direct rainfall} + \text{Overland flow} + \text{Wetland storage}$$



Direct rain

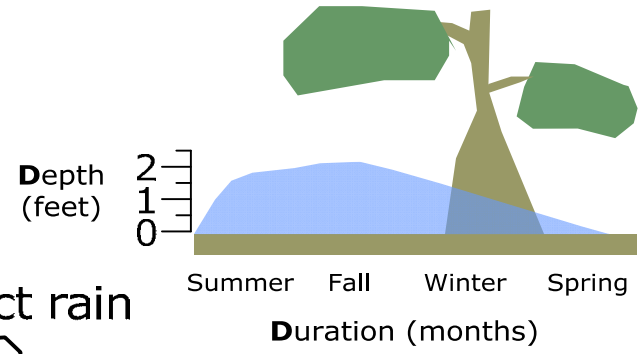


Overland flow

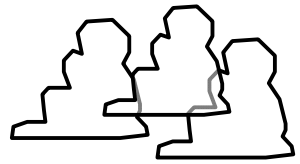


Dome $_{\text{depth (ft) and duration (months)}}$ $\propto$ Direct rainfall + ~~Overland flow~~

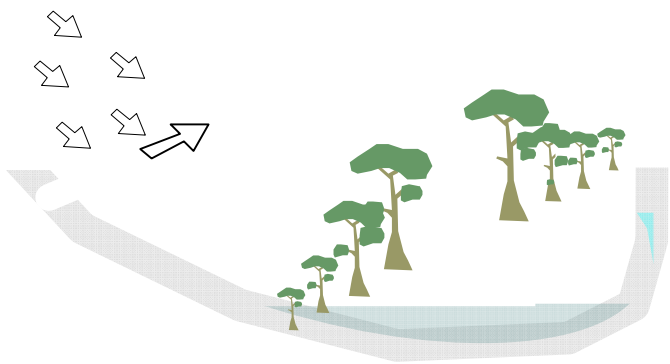
+ Wetland storage



Direct rain



Overland flow



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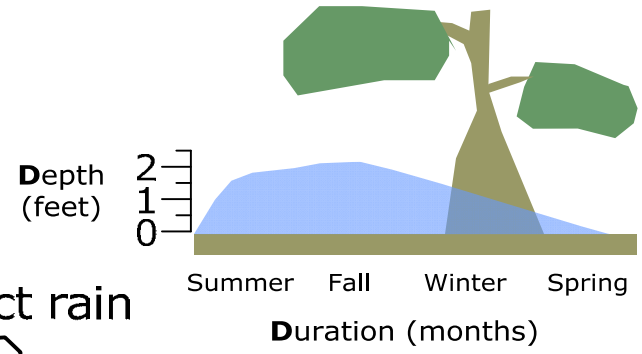
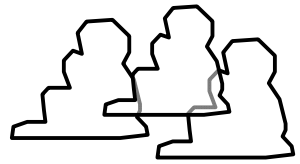
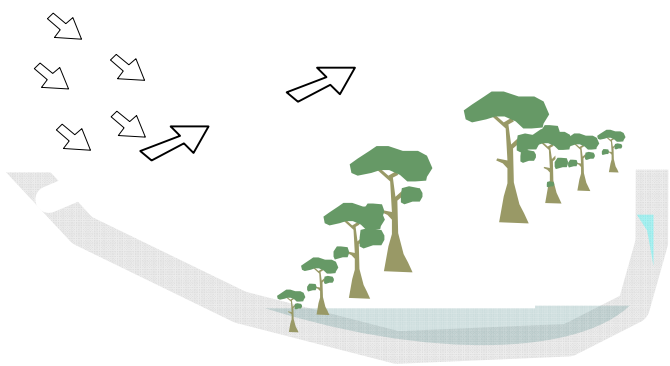


Direct rain



Overland flow



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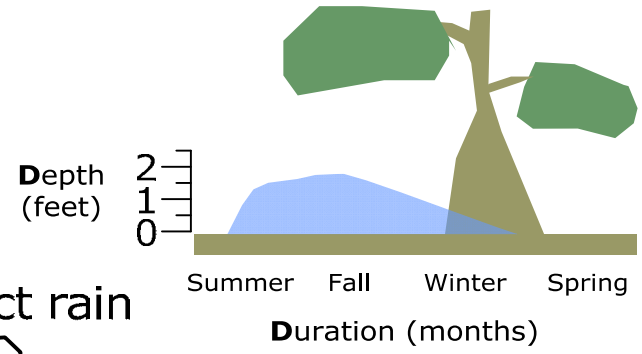
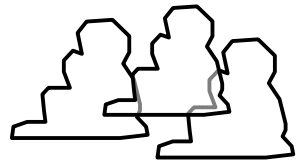
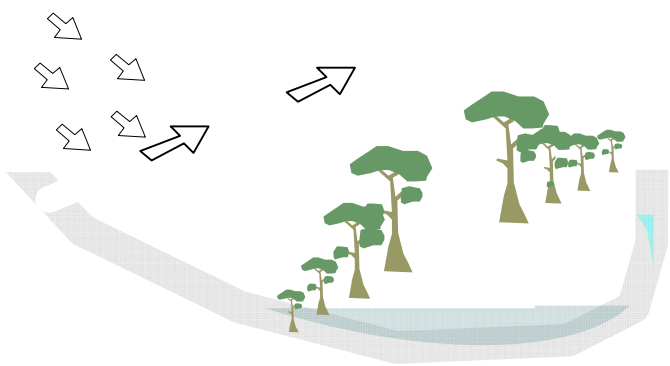
+ Wetland storage



Direct rain



Overland flow



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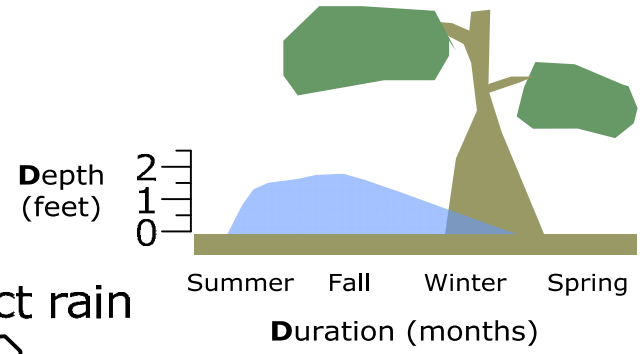
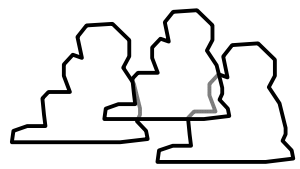
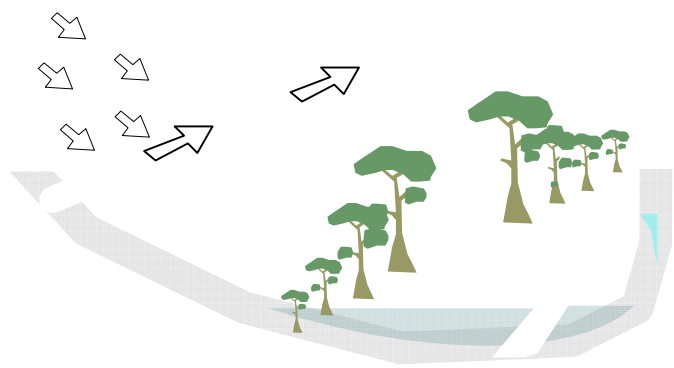


Direct rain

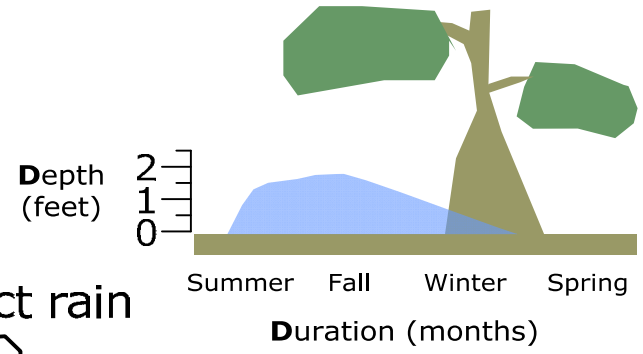


Overland flow

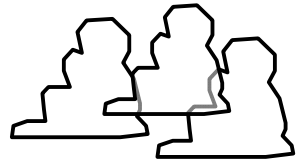


Interior canals

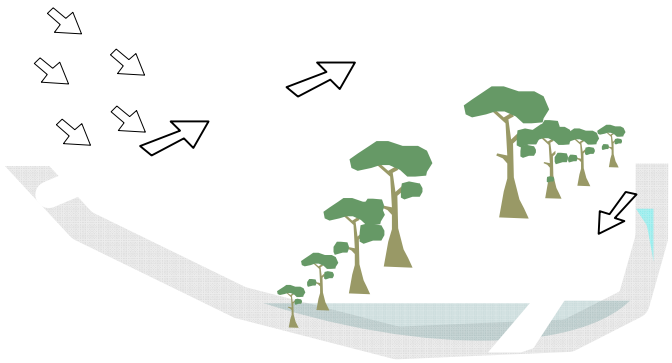
$$\text{Dome}_{\text{depth (ft) and duration (months)}} \propto \text{Direct rainfall} + \cancel{\text{Overland flow}} + \text{Wetland storage}$$



Direct rain



Overland flow



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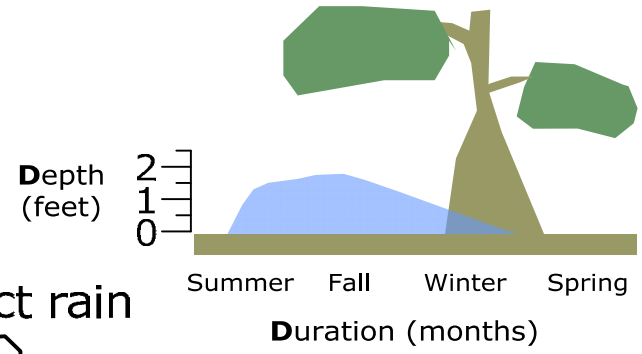
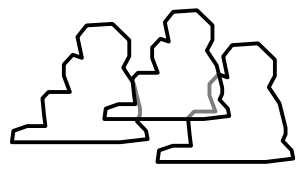
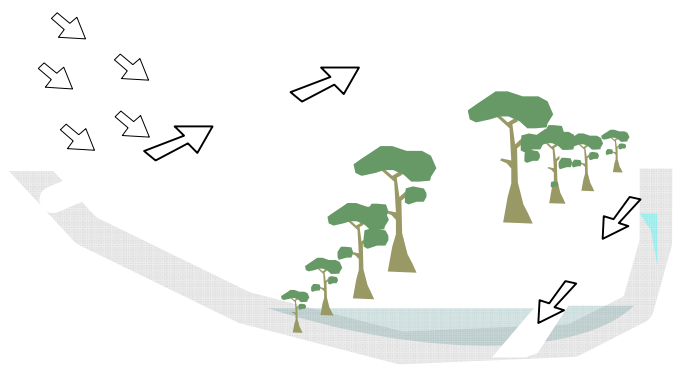


Direct rain



Overland flow



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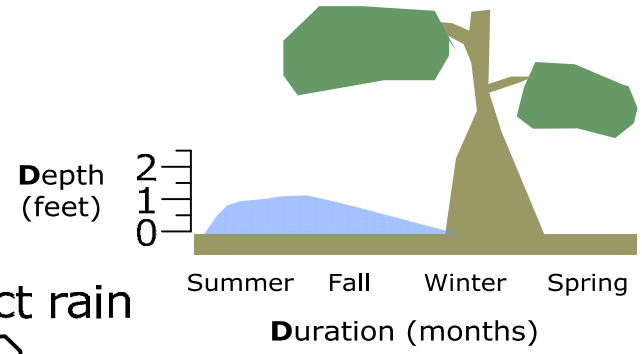
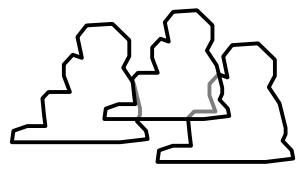
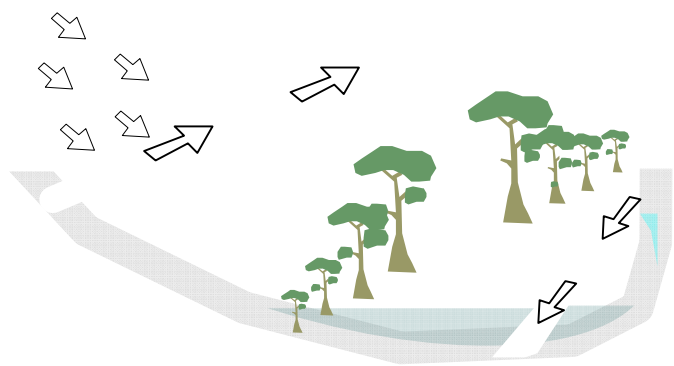


Direct rain



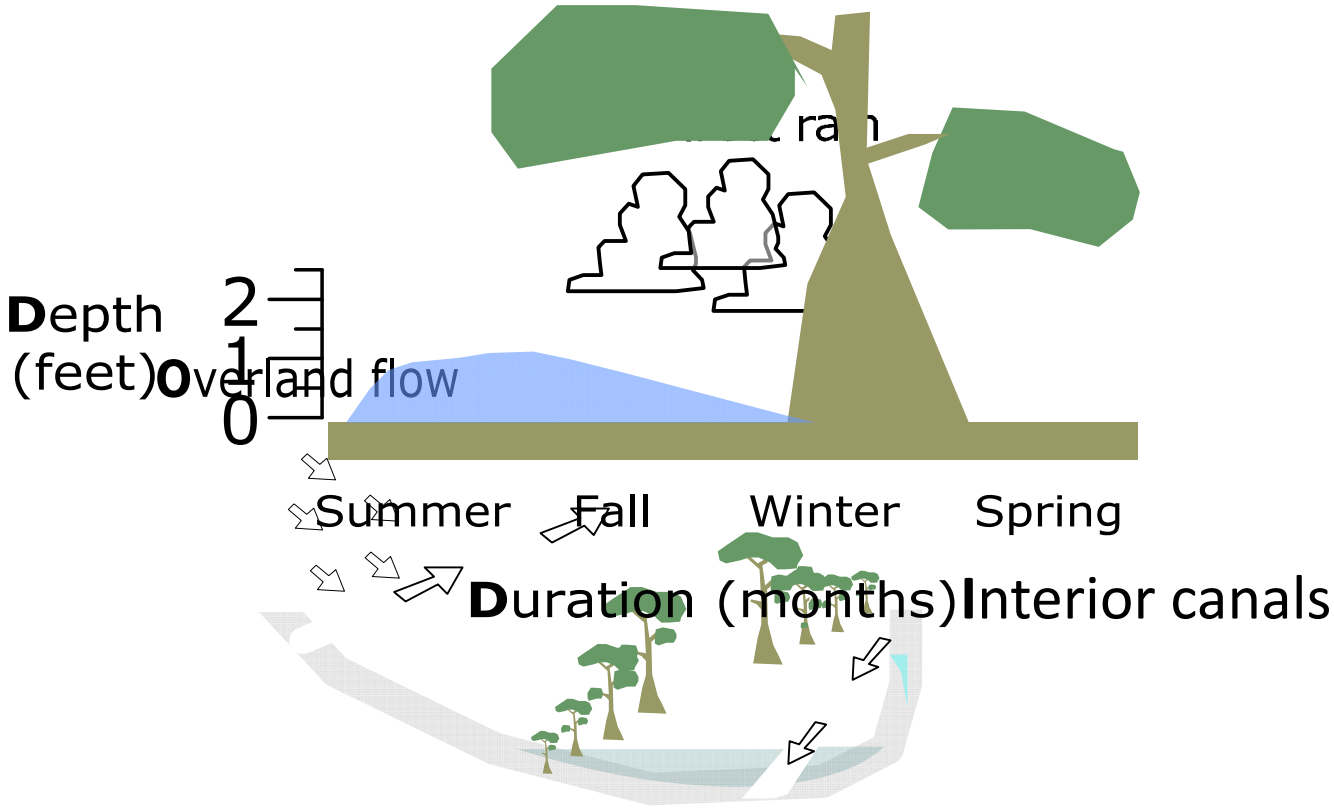
Overland flow



Interior canals

Dome $_{\text{depth (ft) and duration (months)}}$ $\propto$ Direct rainfall + ~~Overland flow~~

