

Staying in Tune with South Florida's Water Cycle

for Scientists, Managers, and Policy Makers
in 5 Minutes per Week



**Robert Sobczak (Big Cypress Nat'l Pres), Todd Hopkins (FWS),
Kevin Kotun (Everglades National Park), Cal Neidrauer
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(SFWMD), Eric Swartz (SFWMD), Susan Sylvester (SFWMD)**


The logo is an arrowhead-shaped sign with a reddish-brown background. It features a large sequoia tree on the left, a mountain range in the center, and a bison at the bottom. The text "NATIONAL PARK SERVICE" is in the upper right, and "Department of the Interior" is in the lower right.

NATIONAL
PARK
SERVICE

Department
of the Interior





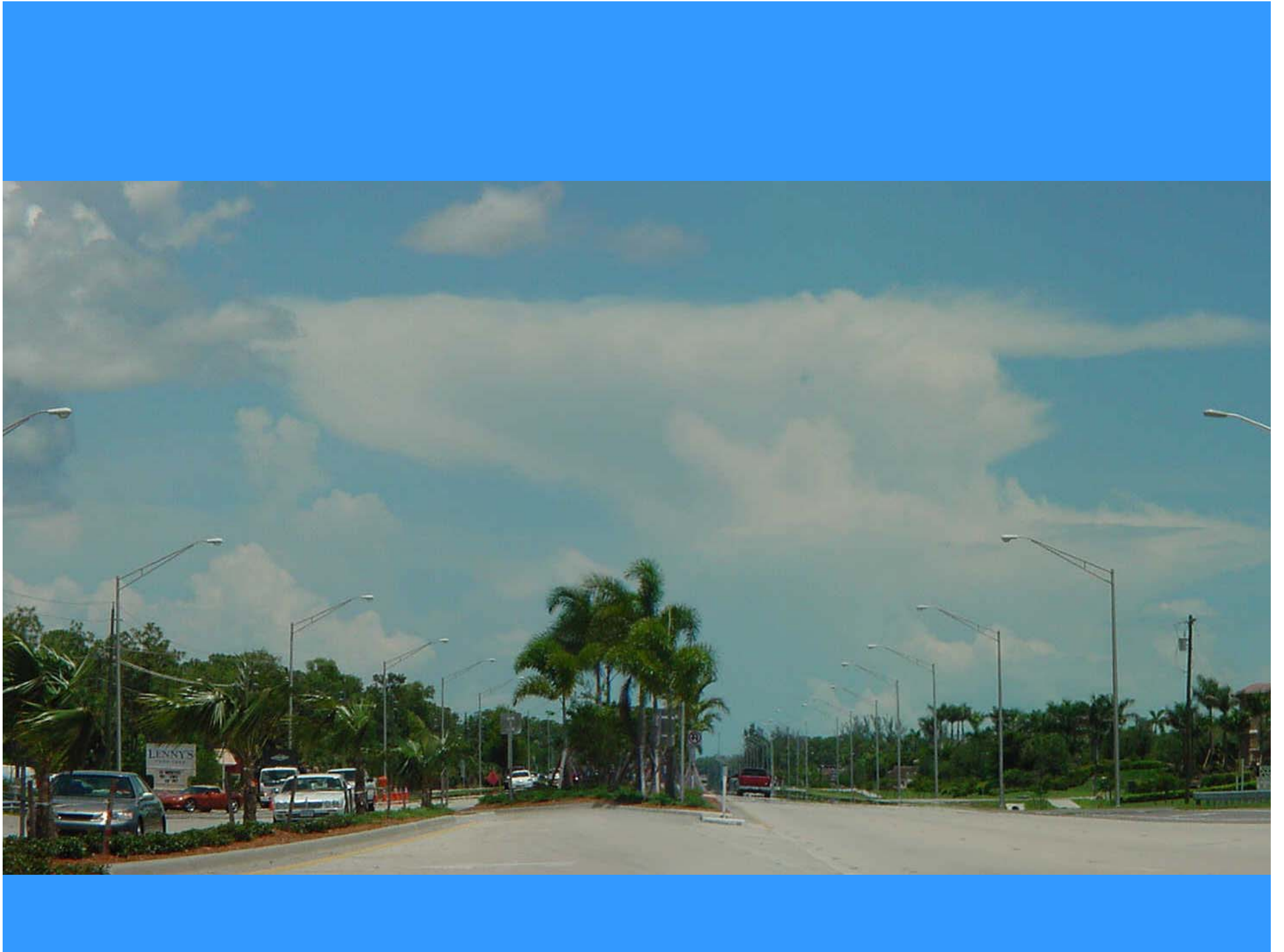
 Big Cypress
National Preserve →
Headquarters