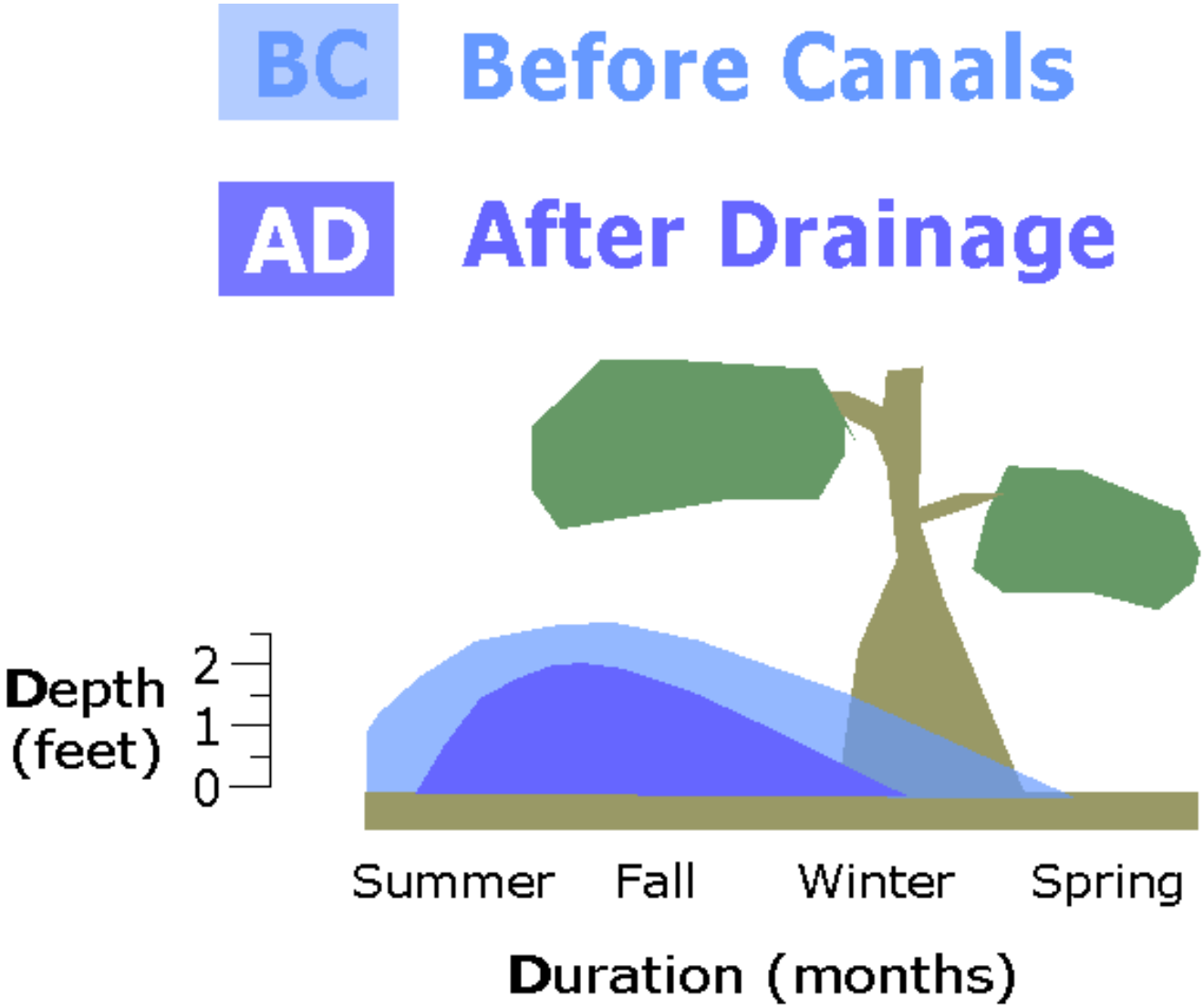
+ Wetland storage



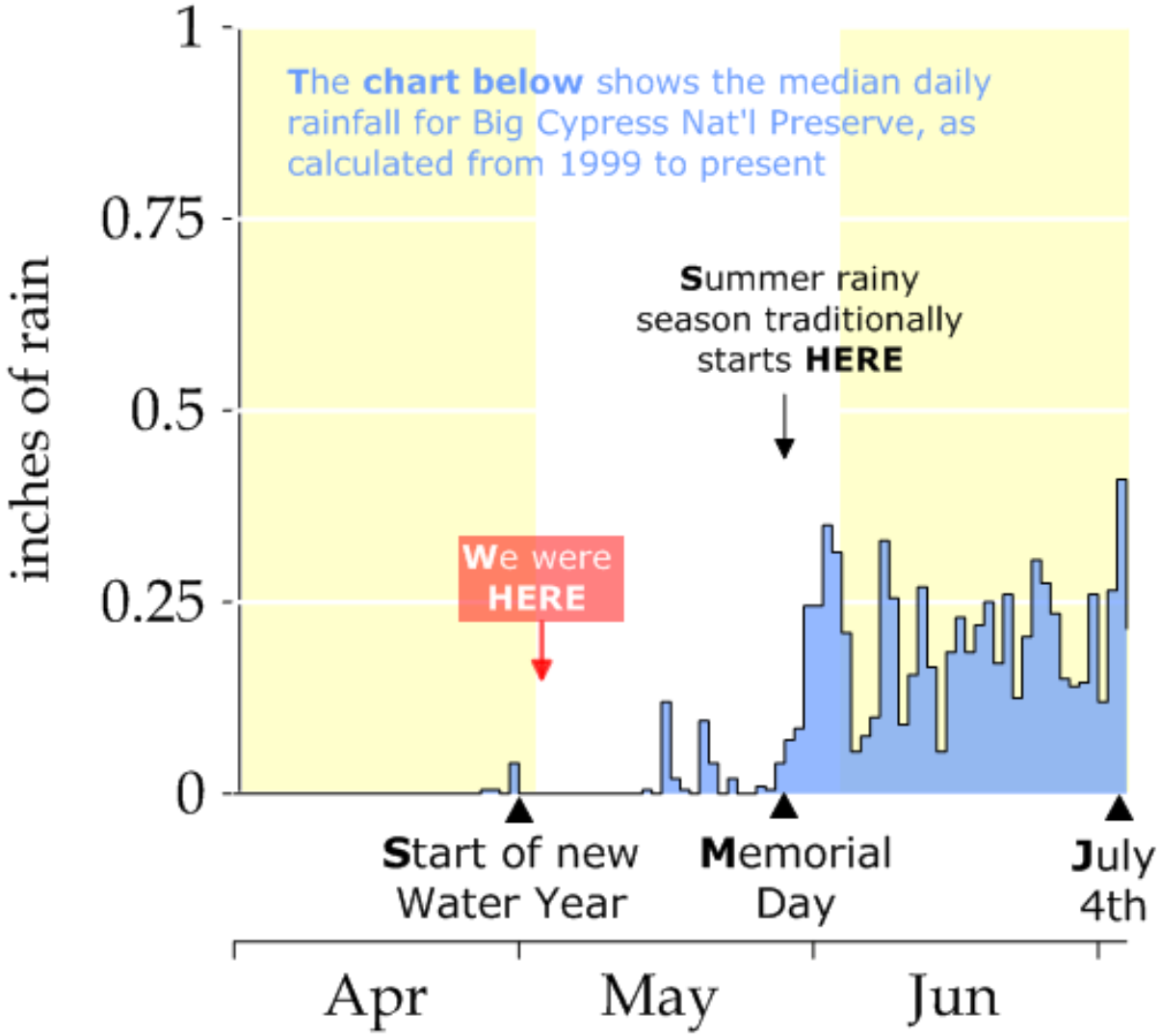
Dome $_{\text{depth (ft) and duration (months)}}$ $\propto$ Direct rainfall + ~~Overland flow~~

+ Wetland storage

Before and After **Result**



When does the rainy season start?



Then when it arrives …

Hydrology is cast as **hero**

The **Result**

Shallow flooding

The **Result**

Shallow flooding

As far as the eye can see

The **Problem**

The **Problem**

Summer harvest
is too low

The **Problem**

Leaving the **barn door** open, too

The **Problem**

And that happens
all year round

The **Problem**

The **Problem**

The **Problem**

The **Problem**

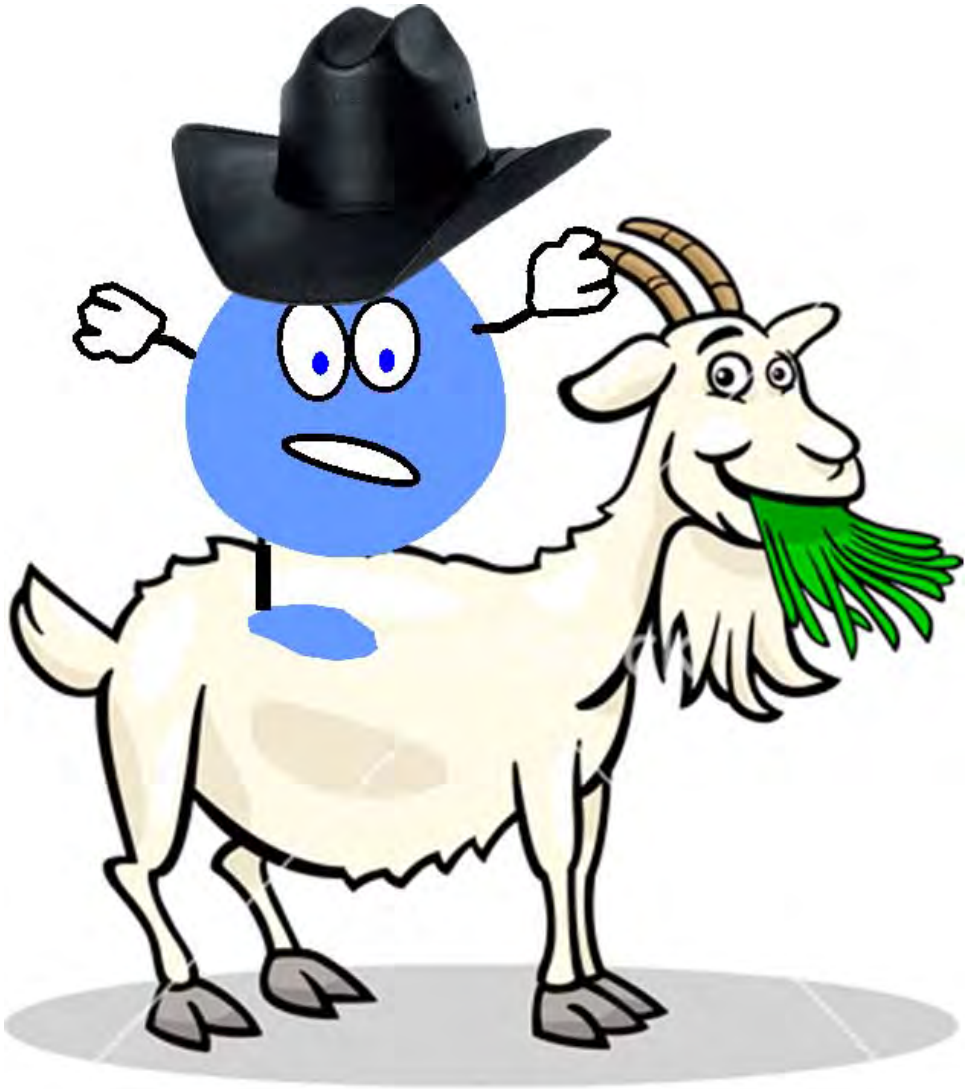
Can you see the **open** barn door?

Can you see the **open** barn door?

“We’re letting the water out!”

The eventual **Result:**

End up with **this** too soon,
too long and too much



Could Hydrology be
Goat instead?

Fortunately, the **solution** is here!

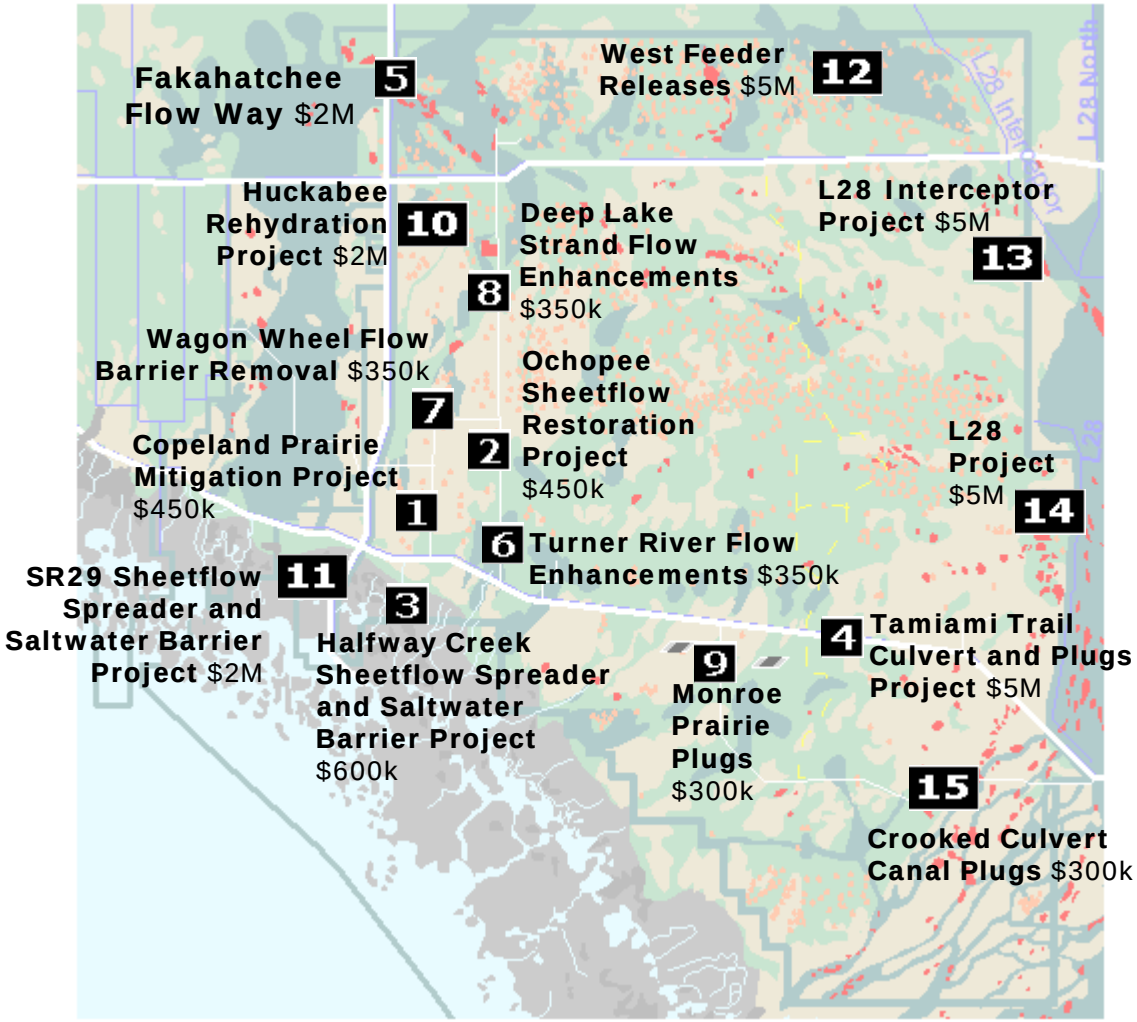
Hydrologic Restoration **Master Plan**

Fortunately, the **solution** is here!

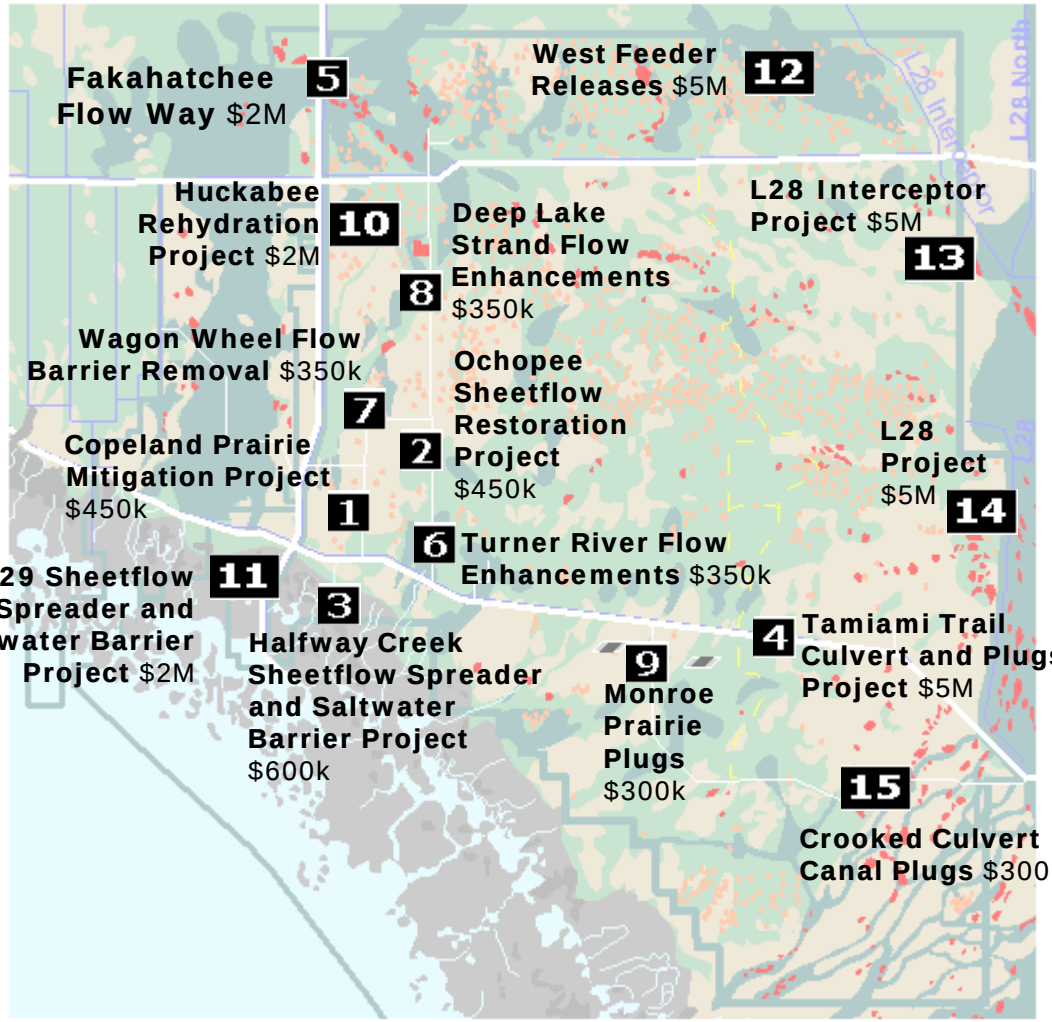
Hydrologic Restoration **Master Plan**

(Comprehensive Canal and Levee Modification Plan)

Master Plan Map



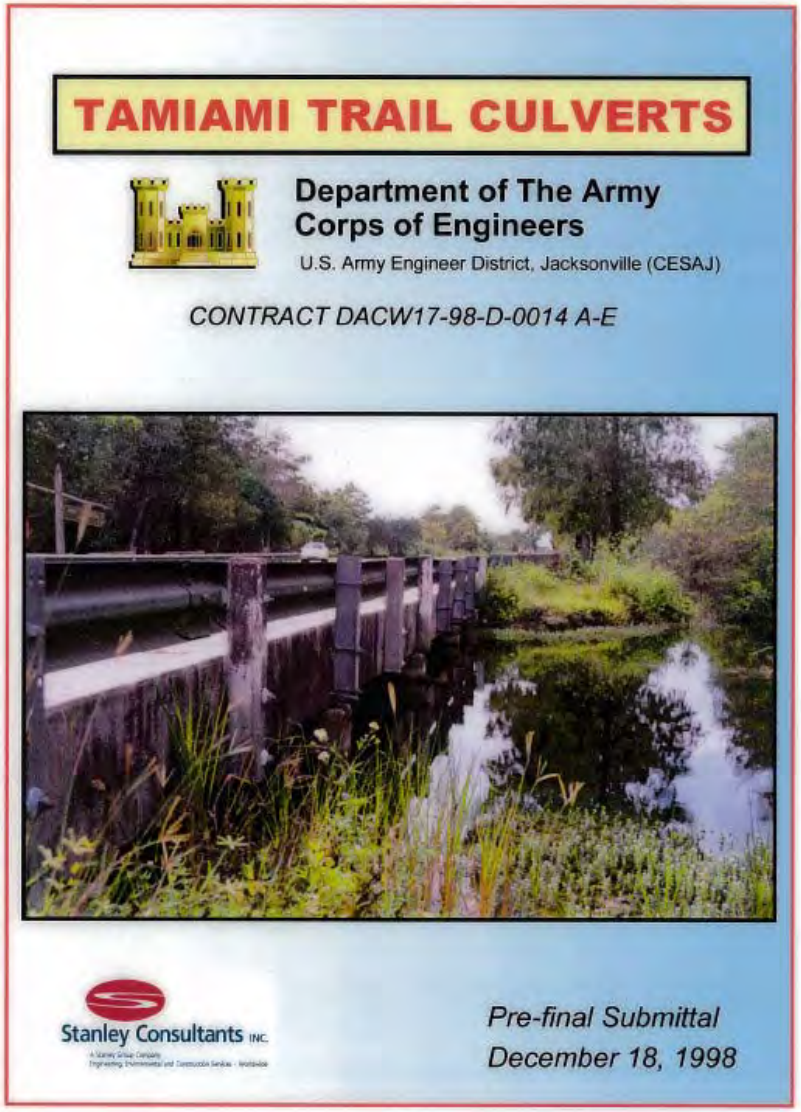
Master Plan Map



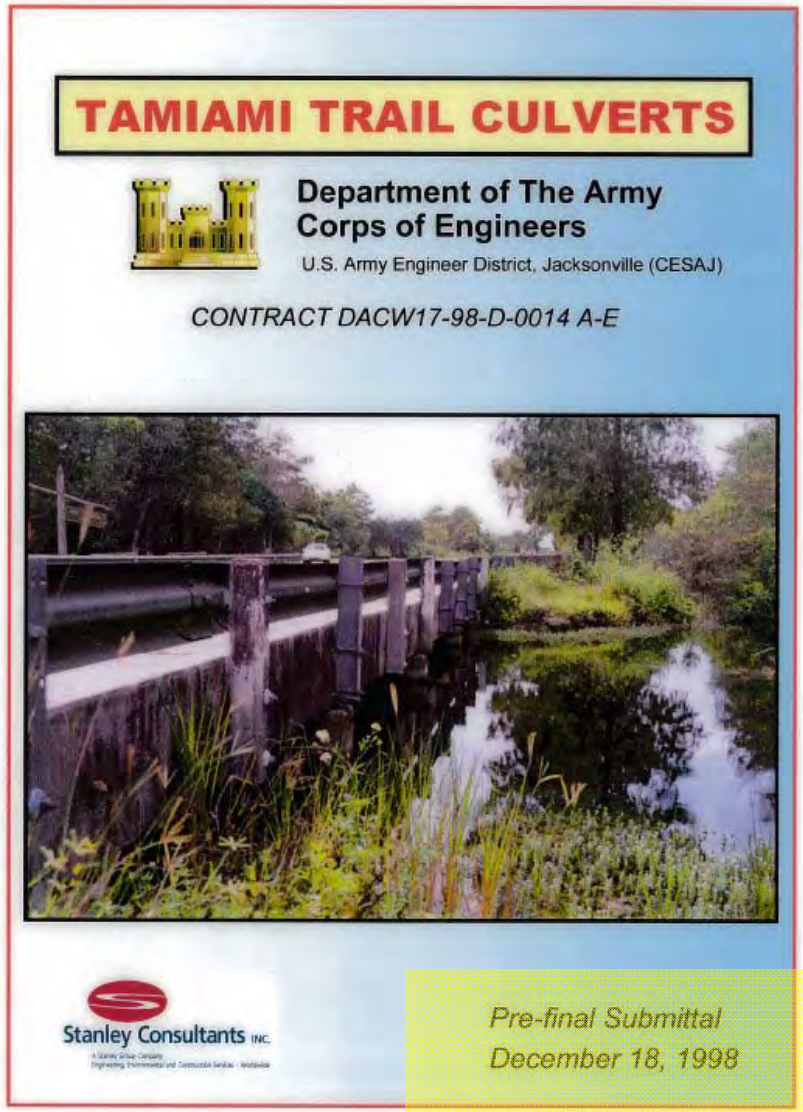
+

= $25M

Shovel Ready Example:
Tamiami Trail Culverts and Plugs

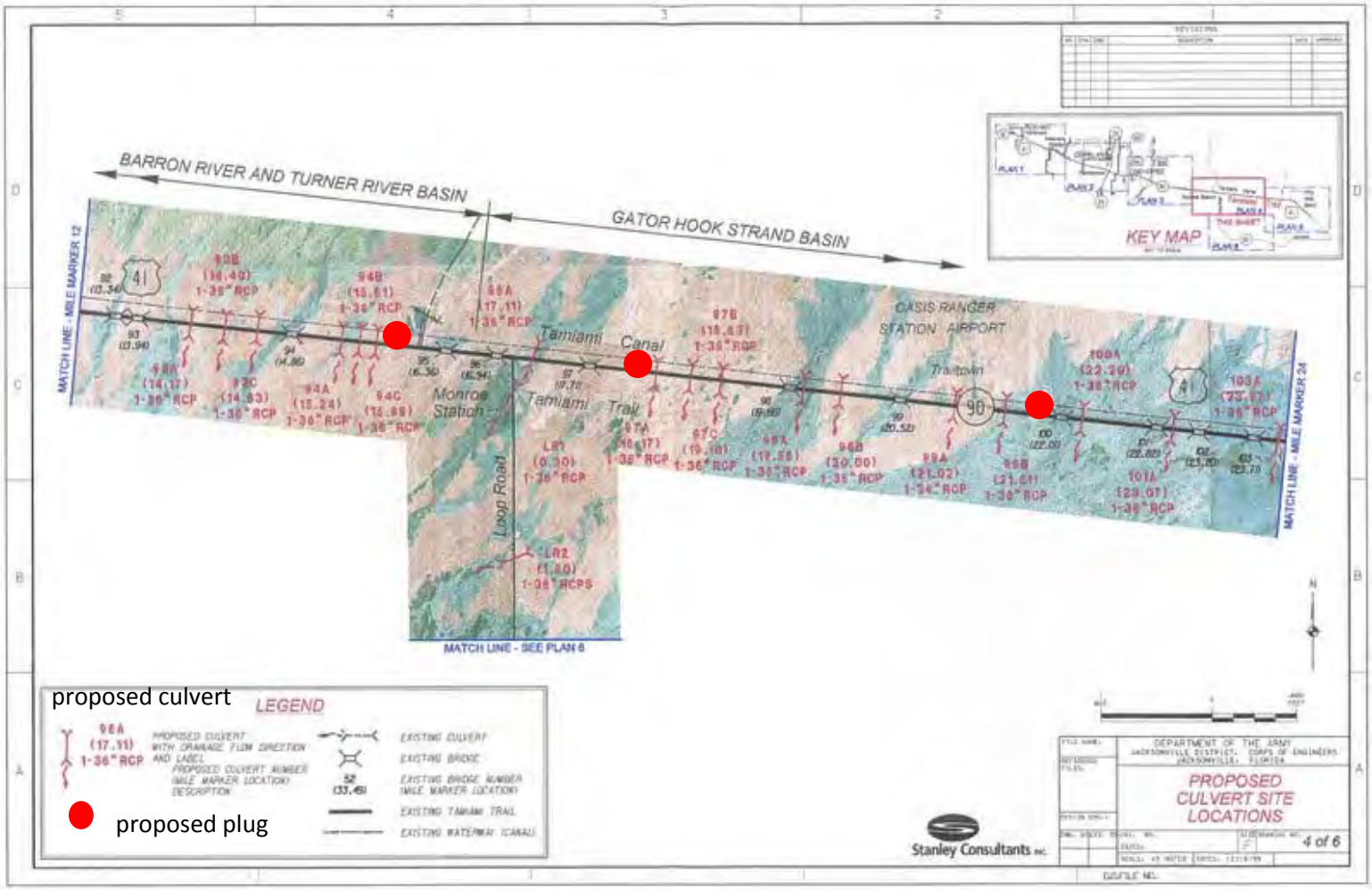


Shovel Ready Example:
Tamiami Trail Culverts and Plugs



1998

Shovel Ready Example:
Tamiami Trail Culverts and Plugs



Cost: $5 Million

Fakahatchee **Flow Way**

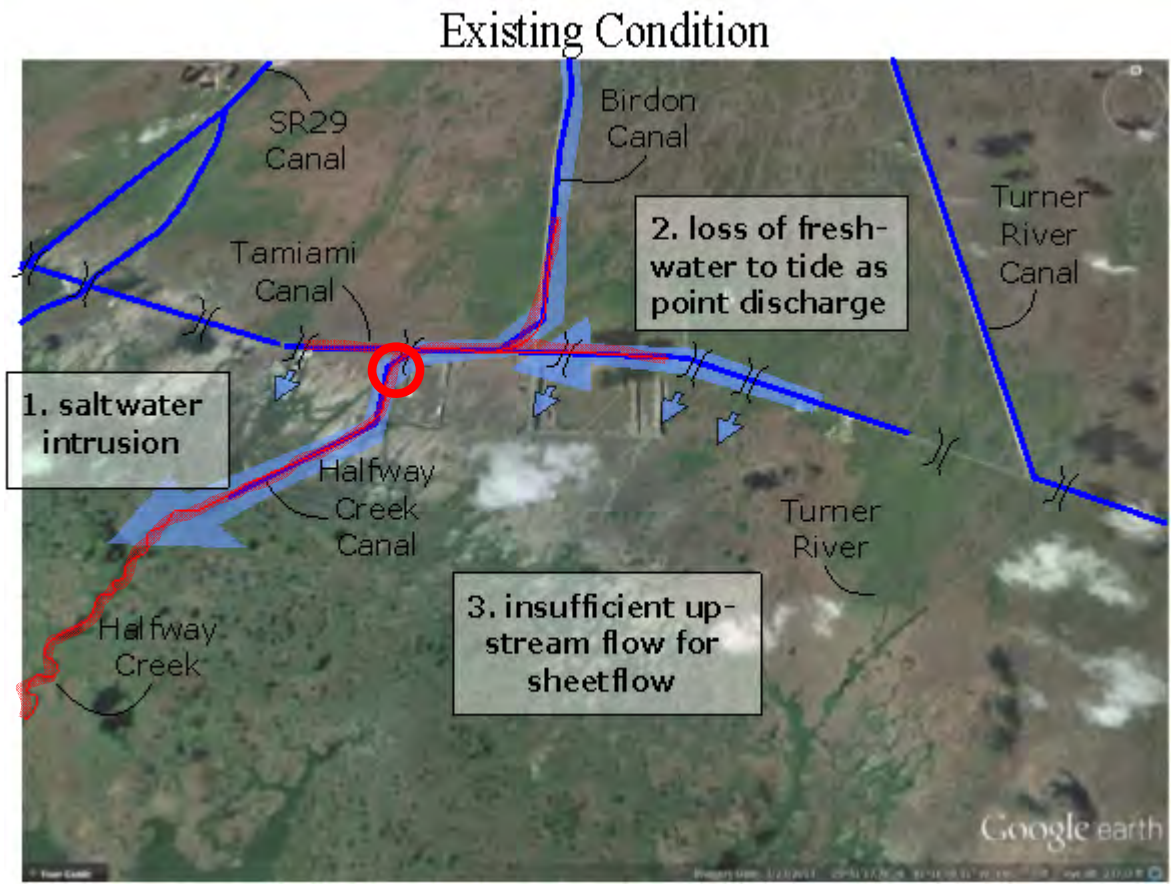
Fakahatchee **Flow Way**

State Road 29 canal is
wide open during **wet season**

Fakahatchee **Flow Way**

State Road 29 canal
leaks water during **dry season**

Sea Level Rise Example:
Halfway Creek Sheetflow Spreader and Saltwater Intrusion Barrier



Sea Level Rise Example:
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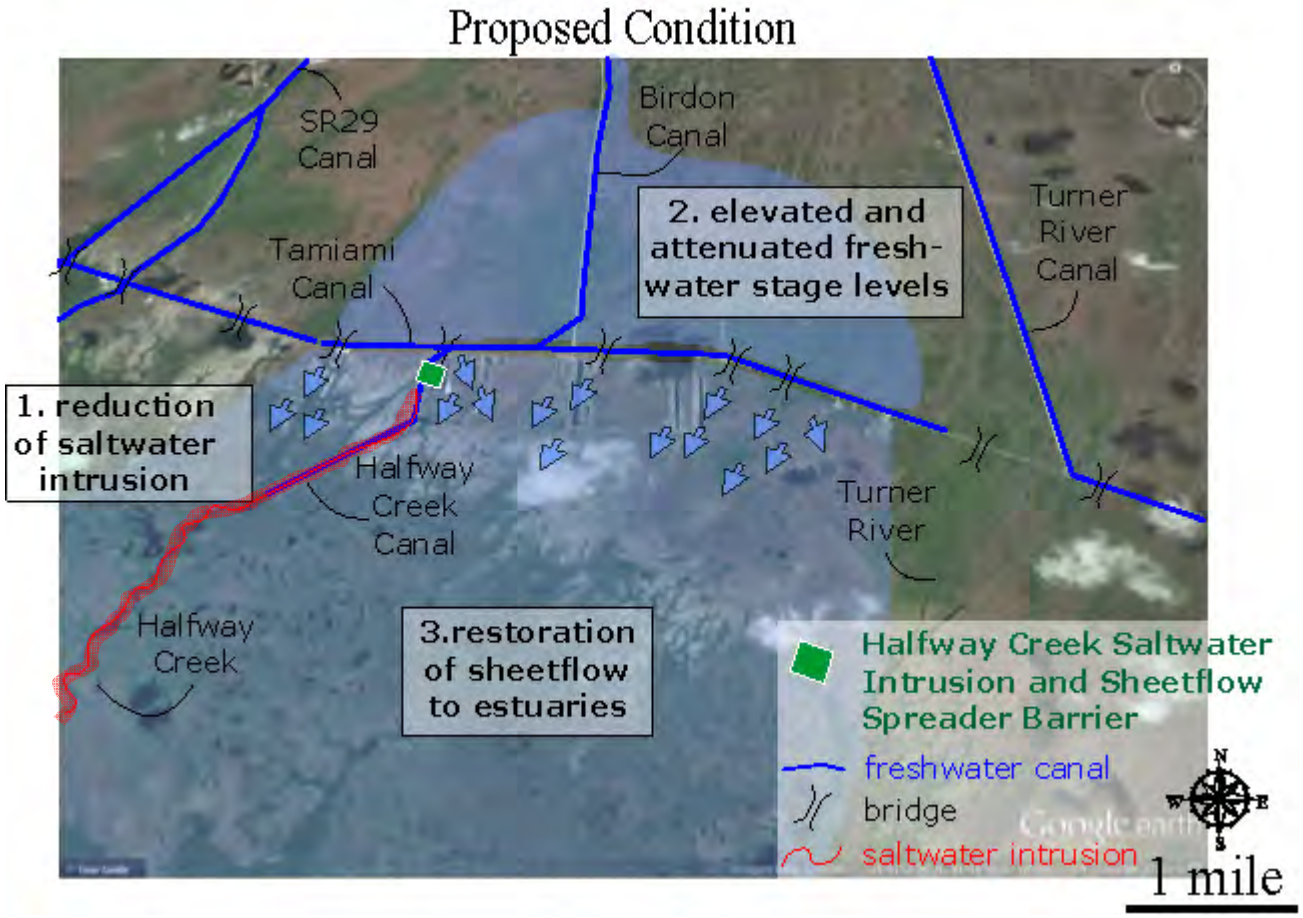
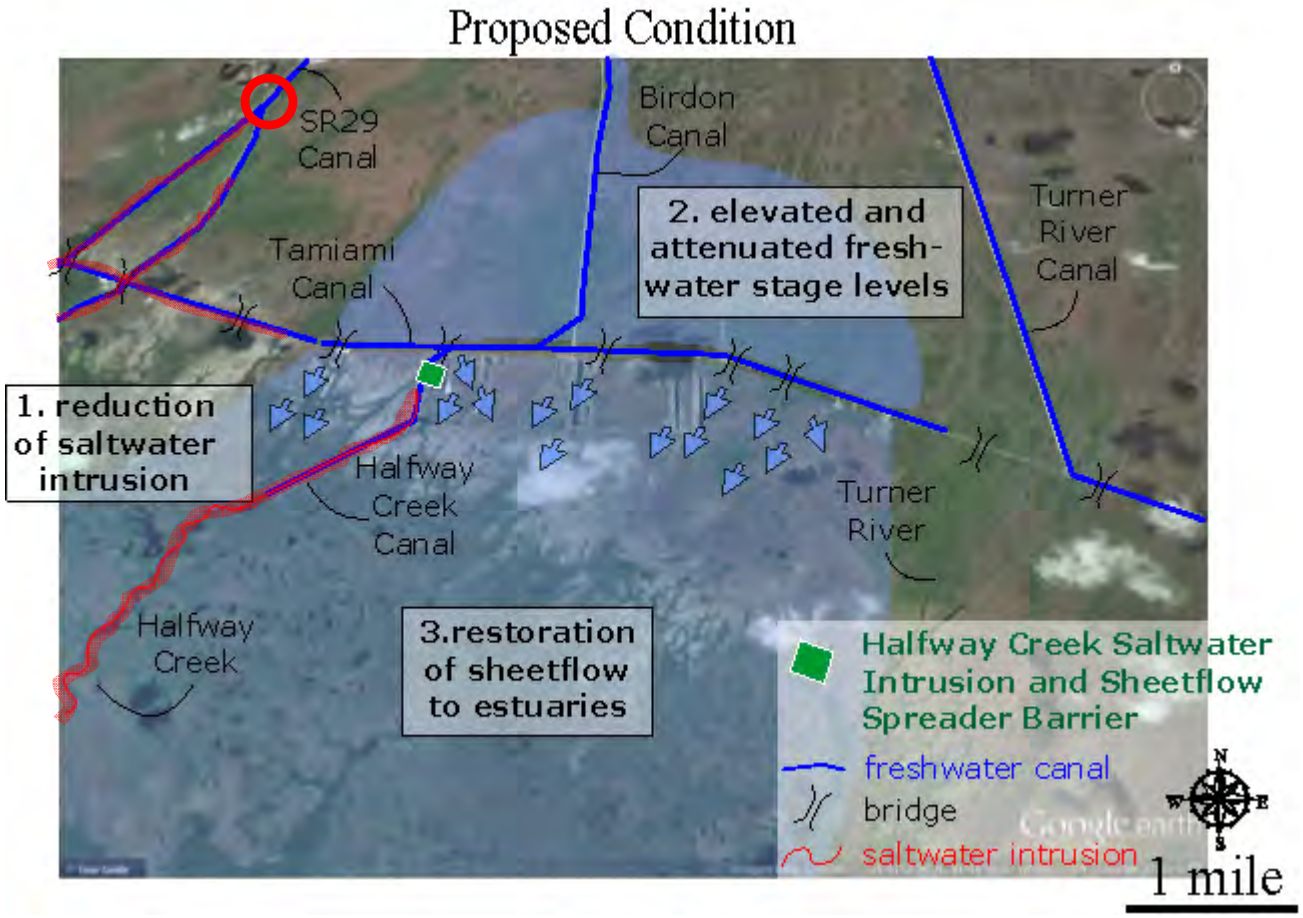


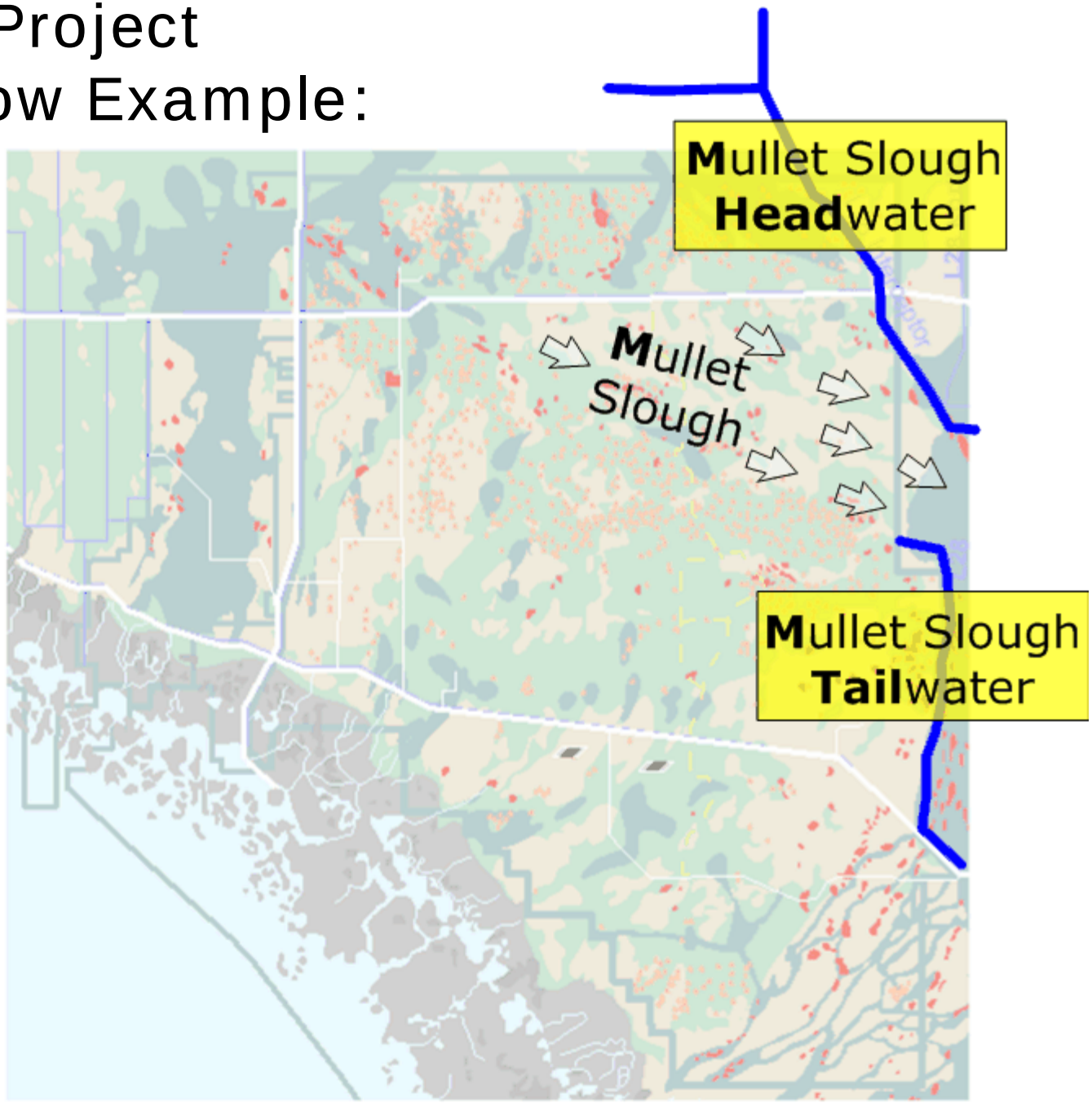
Cost: $600,000

Sea Level Rise Example:
Halfway Creek Sheetflow Spreader and Saltwater Intrusion Barrier