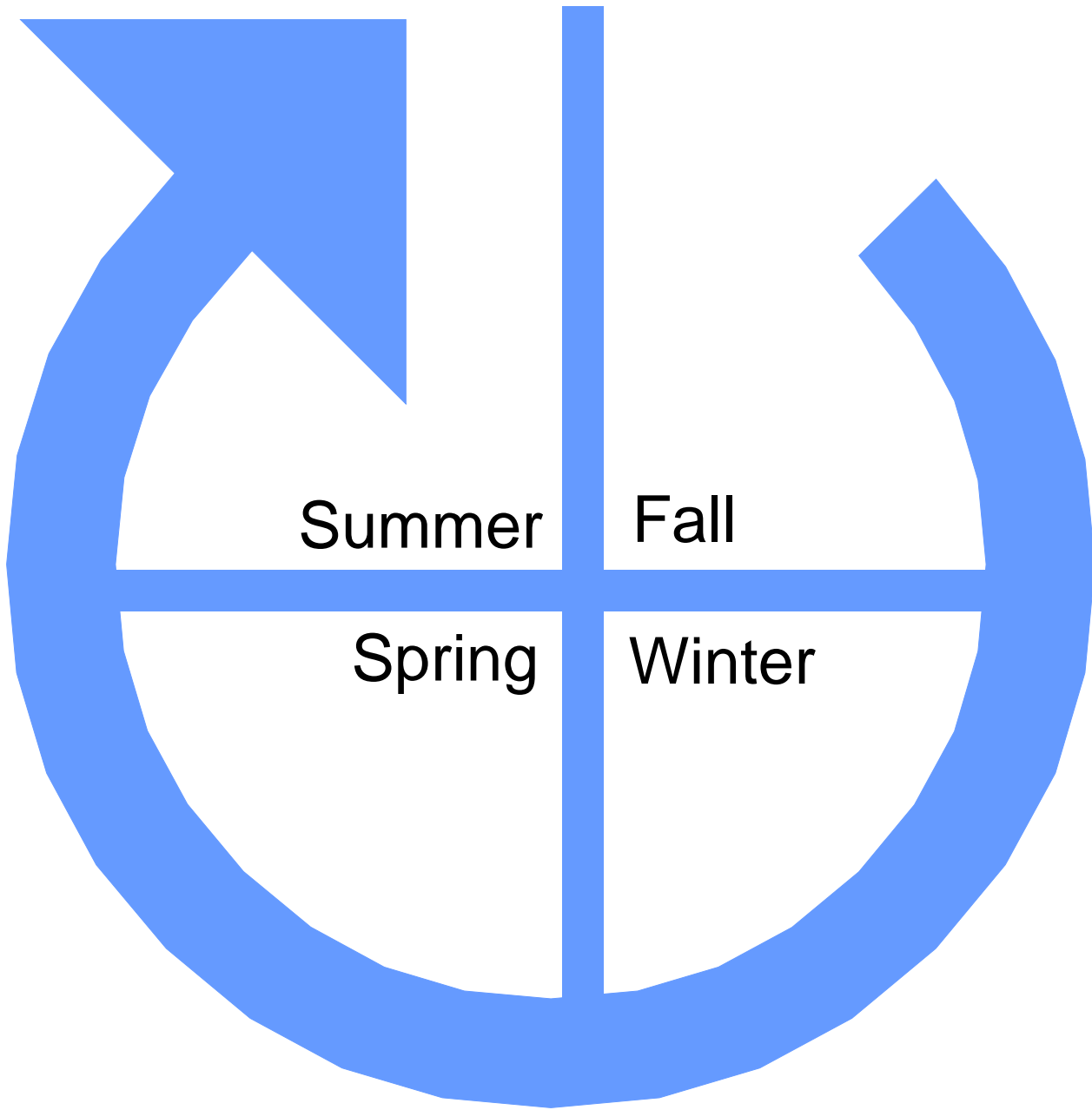


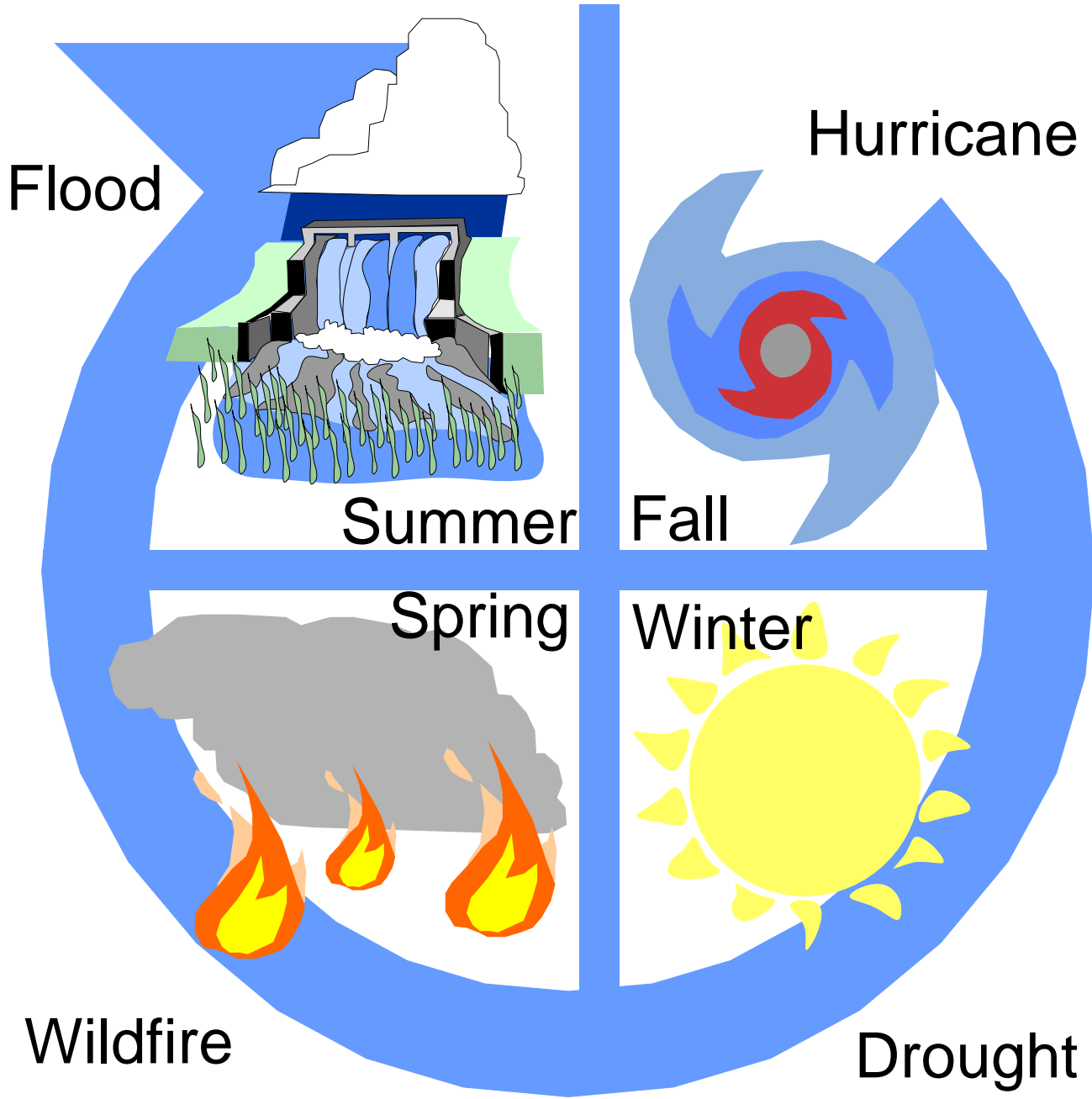












Flood

Hurricane

Summer

Fall

Spring

Winter

Wildfire

Drought

The South Florida Watershed Journal



Robert V Sobczak

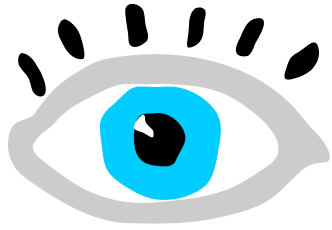
<http://sfwj.blogspot.com>

Hydrologist at Big Cypress National Preserve



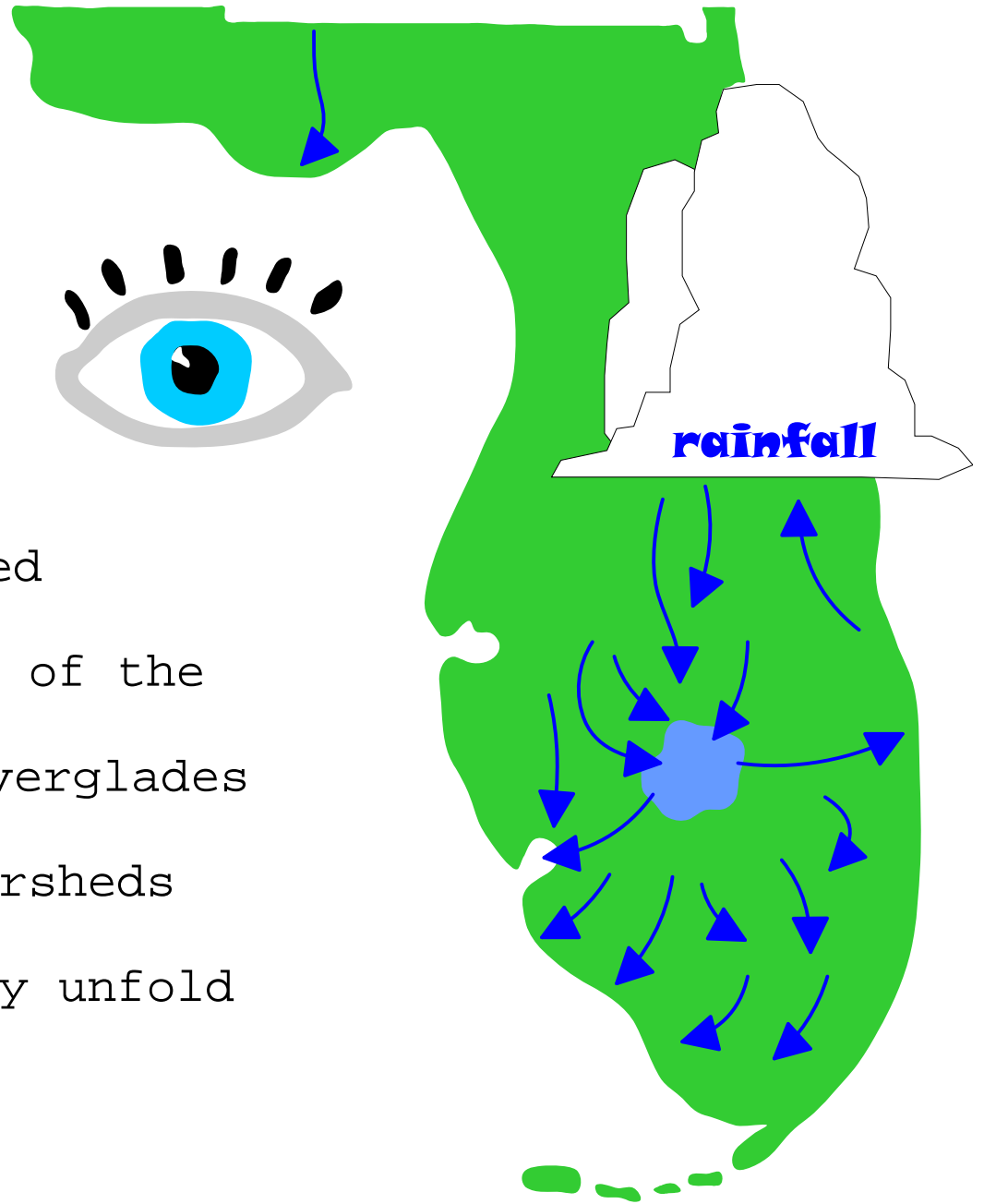
TUNE INTO

South Florida's water cycle



VIEW

the interconnected
wetlands and waterways of the
Kissimmee-Okeechobee-Everglades
and Big Cypress watersheds
week after week as they unfold



A white cylindrical rain bucket is mounted on a silver metal pole. The bucket has a flat top and a circular base. The text "Rain bucket" is printed in black on the side of the bucket. The background shows a blue sky with white clouds and a line of green trees in the distance.