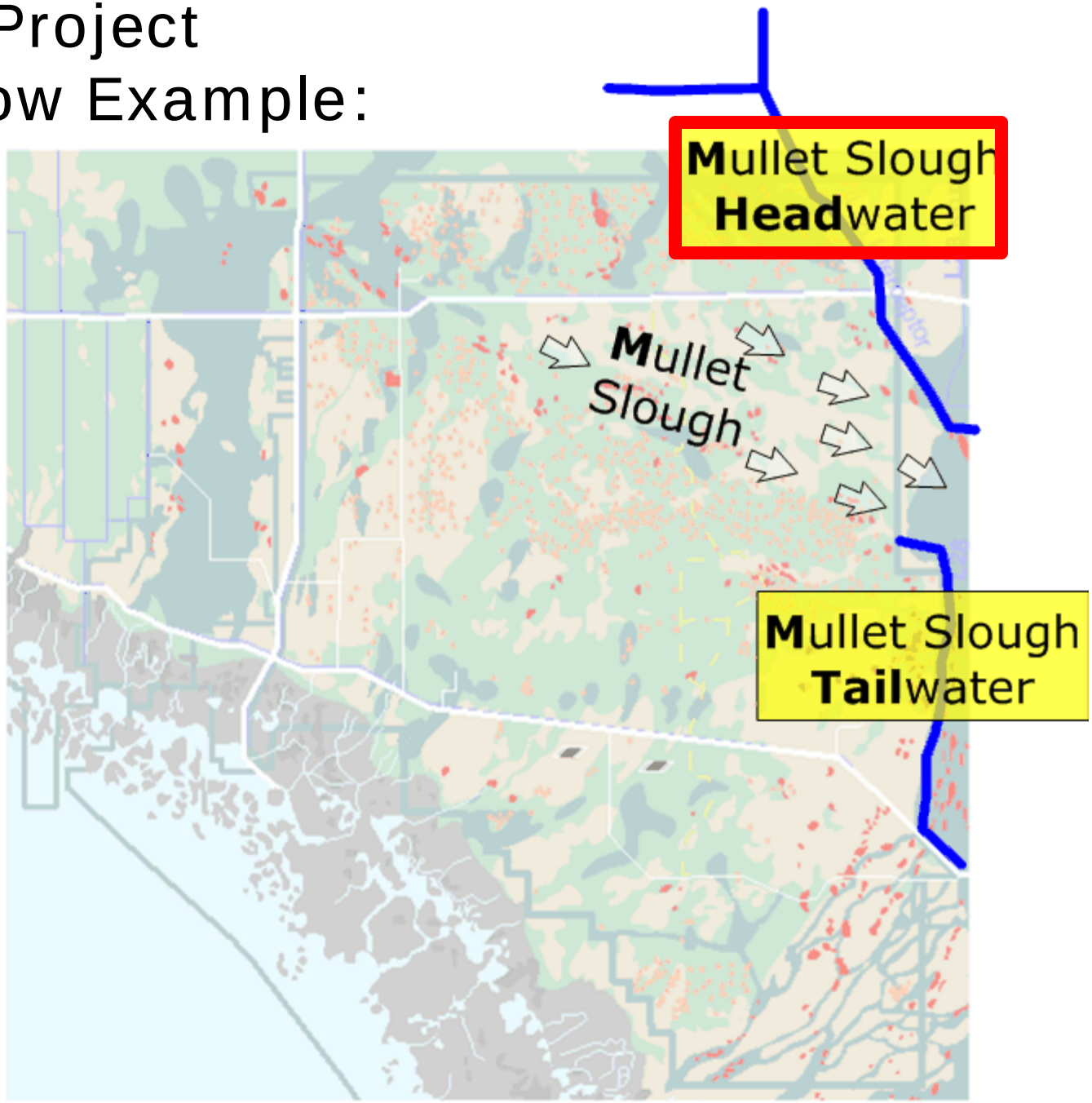


Cost: $600,000

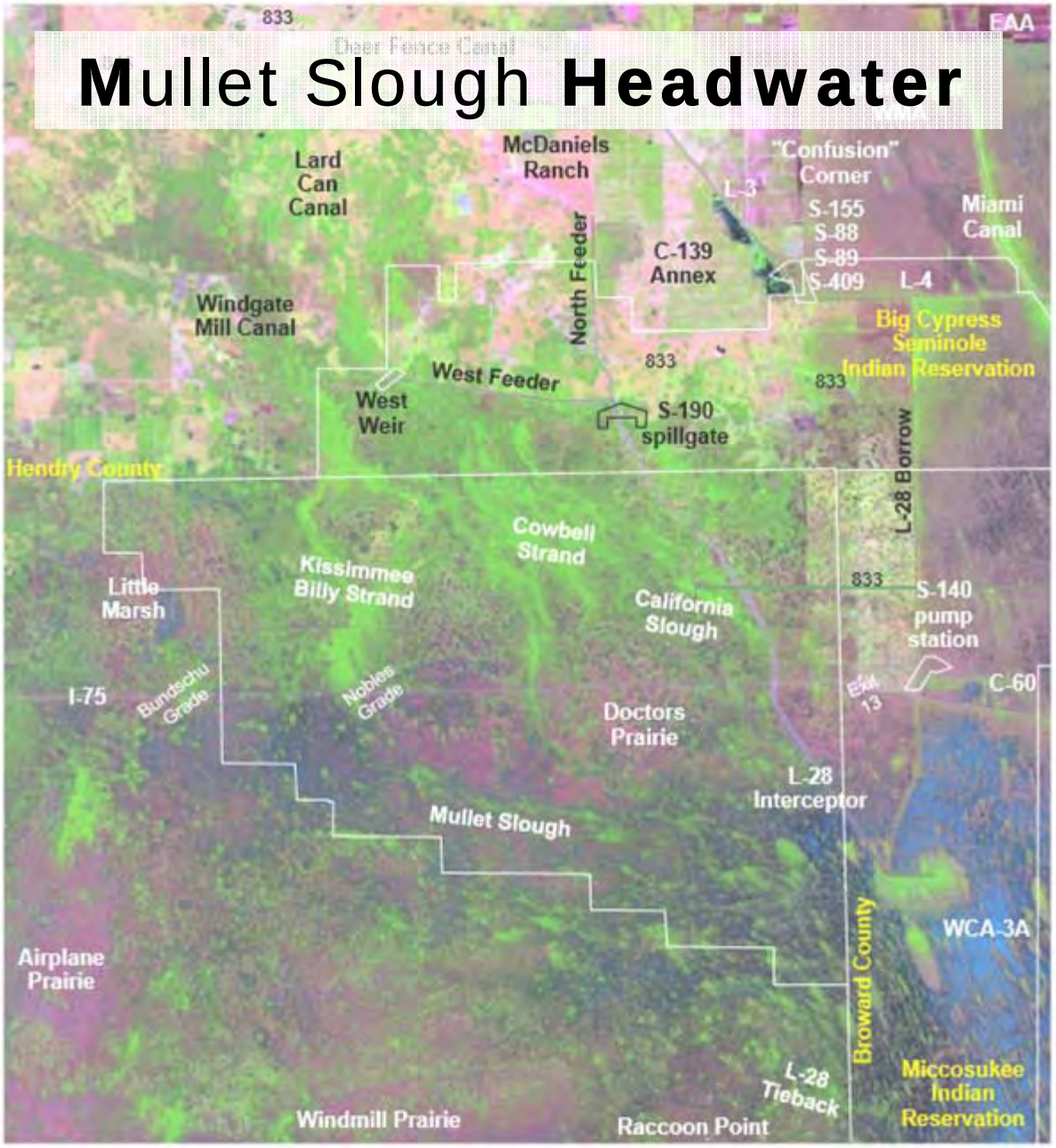
C&SF Project
Overland Flow Example:



C&SF Project
Overland Flow Example:



Mullet Slough Headwater

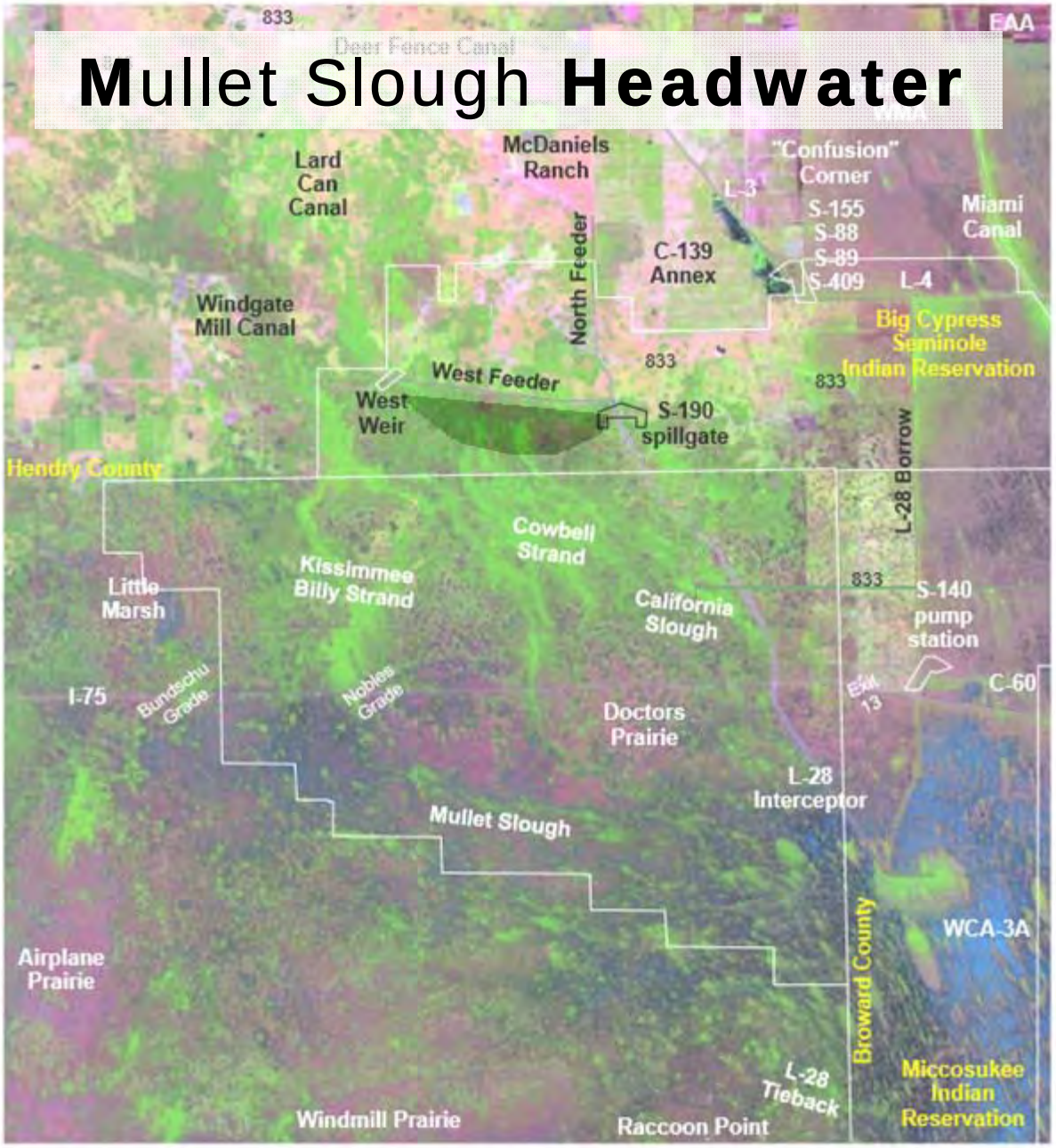


Satellite view of the
Northeast Addition Lands of
Big Cypress National Preserve

5 miles

NORTH

Mullet Slough Headwater

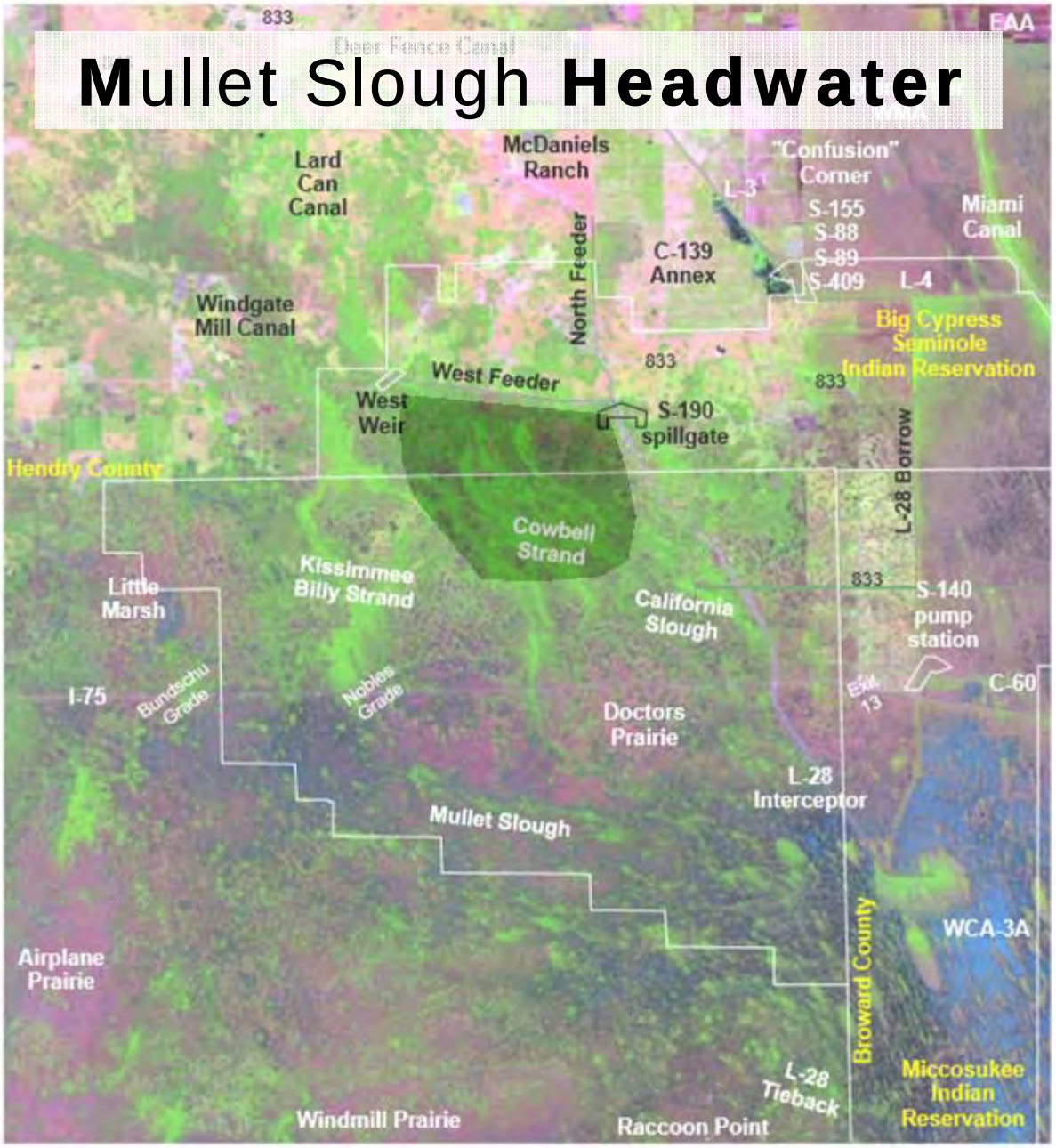


Satellite view of the Northeast Addition Lands of Big Cypress National Preserve

5 miles

NORTH

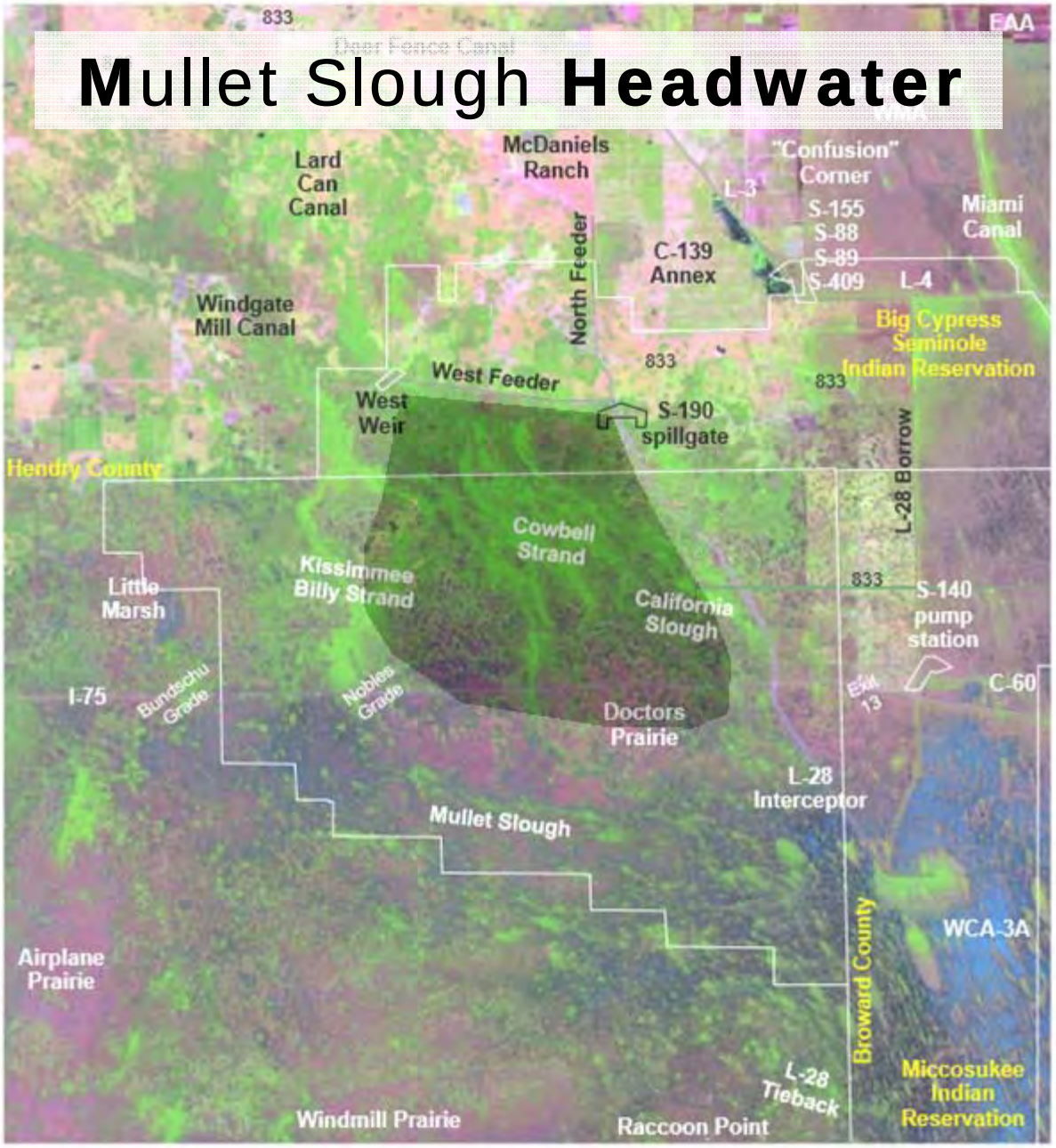
Mullet Slough **Headwater**



Satellite view of the Northeast Addition Lands of Big Cypress National Preserve

5 miles NORTH

Mullet Slough Headwater

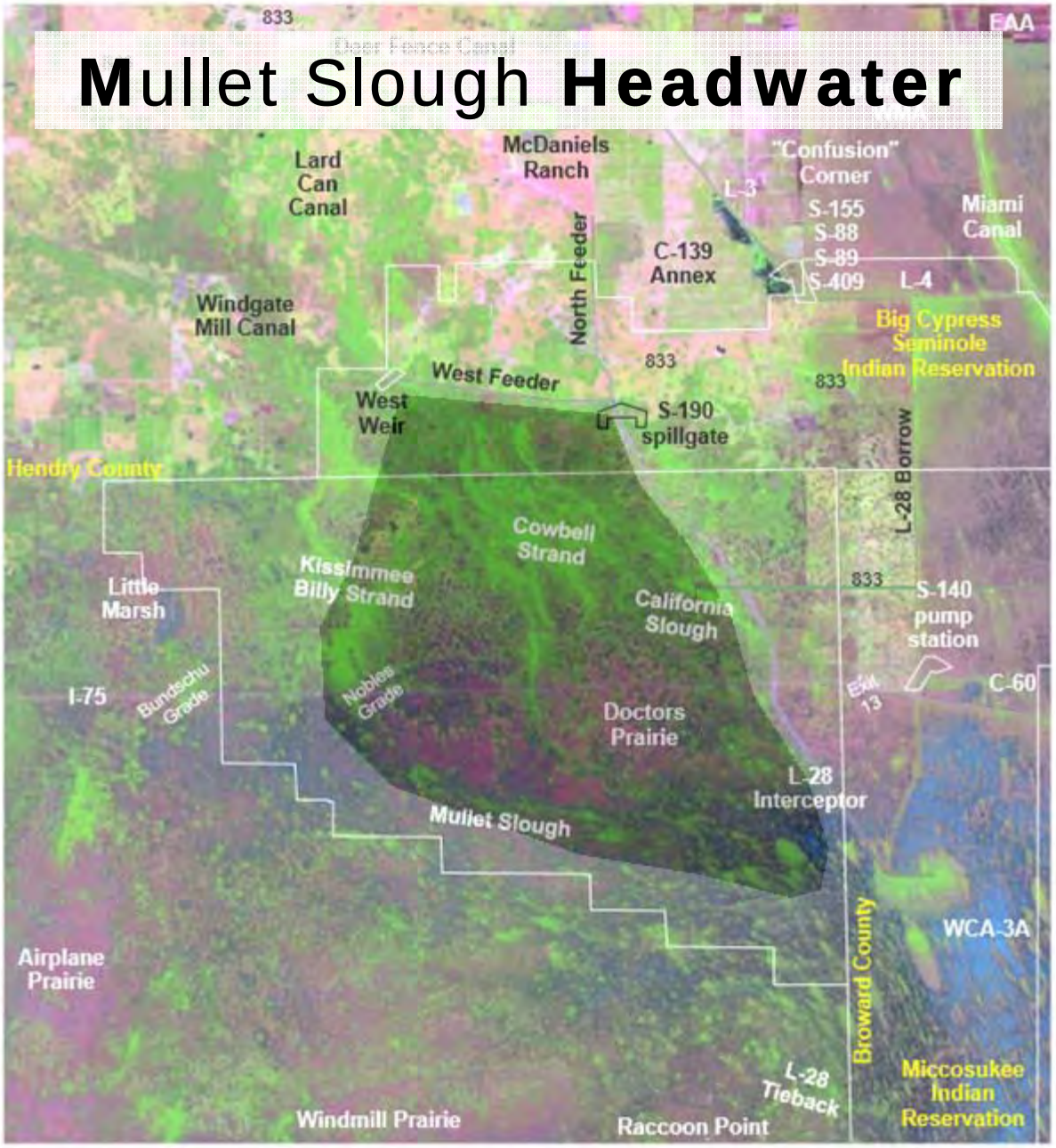


Satellite view of the Northeast Addition Lands of Big Cypress National Preserve

5 miles

NORTH

Mullet Slough Headwater



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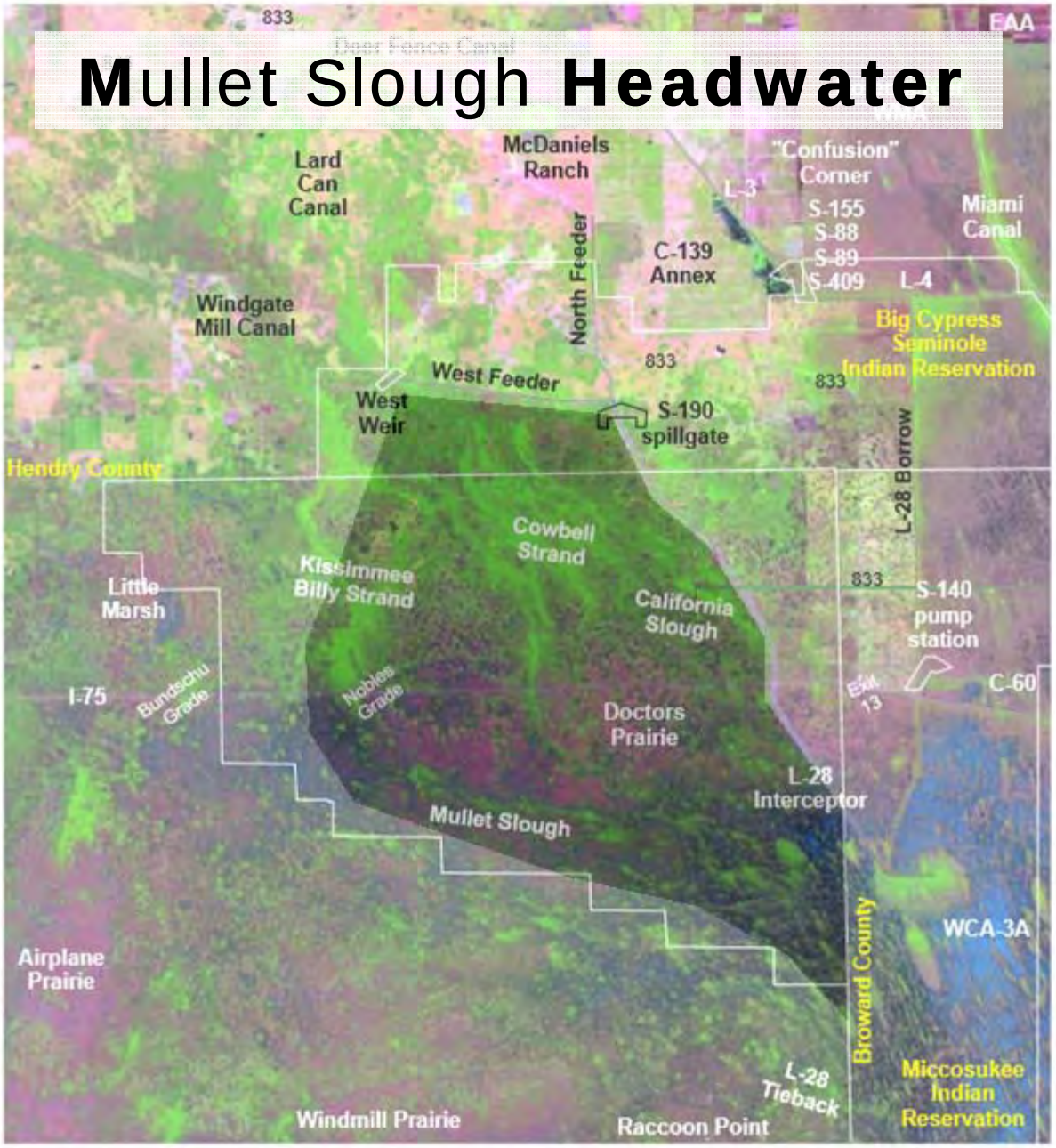
5 miles

NORTH

Mullet Slough Headwater

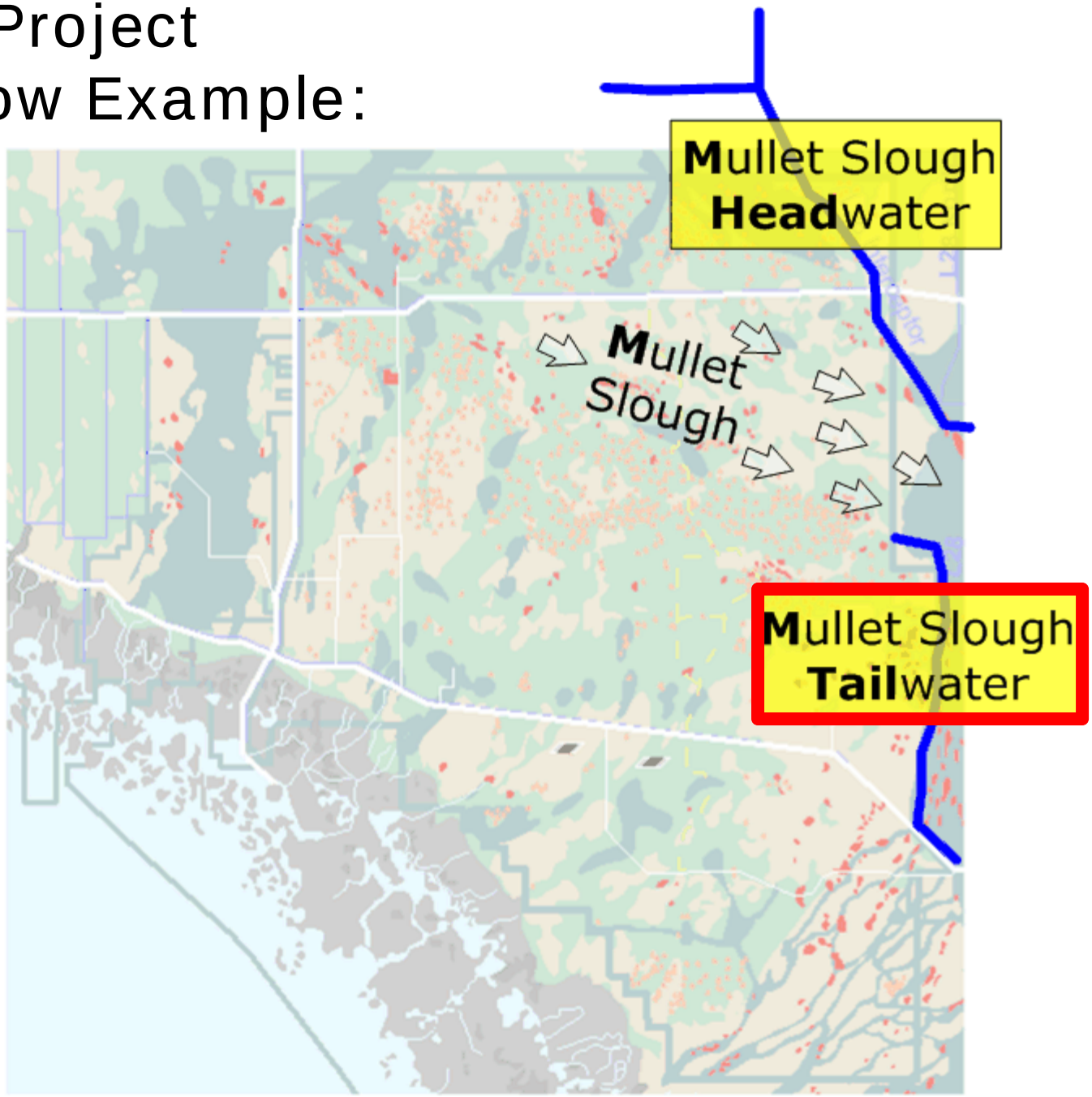


Satellite view of the Northeast Addition Lands of Big Cypress National Preserve

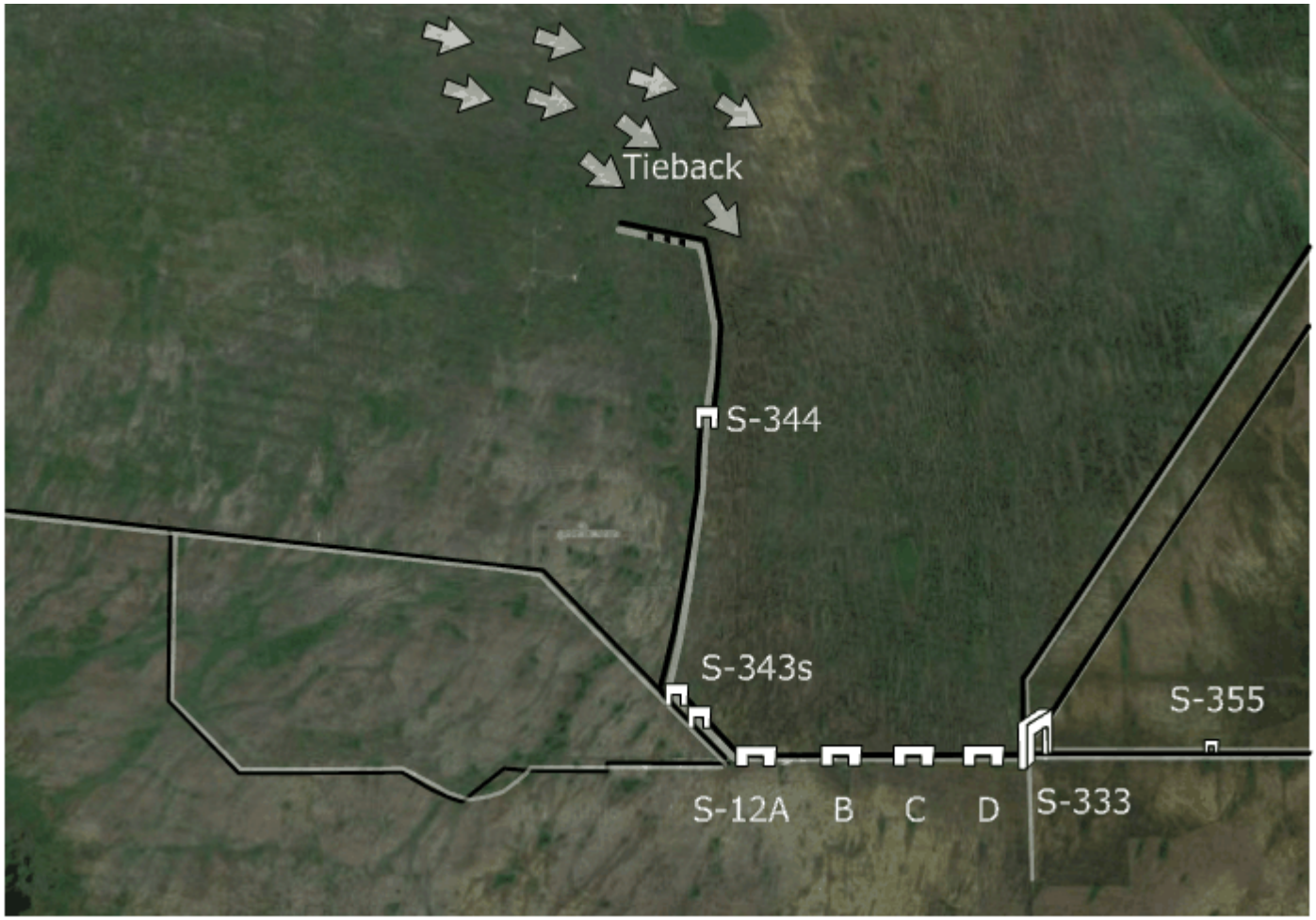
5 miles

NORTH

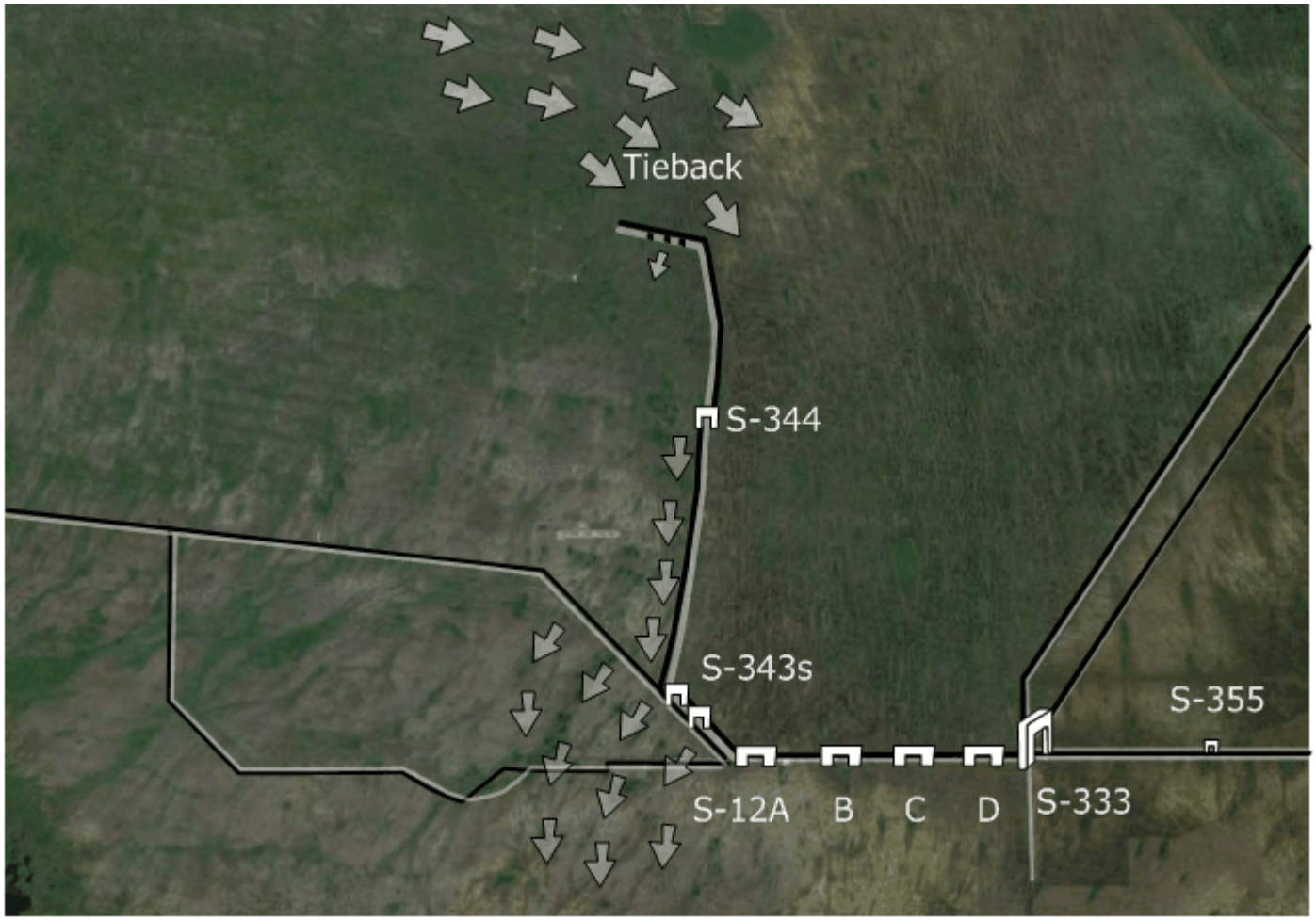
C&SF Project
Overland Flow Example:



Mullet Slough **Tailwater**



Mullet Slough **Tailwater**

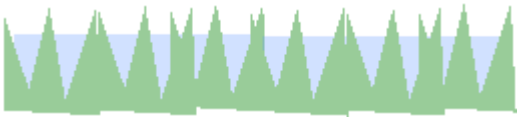


Current Condition

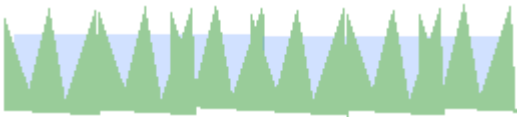
Roof Runoff **Analogy**

Roof Runoff **Analogy**

Roof Runoff **Analogy**



Roof Runoff **Analogy**



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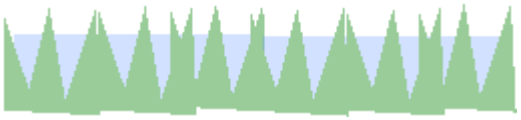

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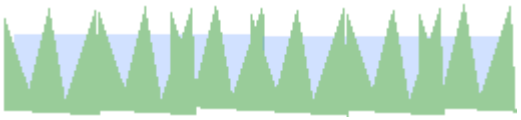
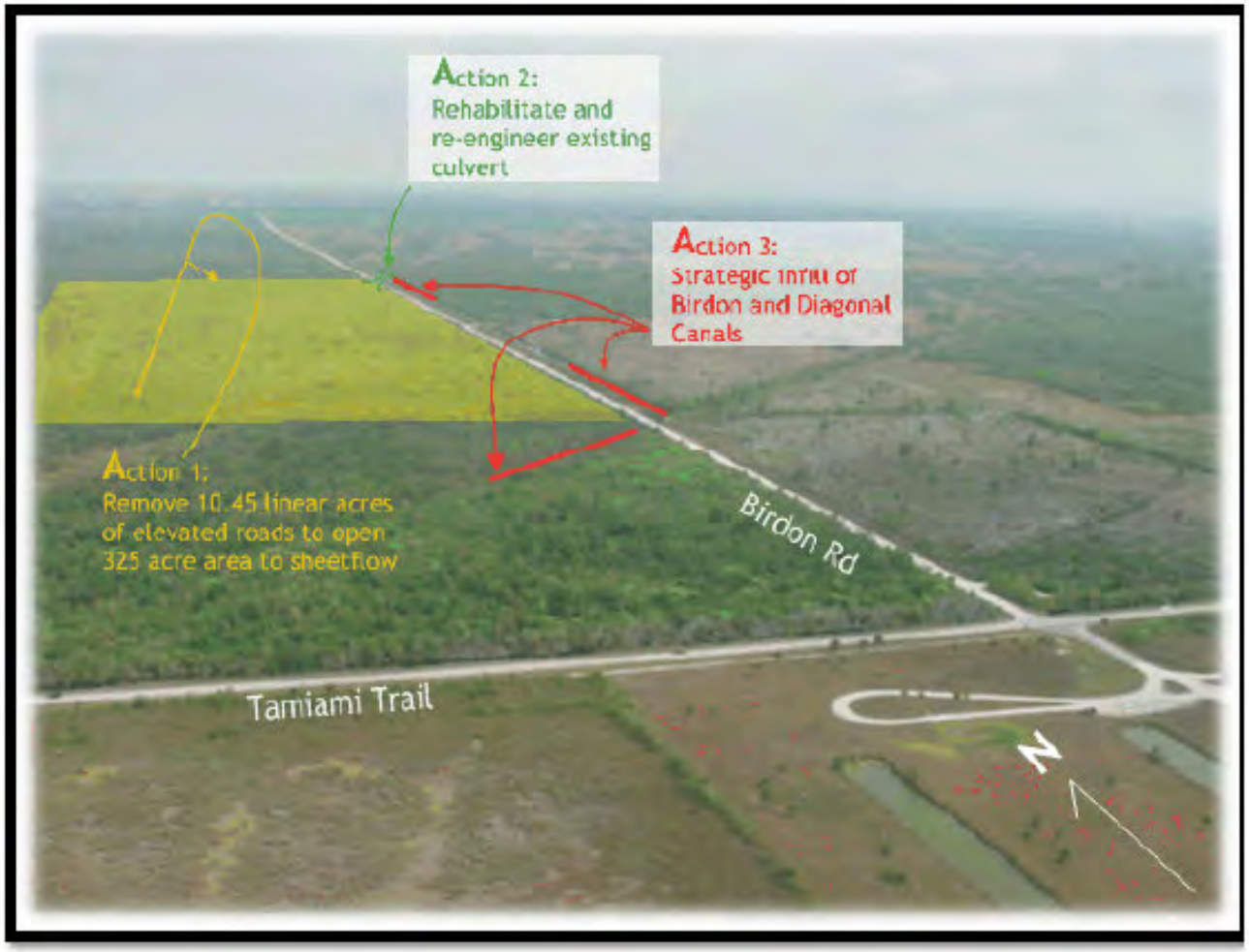


L-28

Cut and Fill Solution

As discussed at June 30th meeting

Mitigation Example:
Copeland Prairie Mitigation Project



Go Hydrology!