Rain
bucket



CHARLESTON

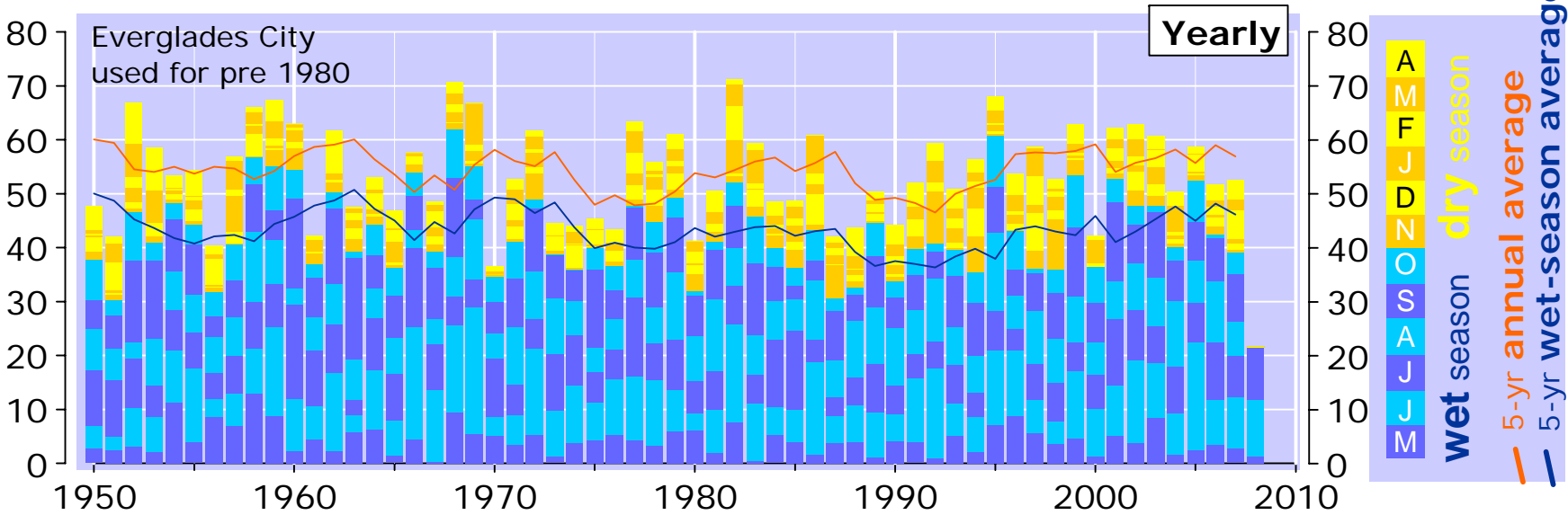
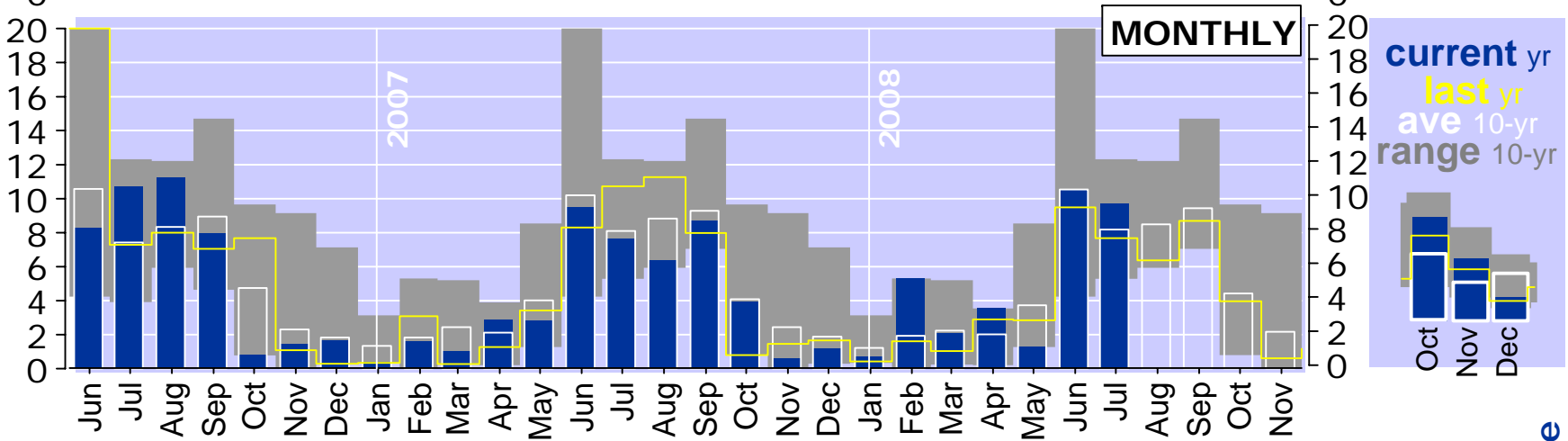
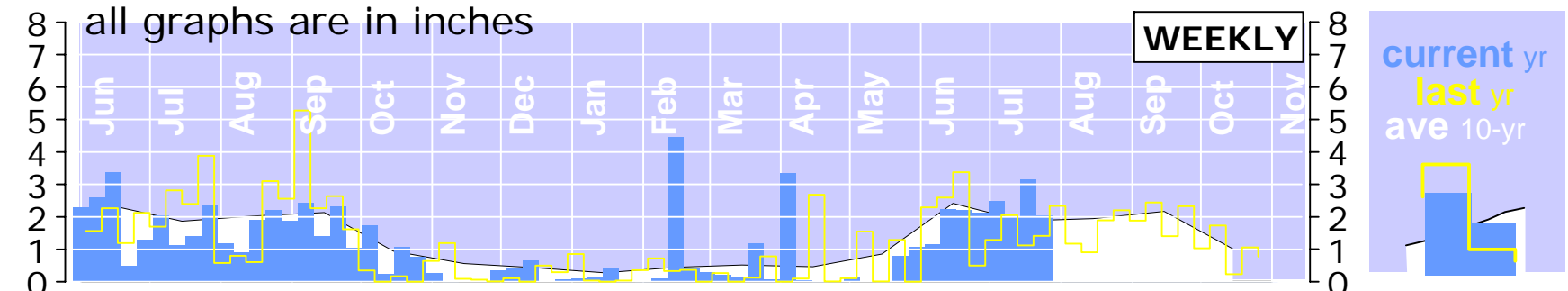
Hurricane 'FLOYD'