Go Hydrology!

Brown **Gold**

BICY Roads and Trails staff harvested over $200,000 in fill and rip rap

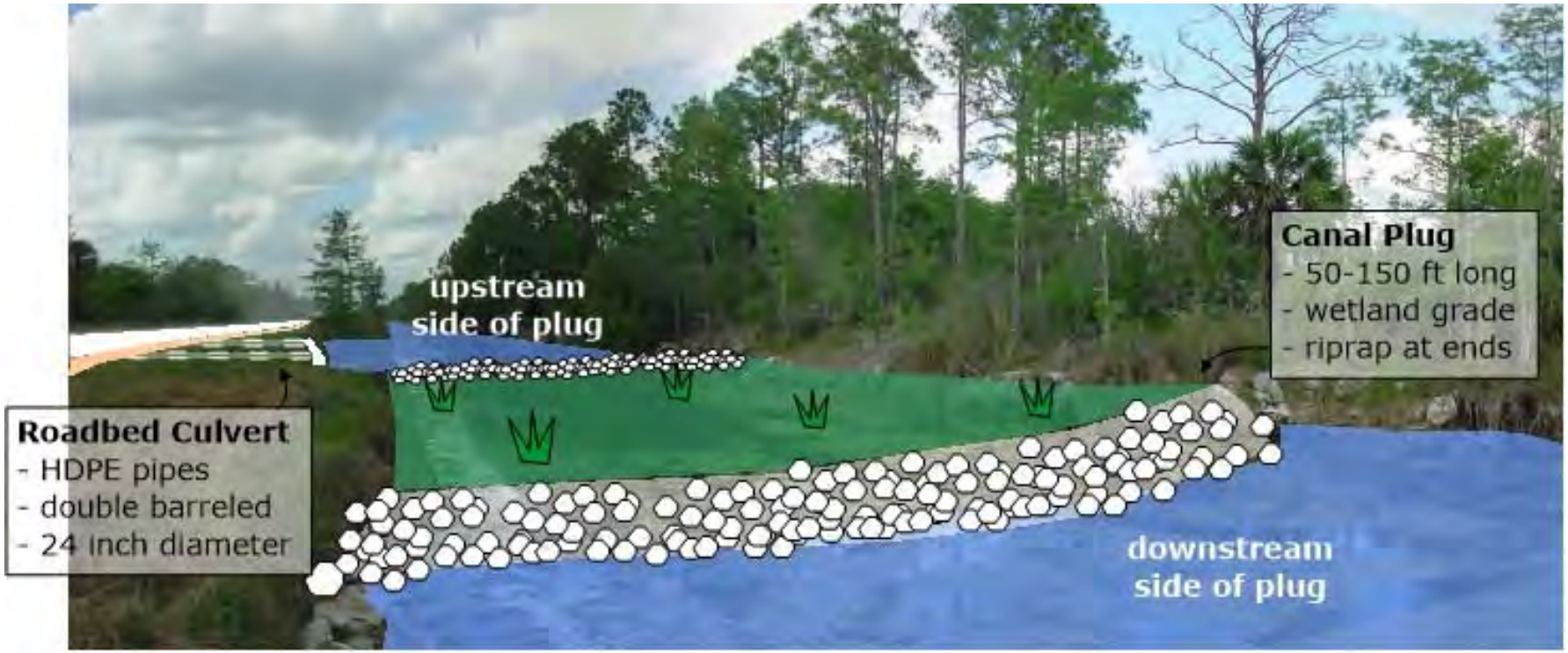
SOUTH FLORIDA
NATIONAL PARKS TRUST

$60,000 grant

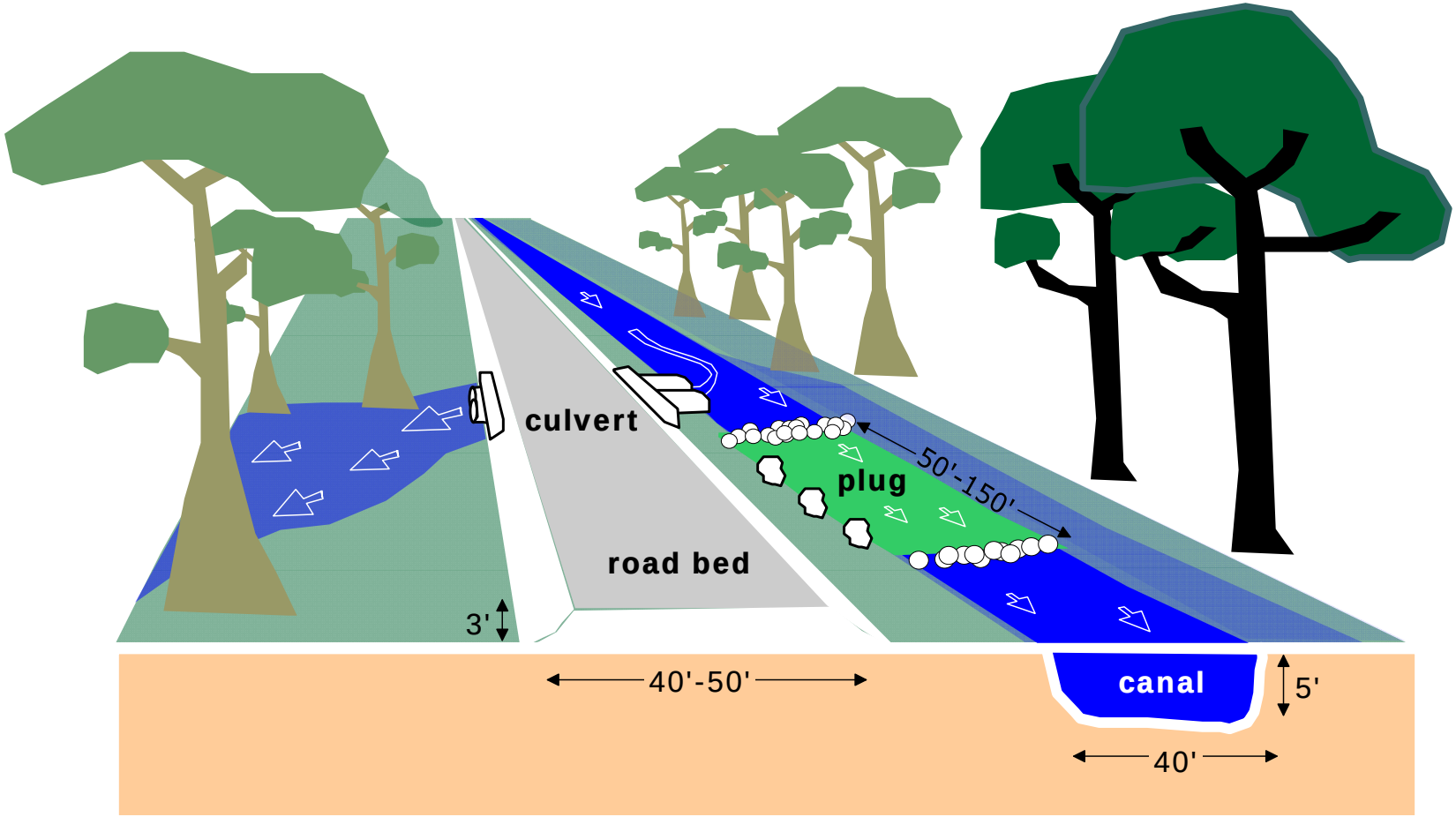
$242,000 in reimbursable funds

In-kind culvert installation

Ochopee Sheetflow **Restoration** Plan

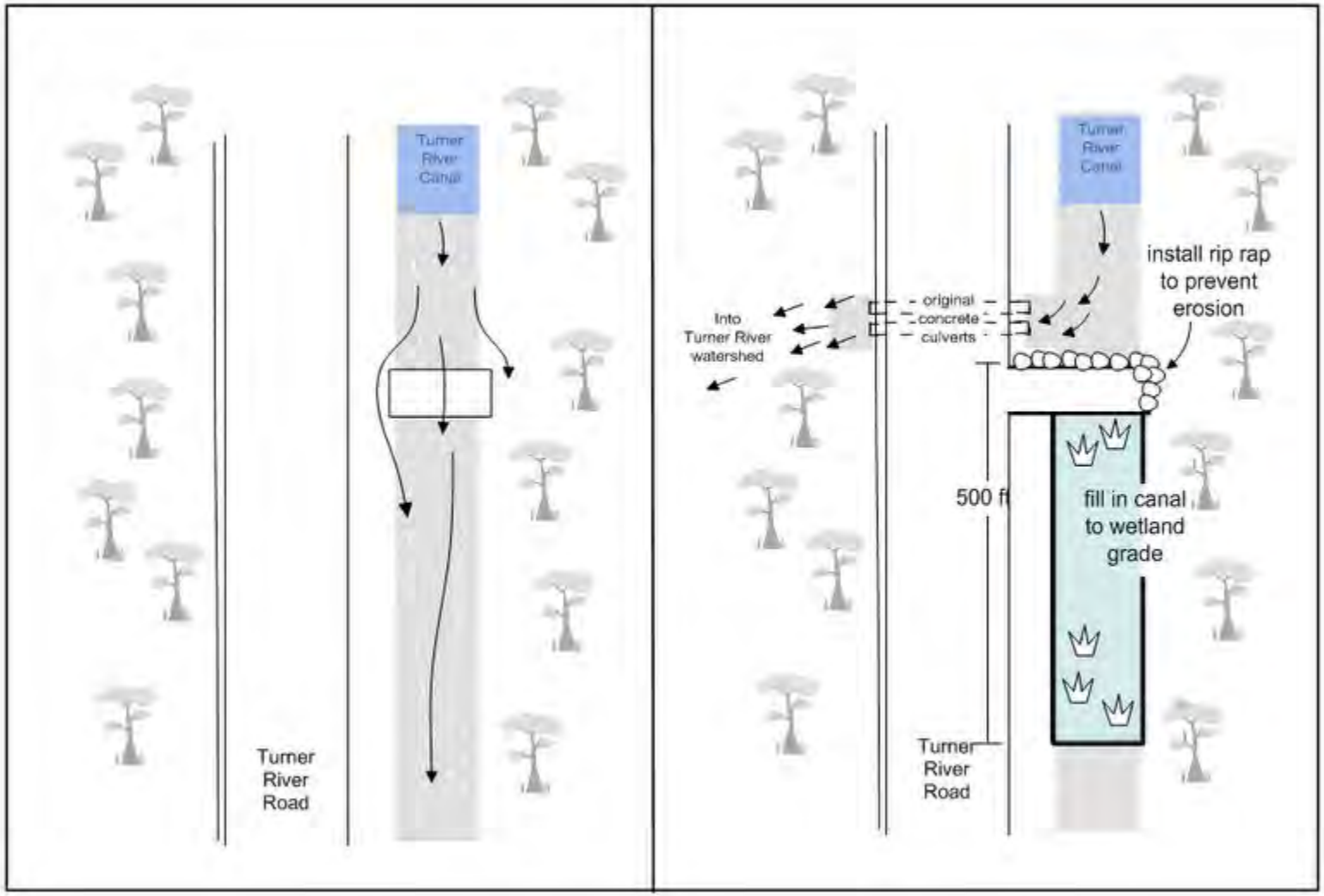


al



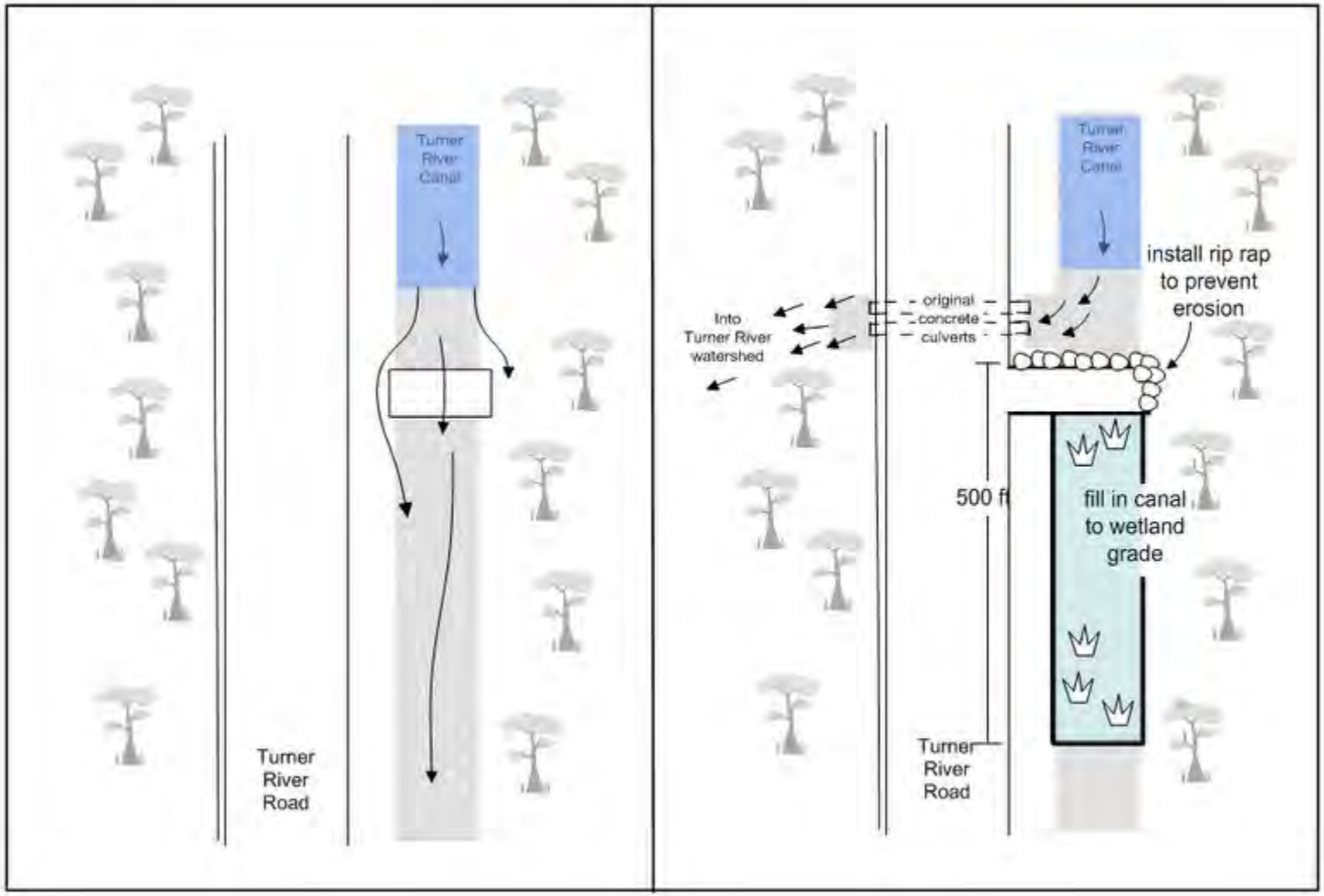
Plug/Culvert **Pair** Principle

Before **A**fter



Simple **Solution**

Before **A**fter



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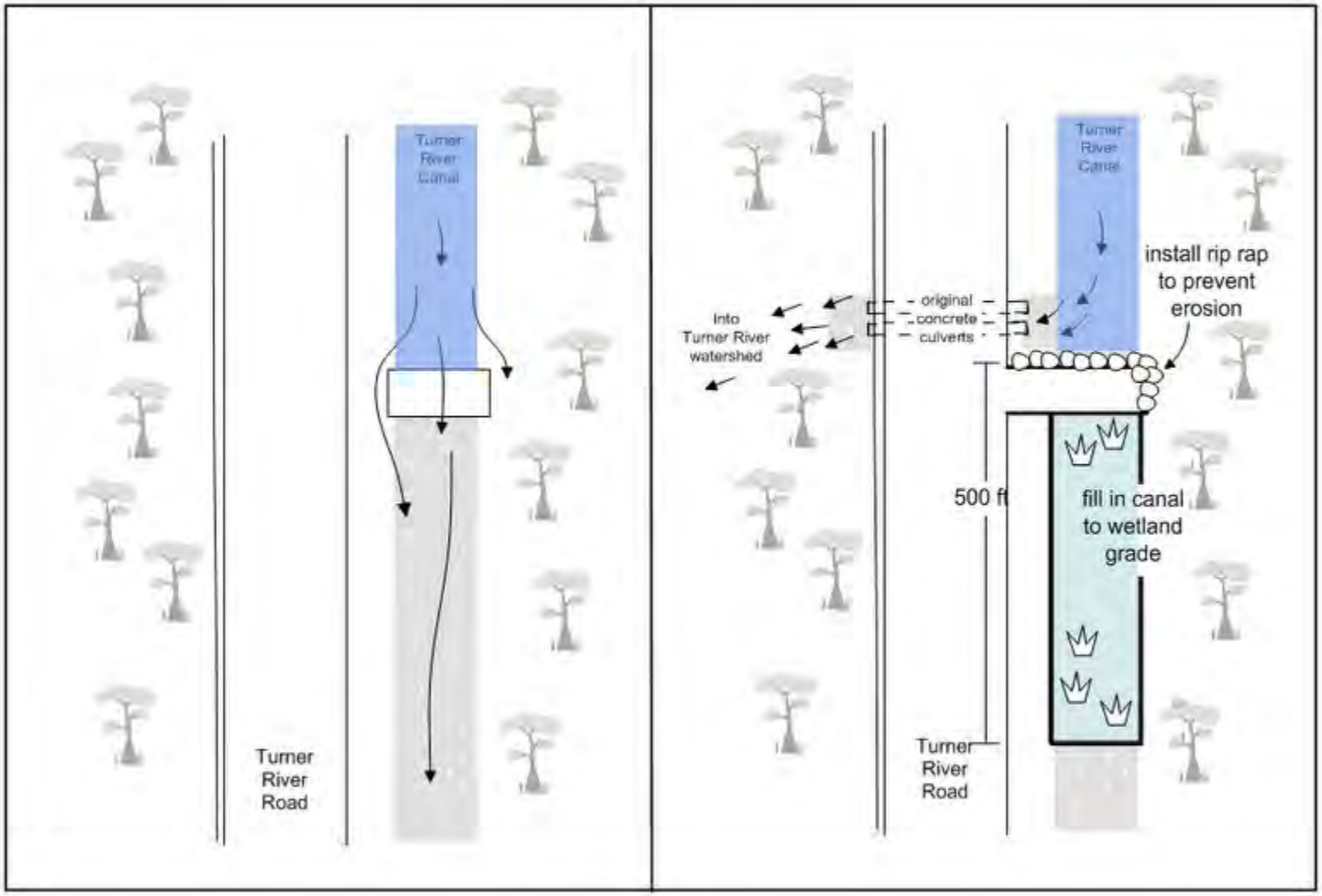