MIAMI

Hurricane FLOYD, 1999/09/14 at 1445Z

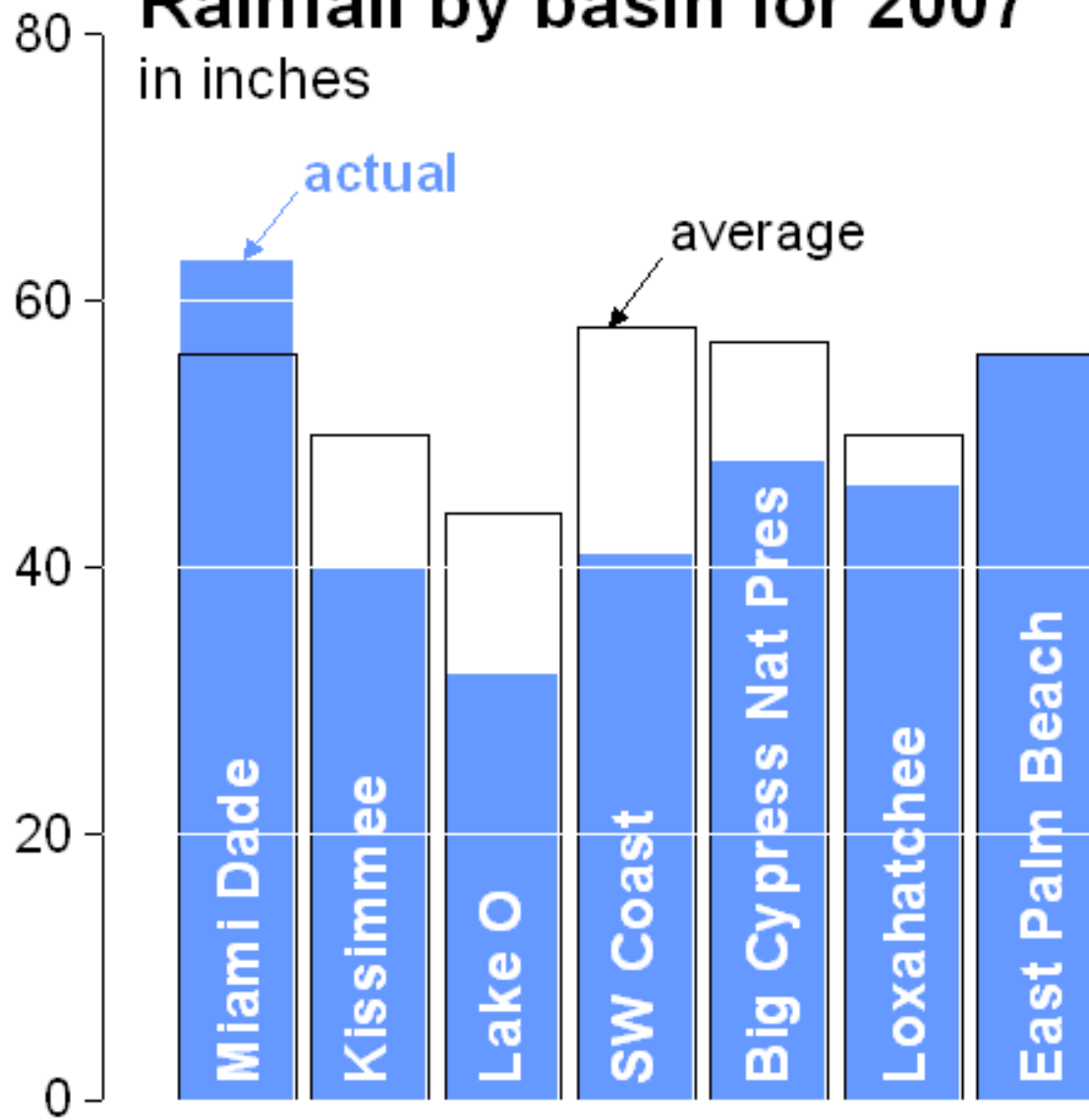






Rainfall by basin for 2007

in inches



Comparing



oranges to oranges









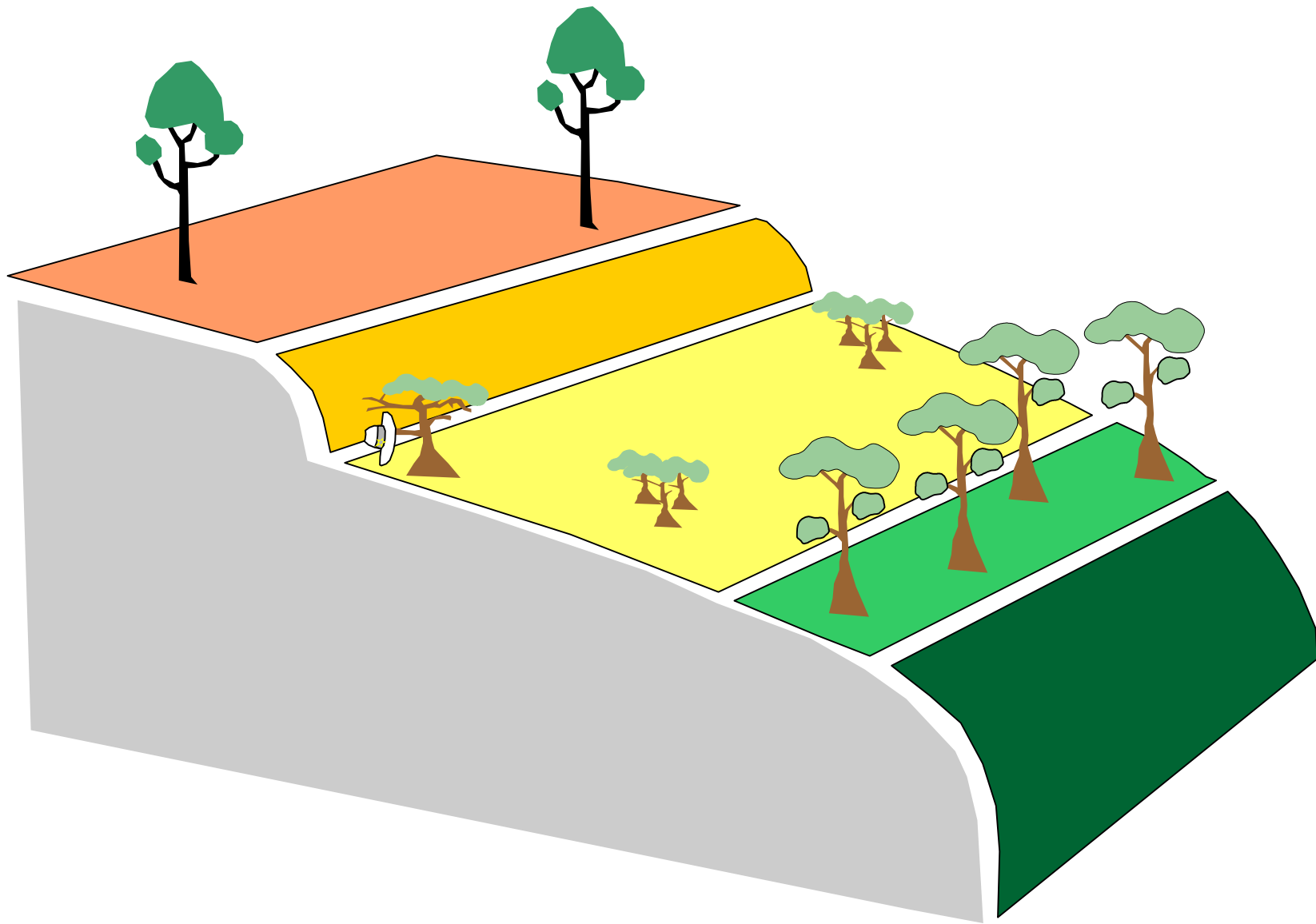


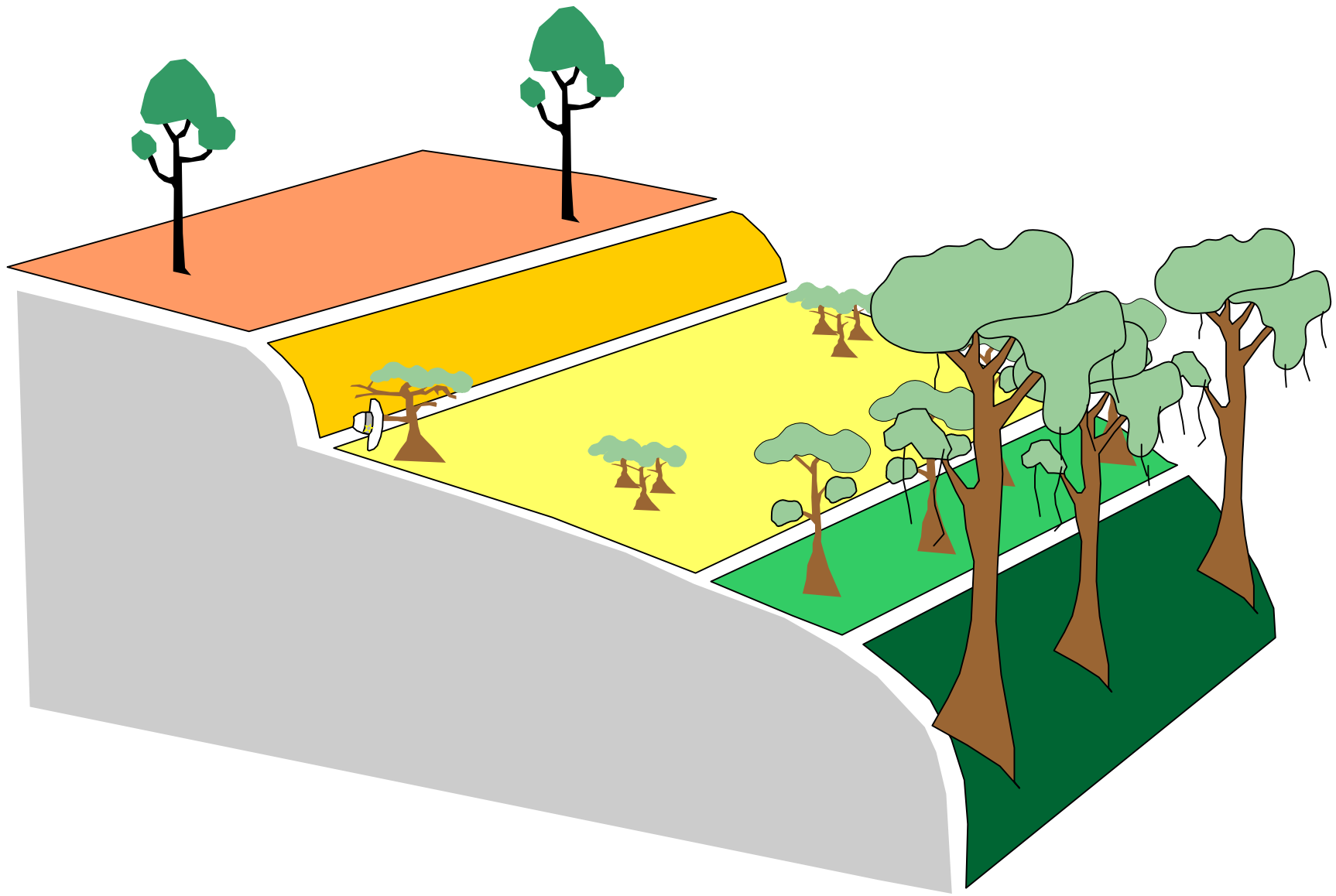