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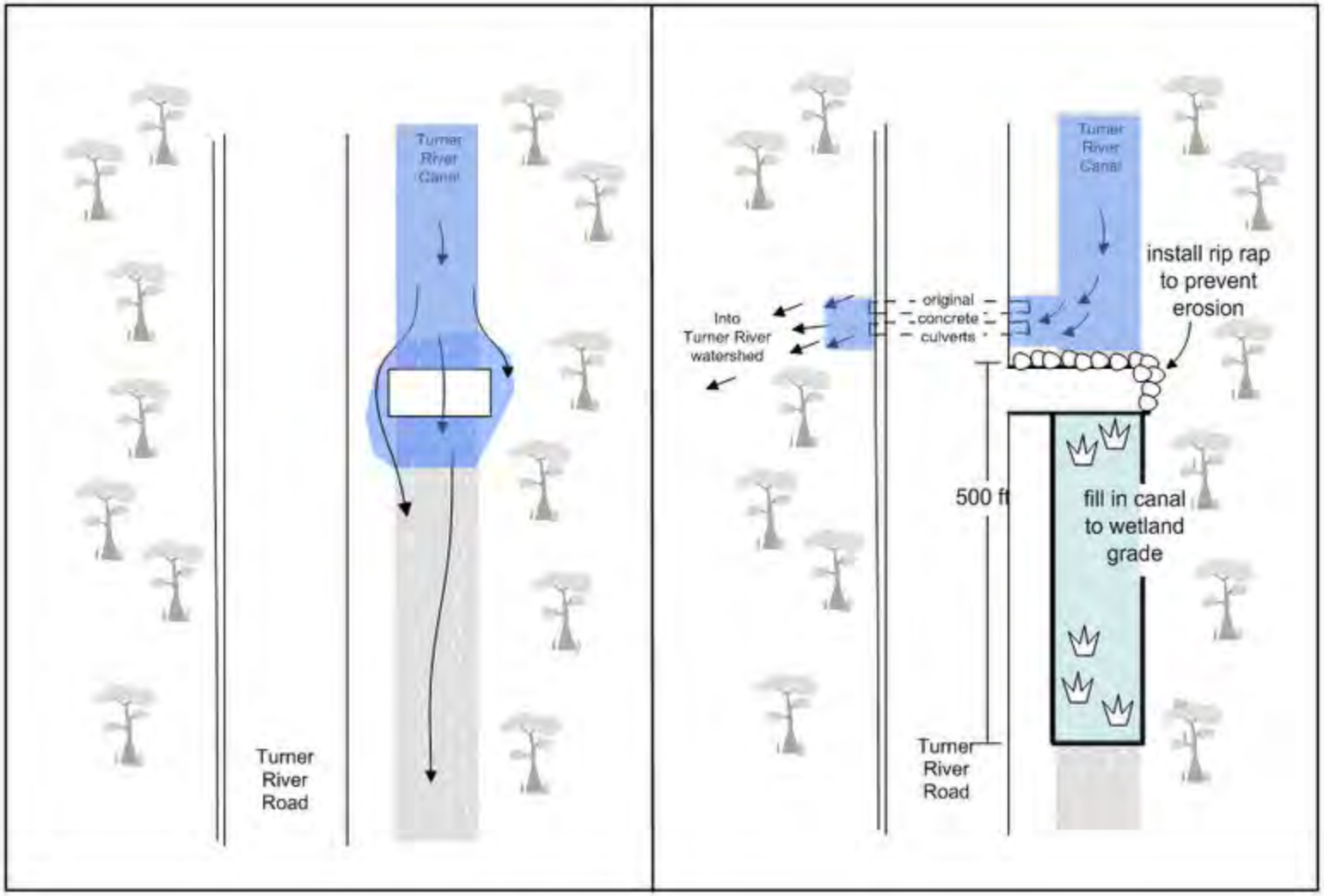

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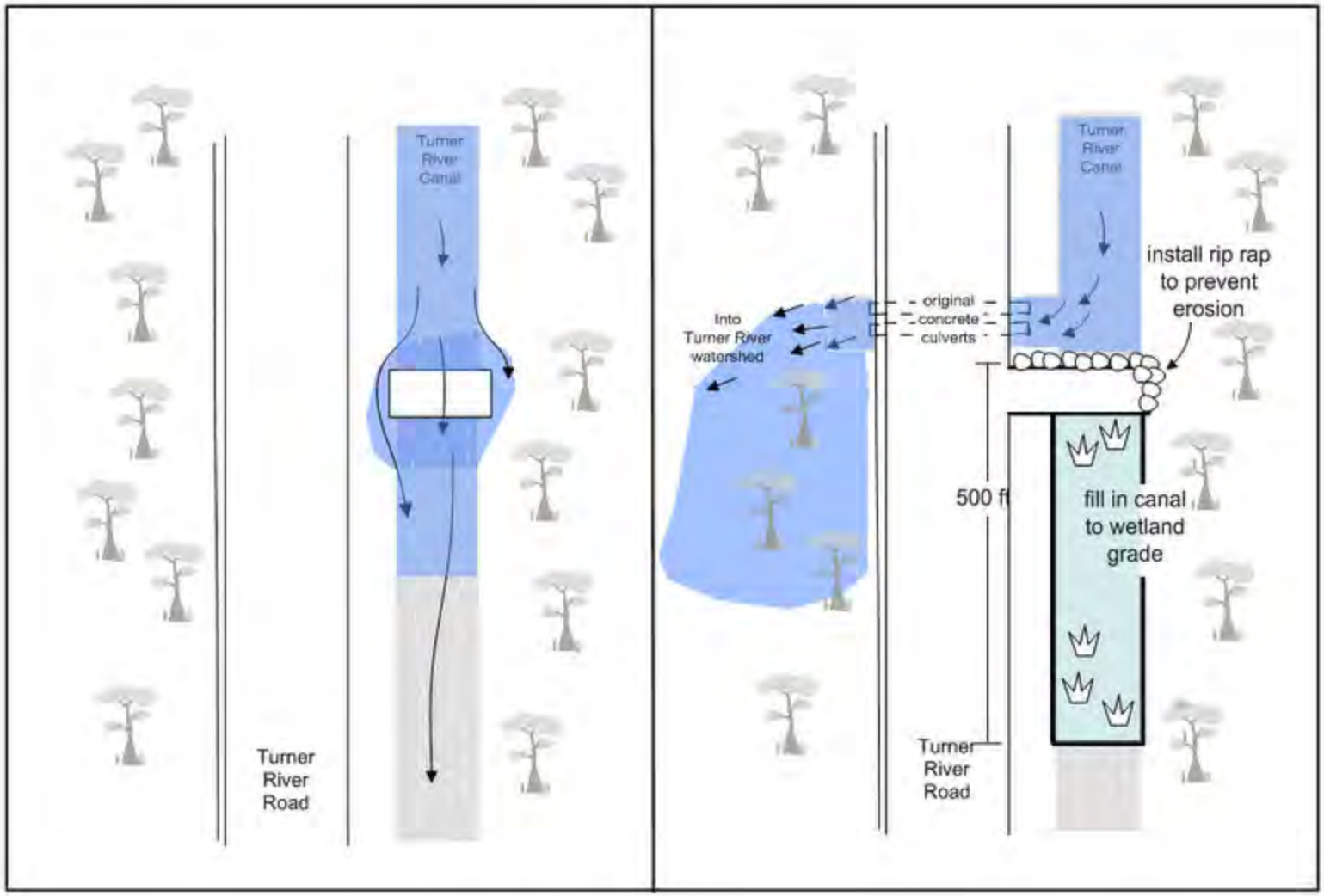
Before **After**



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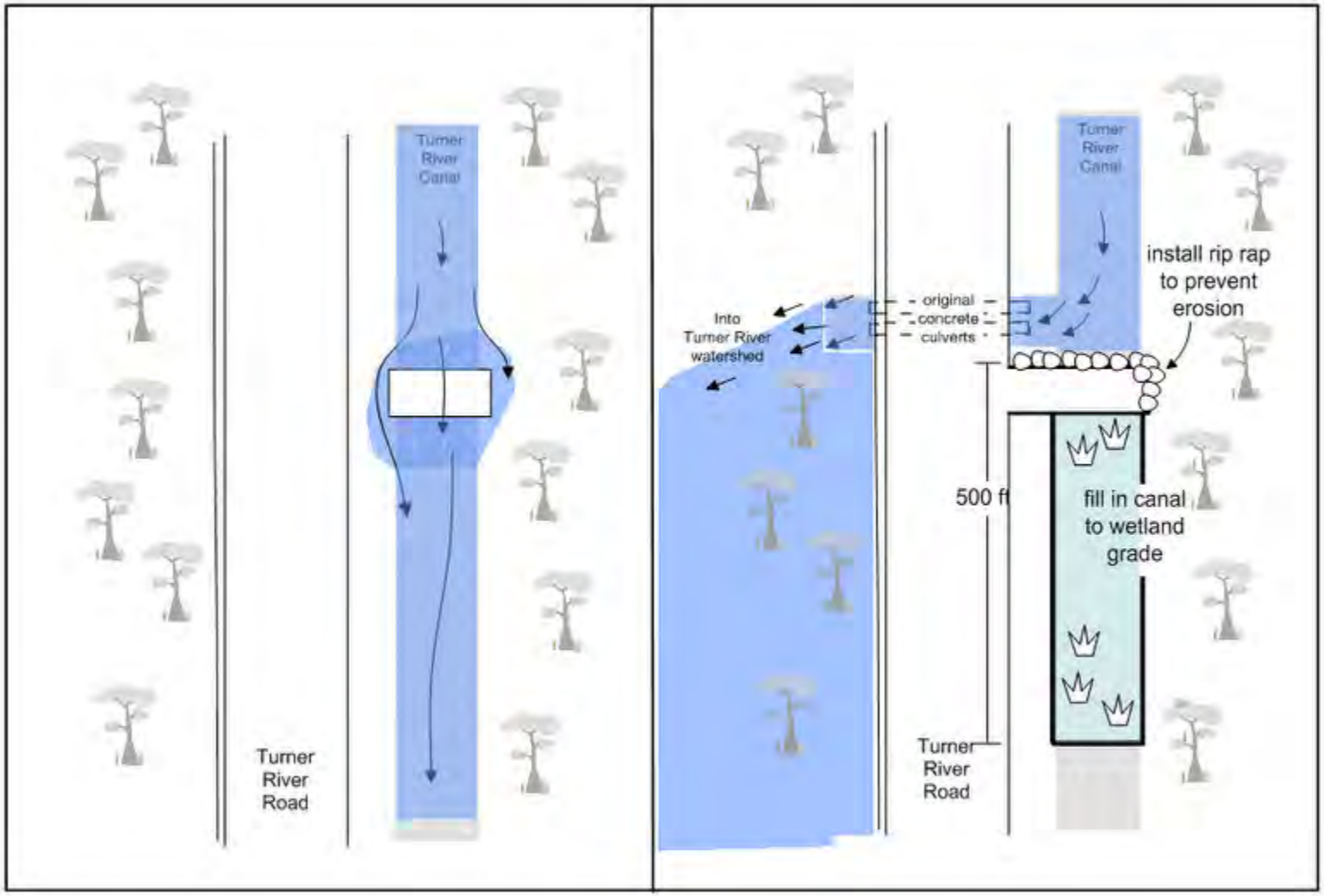
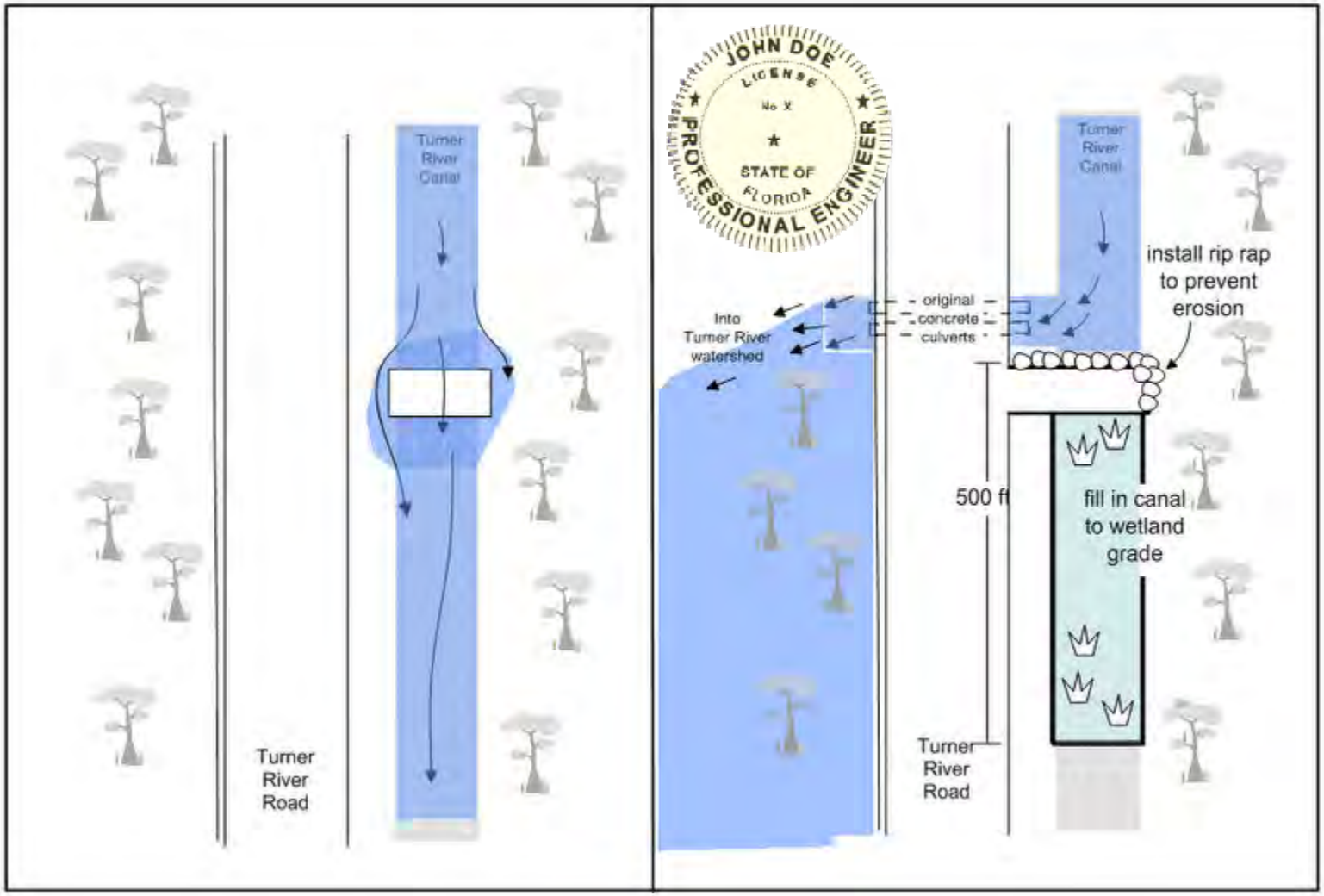
Before **A**fter