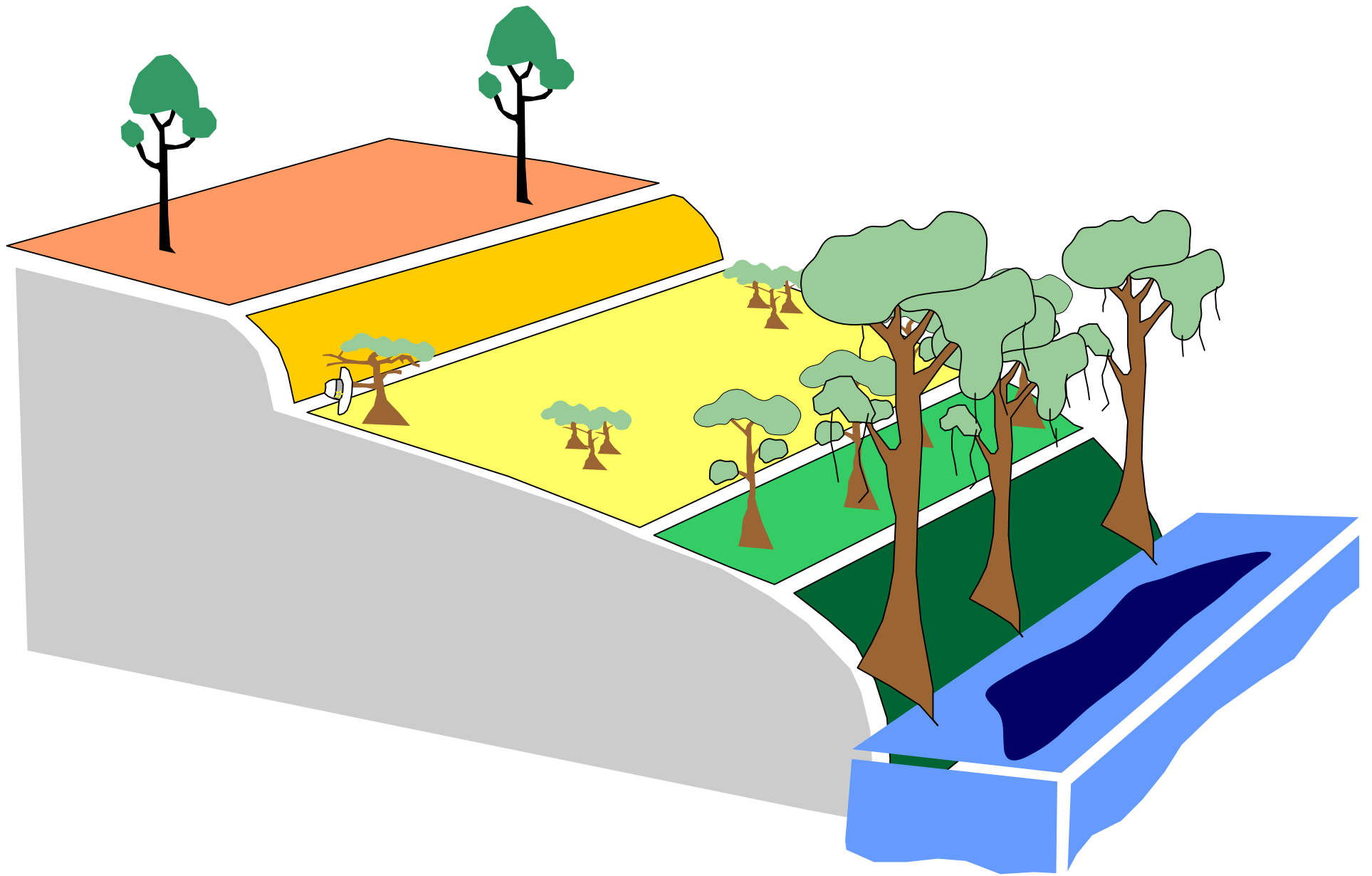


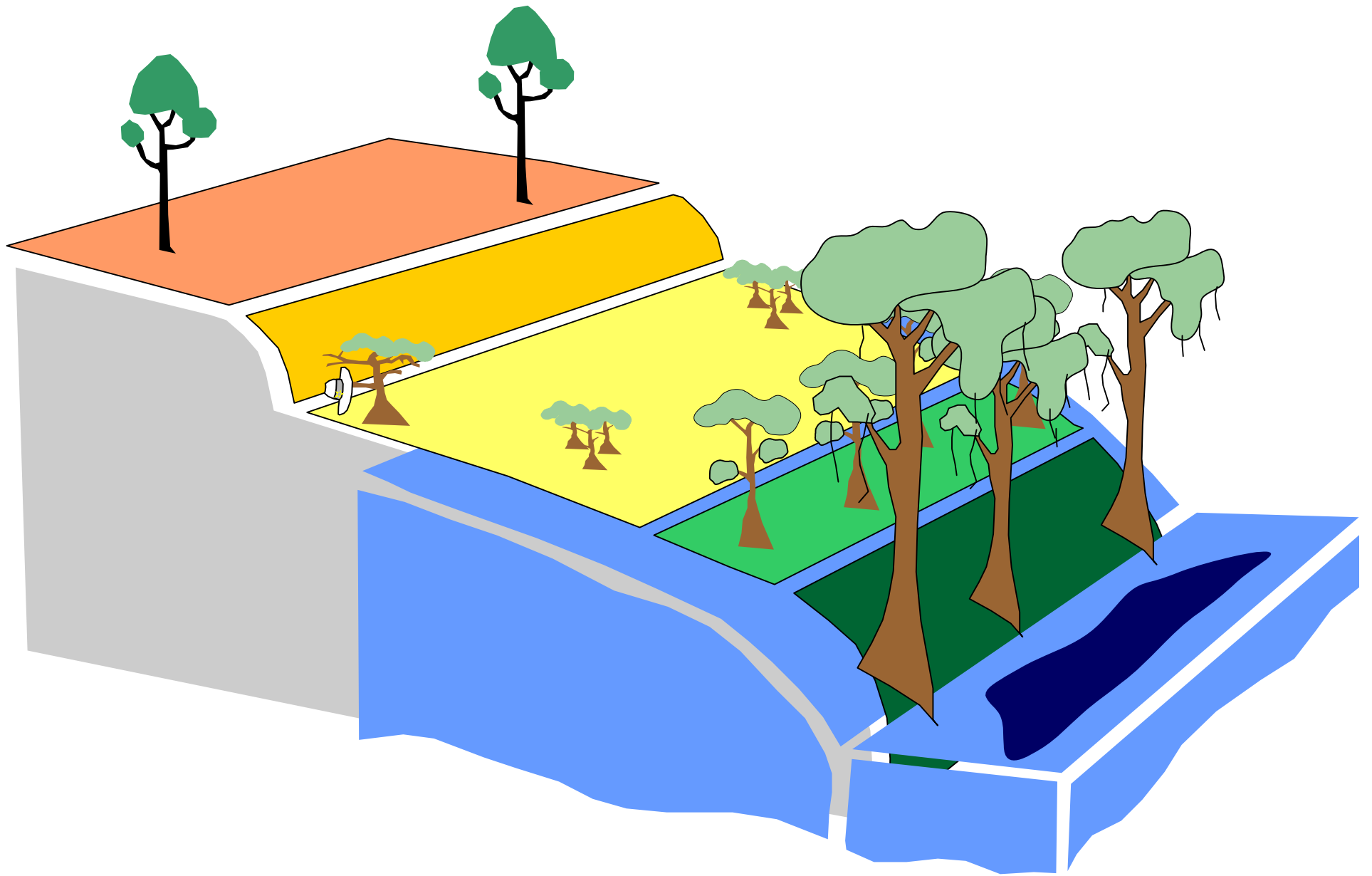