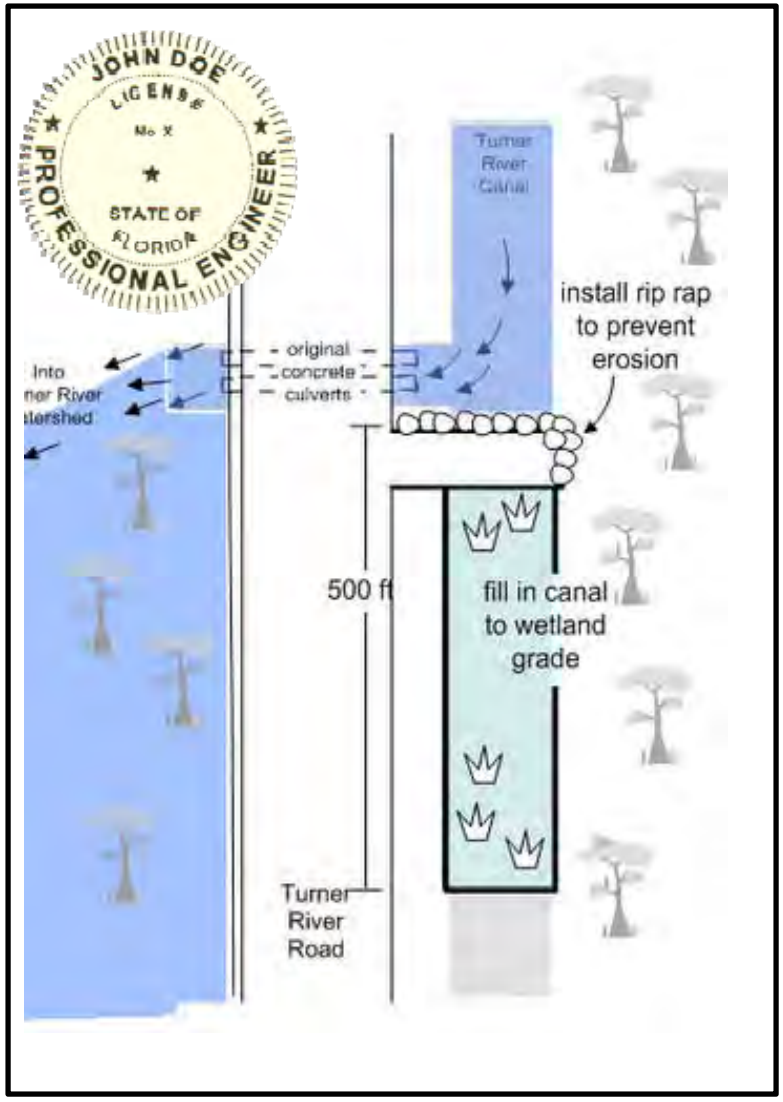
Simple **Solution**

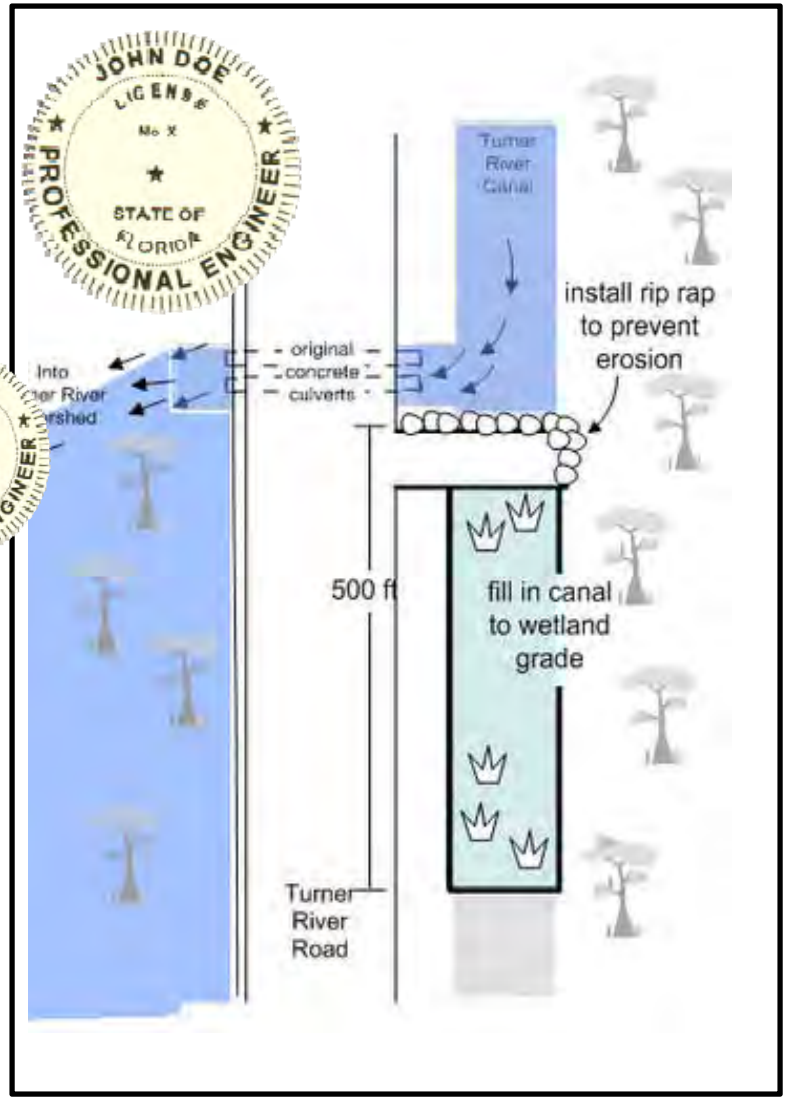
Before **A**fter



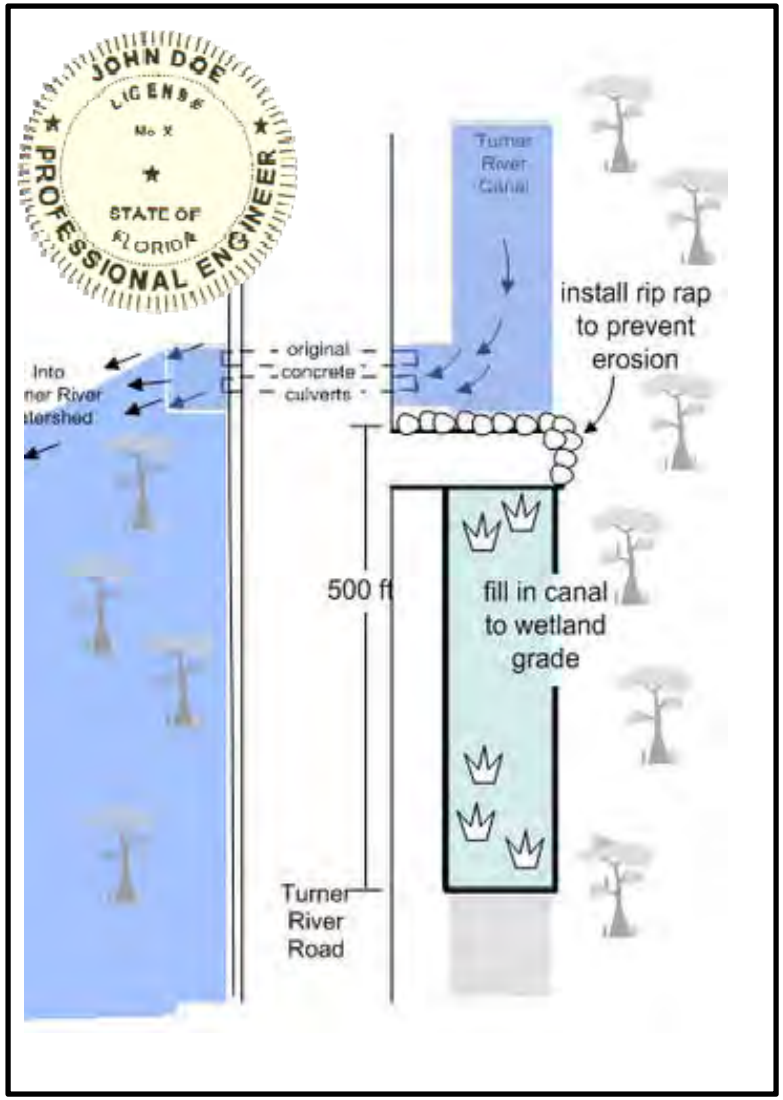
Simple **Solution**

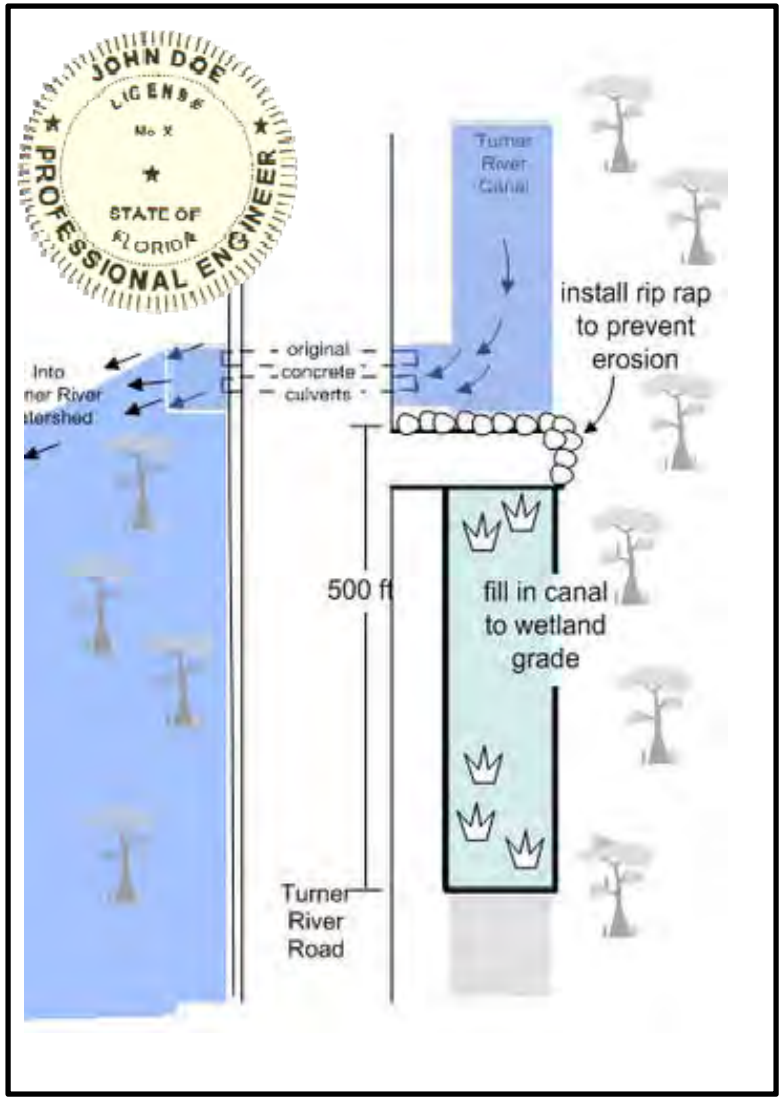
New Standard




JOHN DOE
LICENSE
No X
STATE OF
FLORIDA
PROFESSIONAL ENGINEER
Turner
River
Canal
install rip rap
to prevent
erosion
original
concrete
culverts
500 ft
fill in canal
to wetland
grade
Turner
River
Road

JOHN DOE
LICENSE
No X
STATE OF
FLORIDA
PROFESSIONAL ENGINEER


JOHN DOE
LICENSE
No X
STATE OF
FLORIDA
PROFESSIONAL ENGINEER
Turner River Canal
install rip rap to prevent erosion
original
concrete
culverts
Into
ner River
tershed
500 ft
fill in canal to wetland grade
Turner River Road


JOHN DOE
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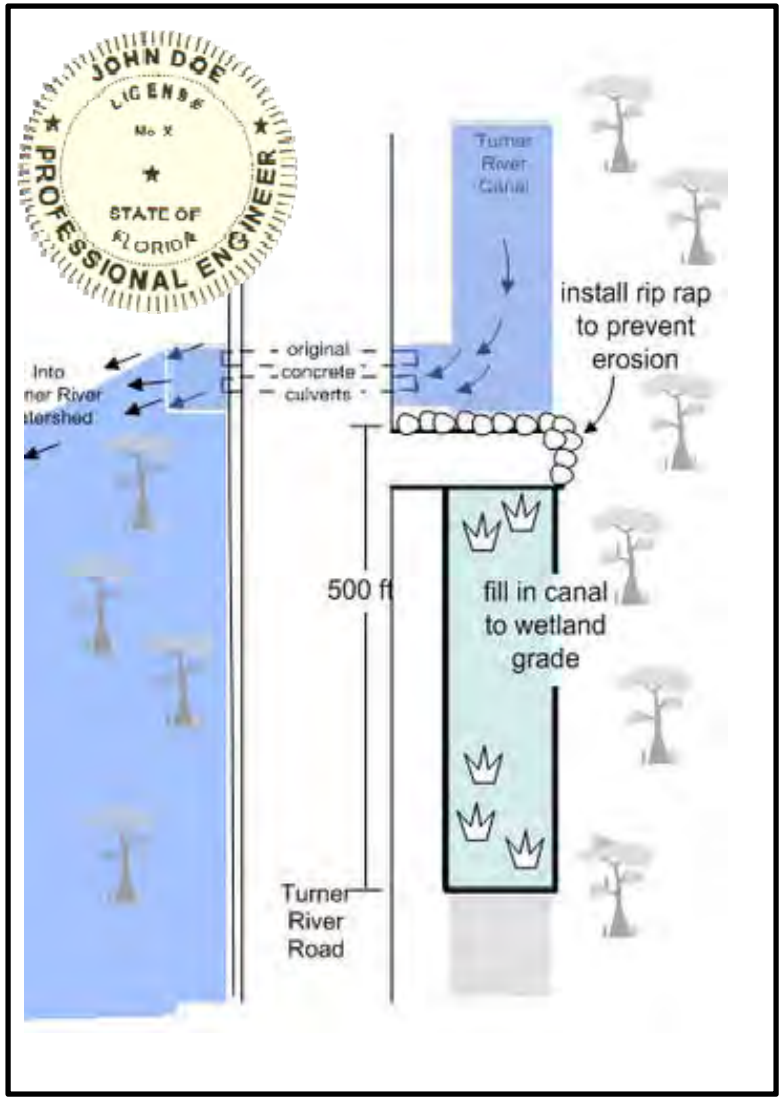
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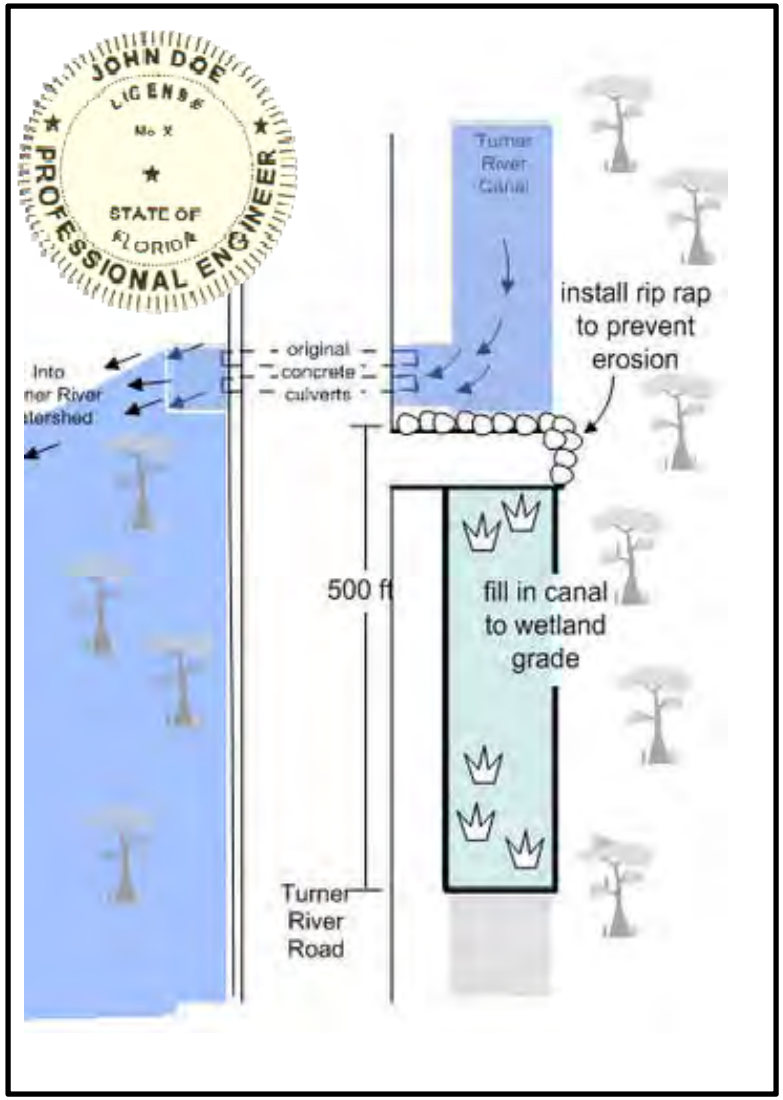
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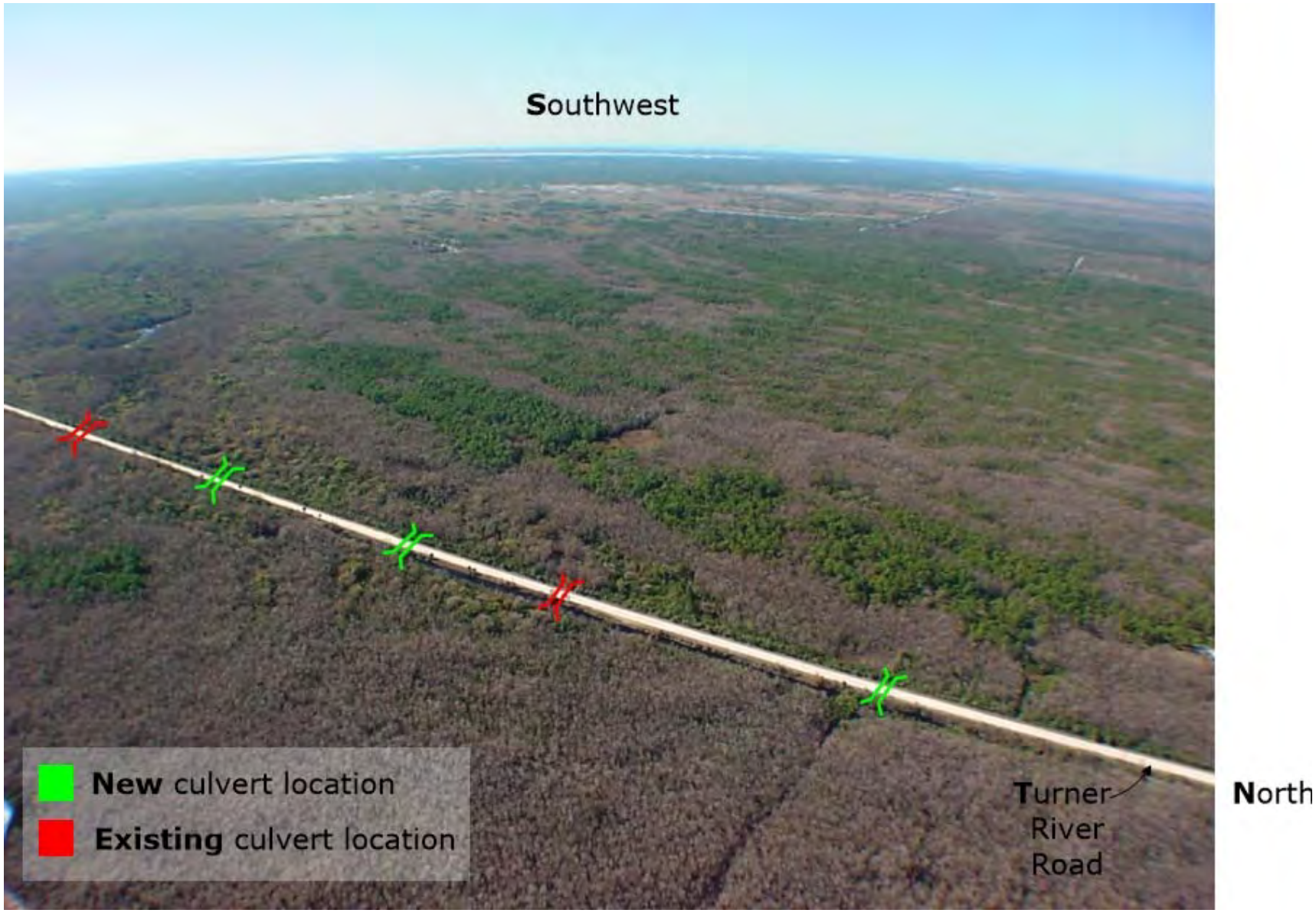
New **Culverts** on Turner River Road



To Feed **Sheet Flow** to Turner River

Before

After

Target Condition

Conclusions

- The Big Cypress is a **missing** piece in the Everglades Restoration puzzle

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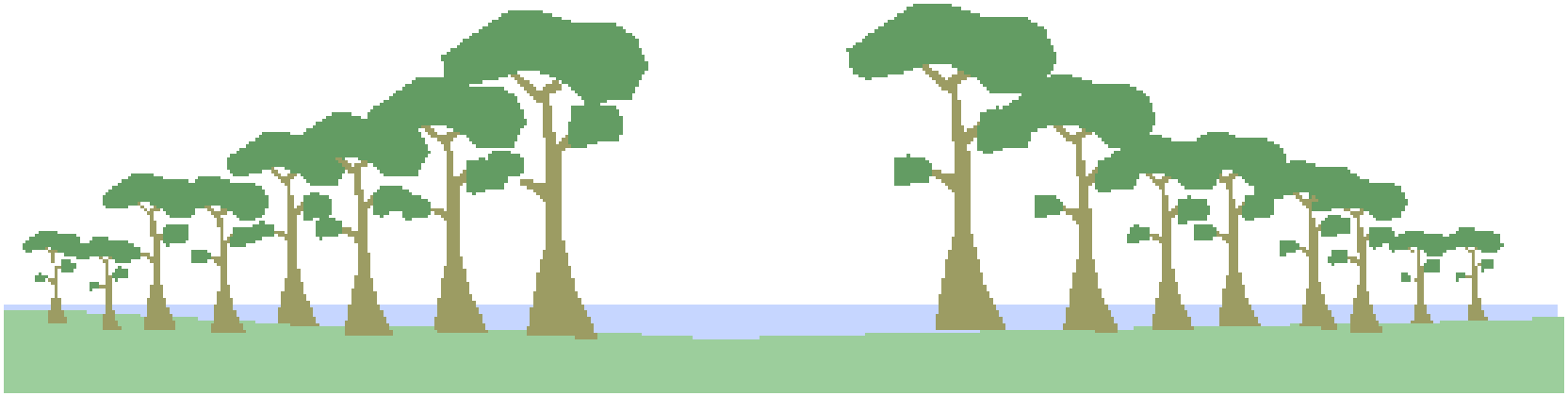
- Help us **interact** with ourselves and Everglades Planners

Please be on **notice**



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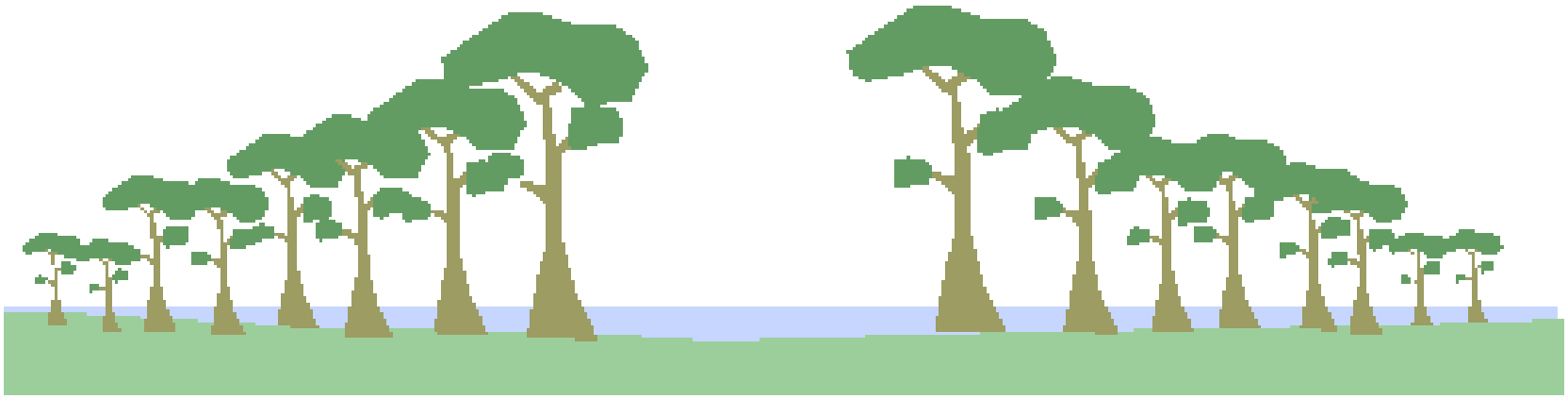
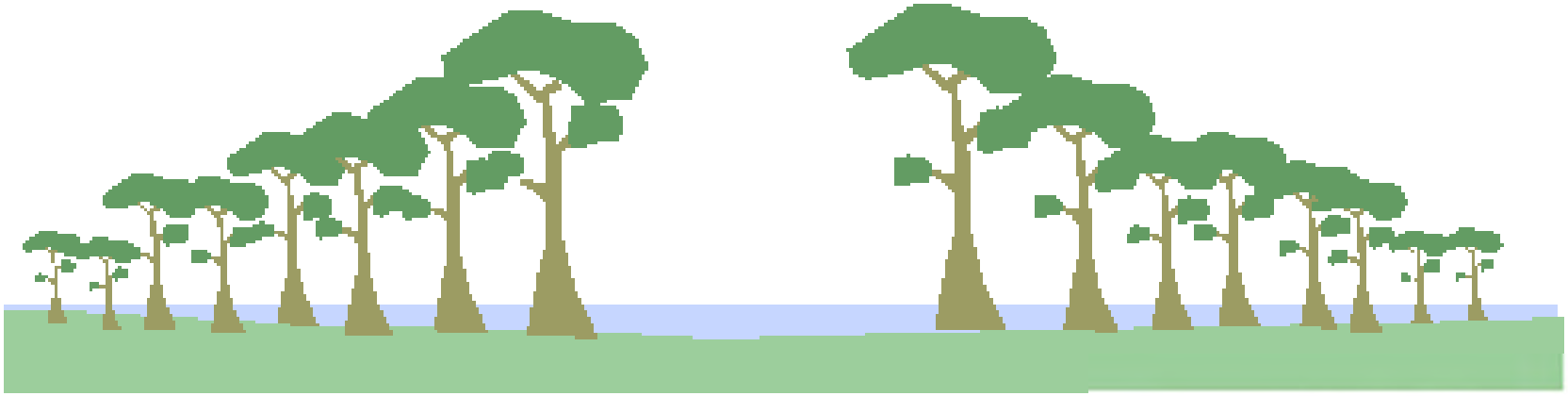


We **will** need your

Please be on **notice**



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