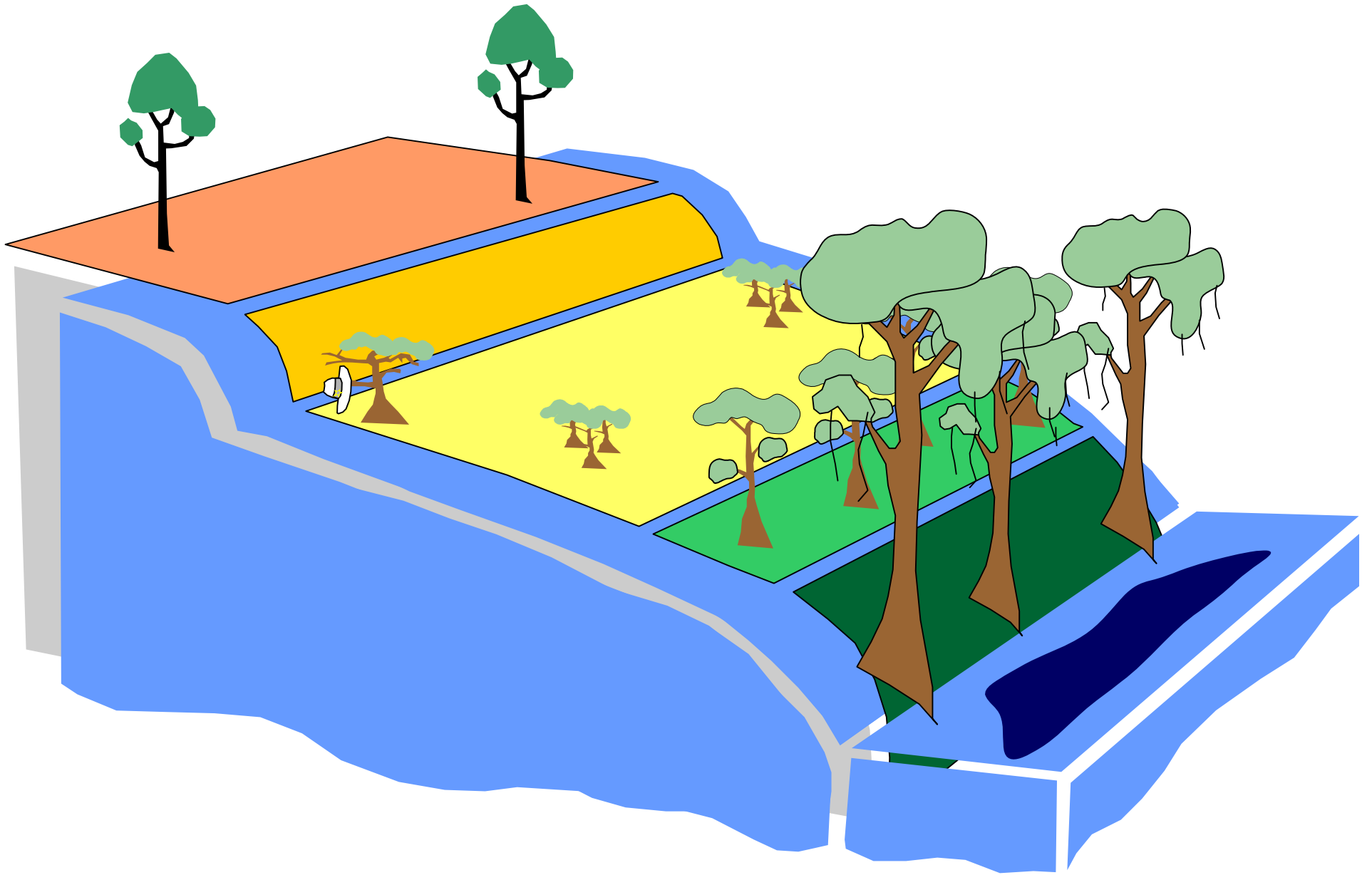


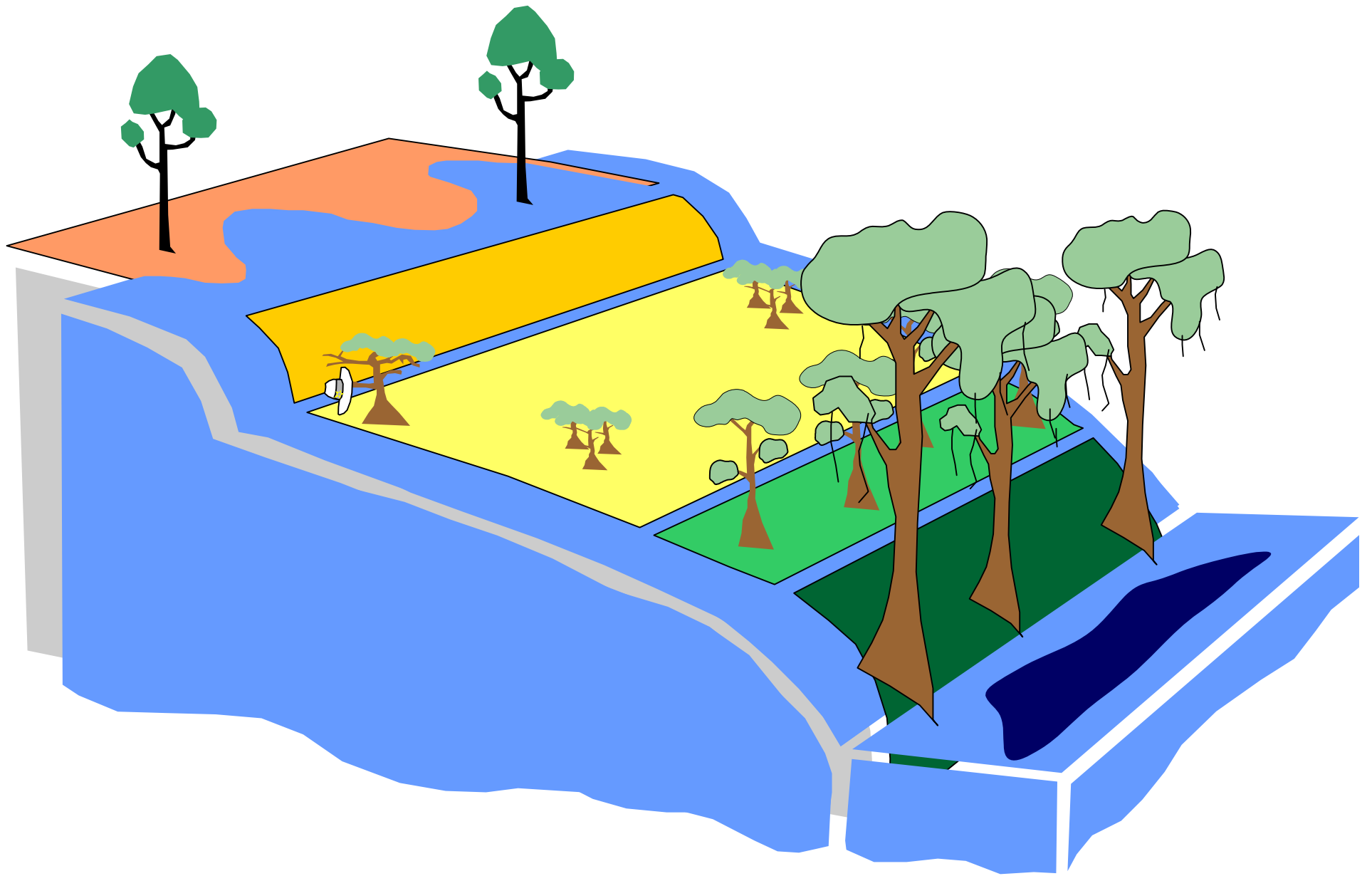


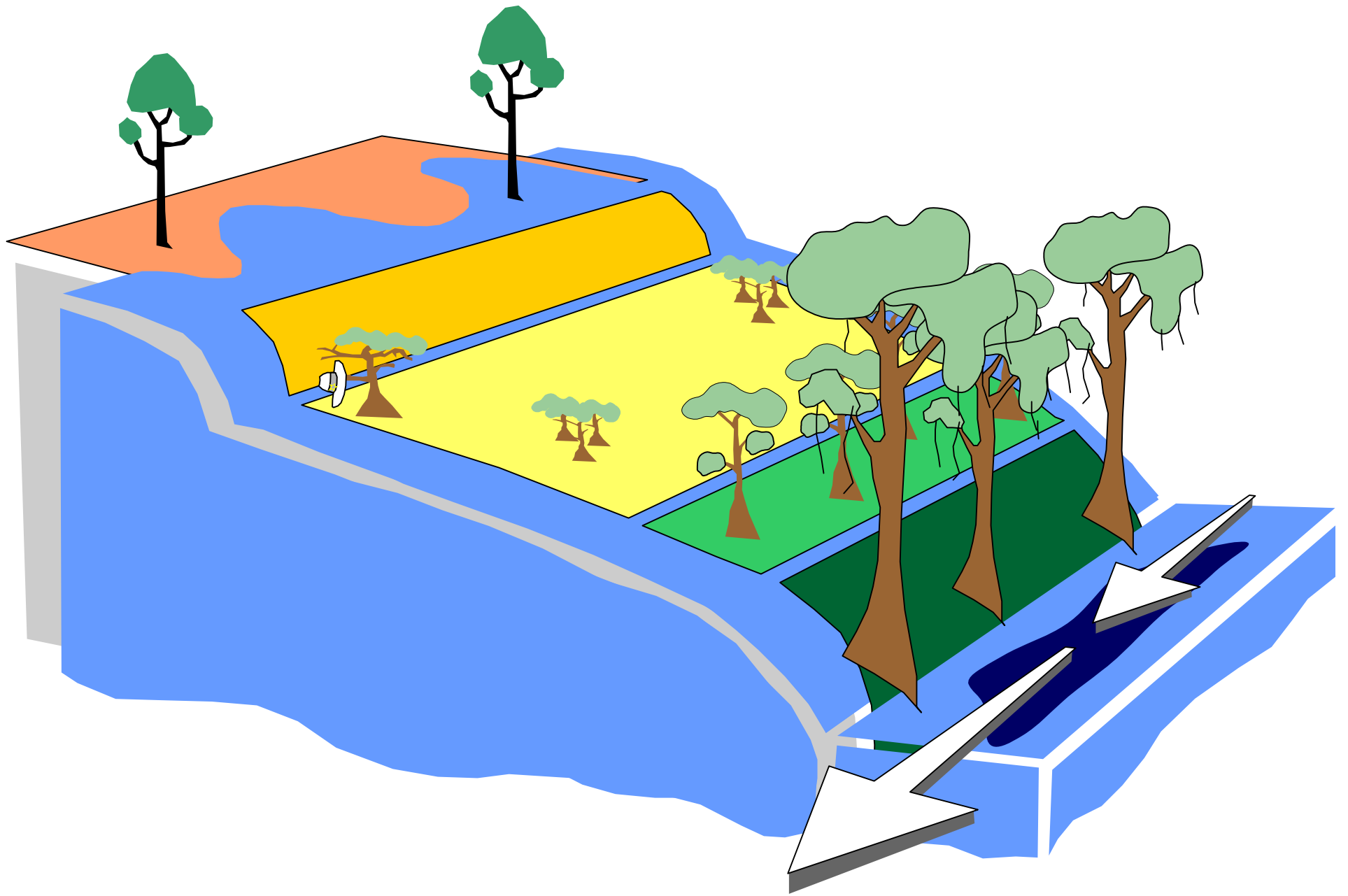


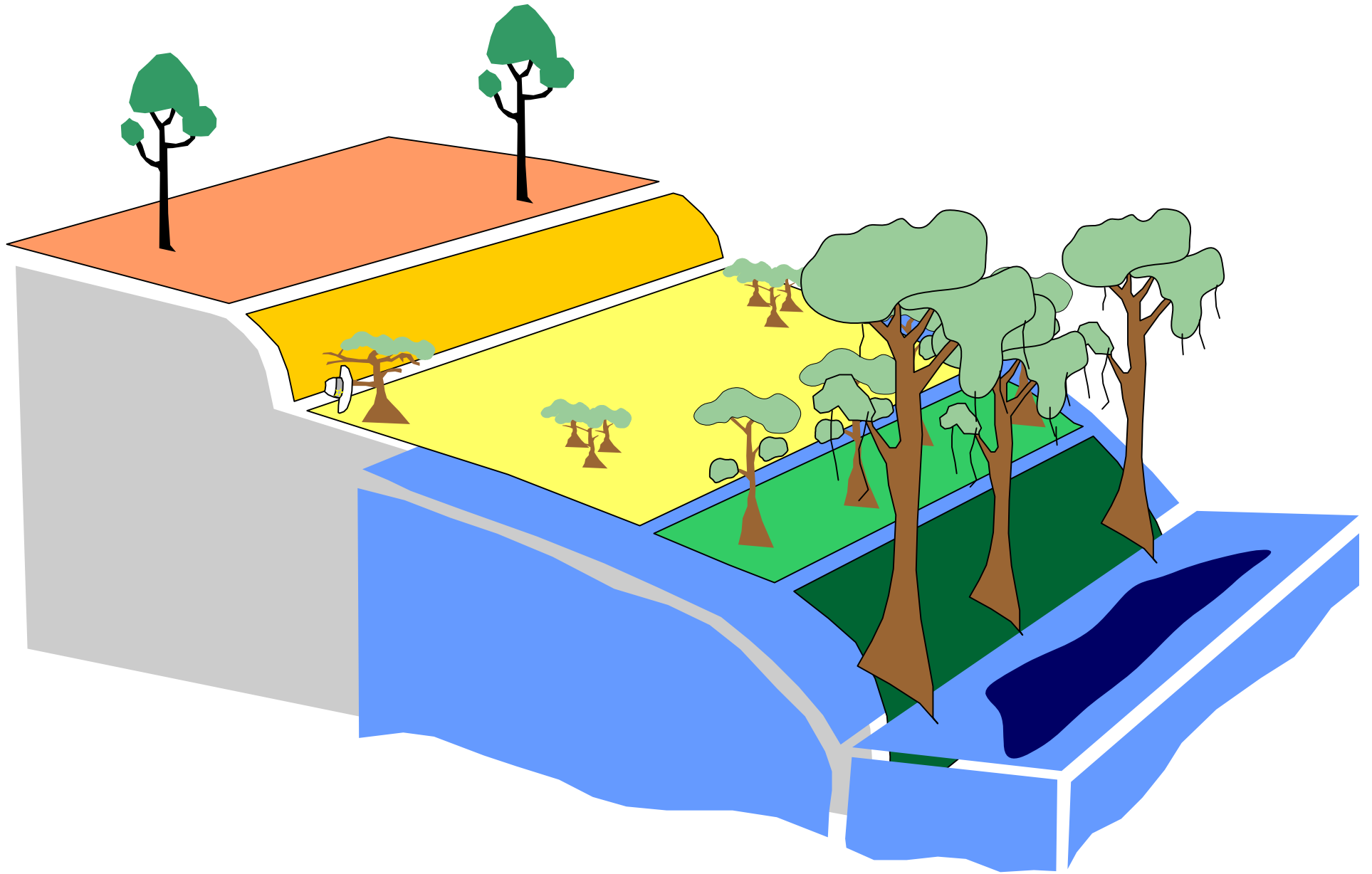


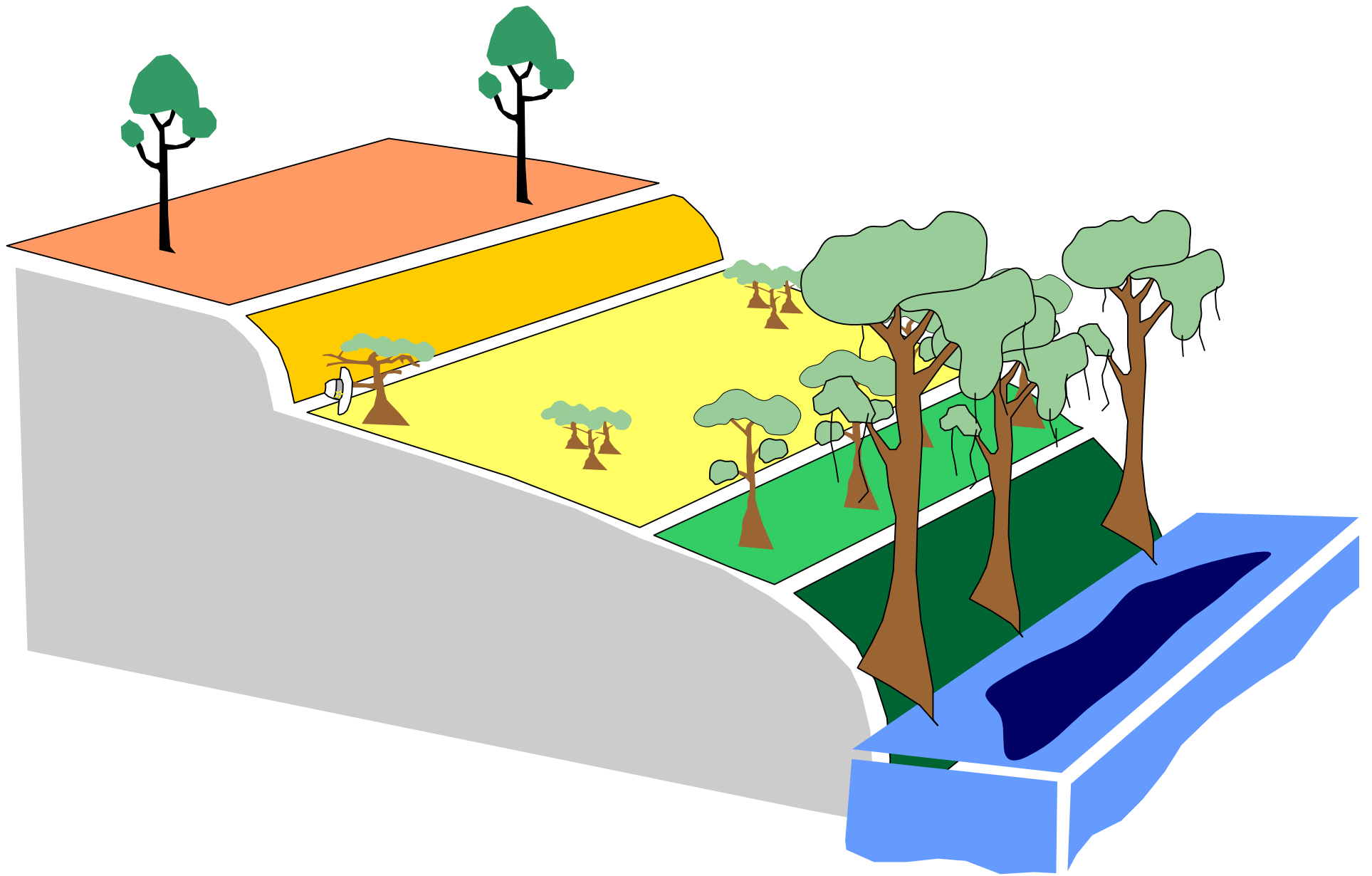


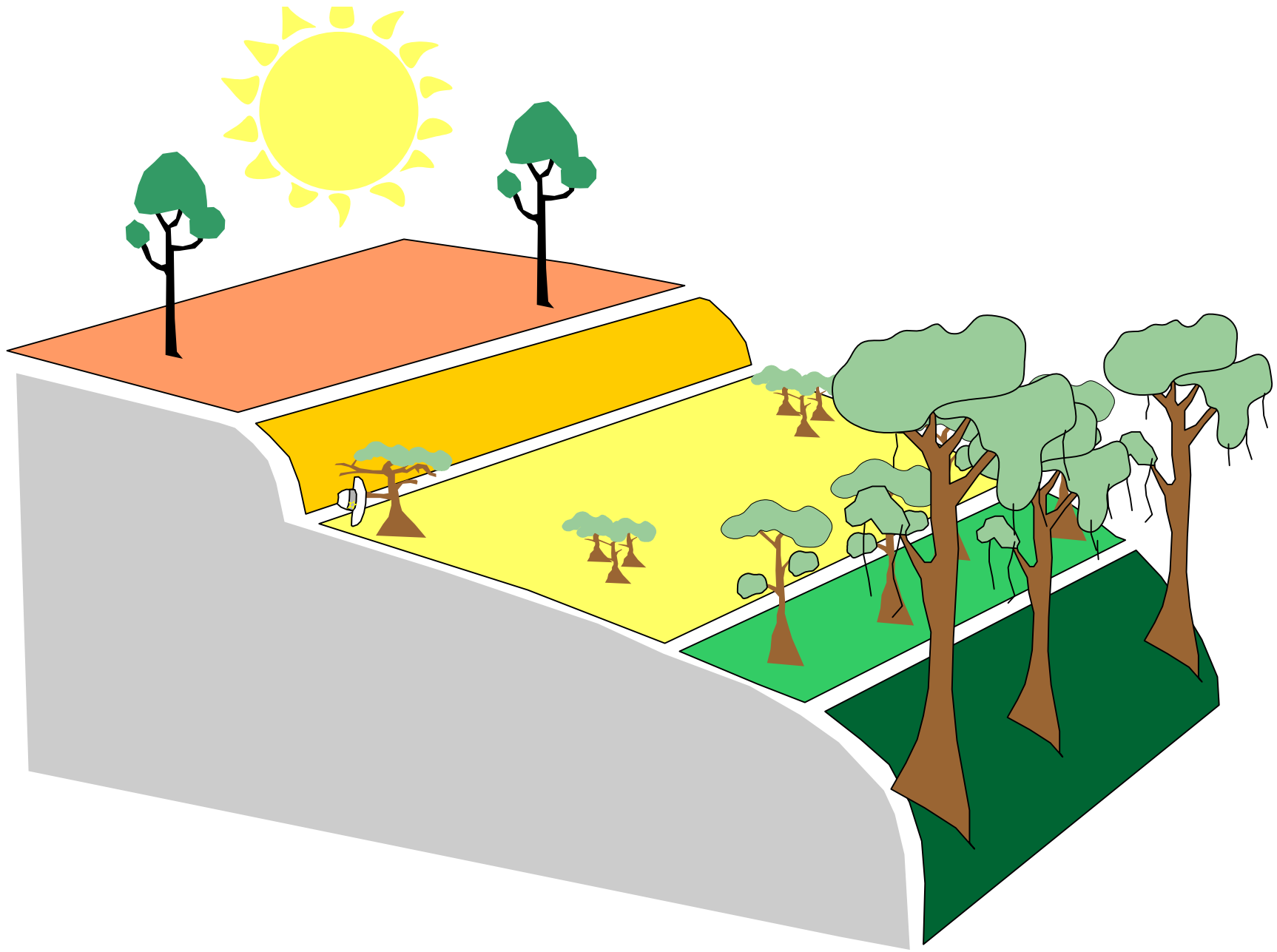


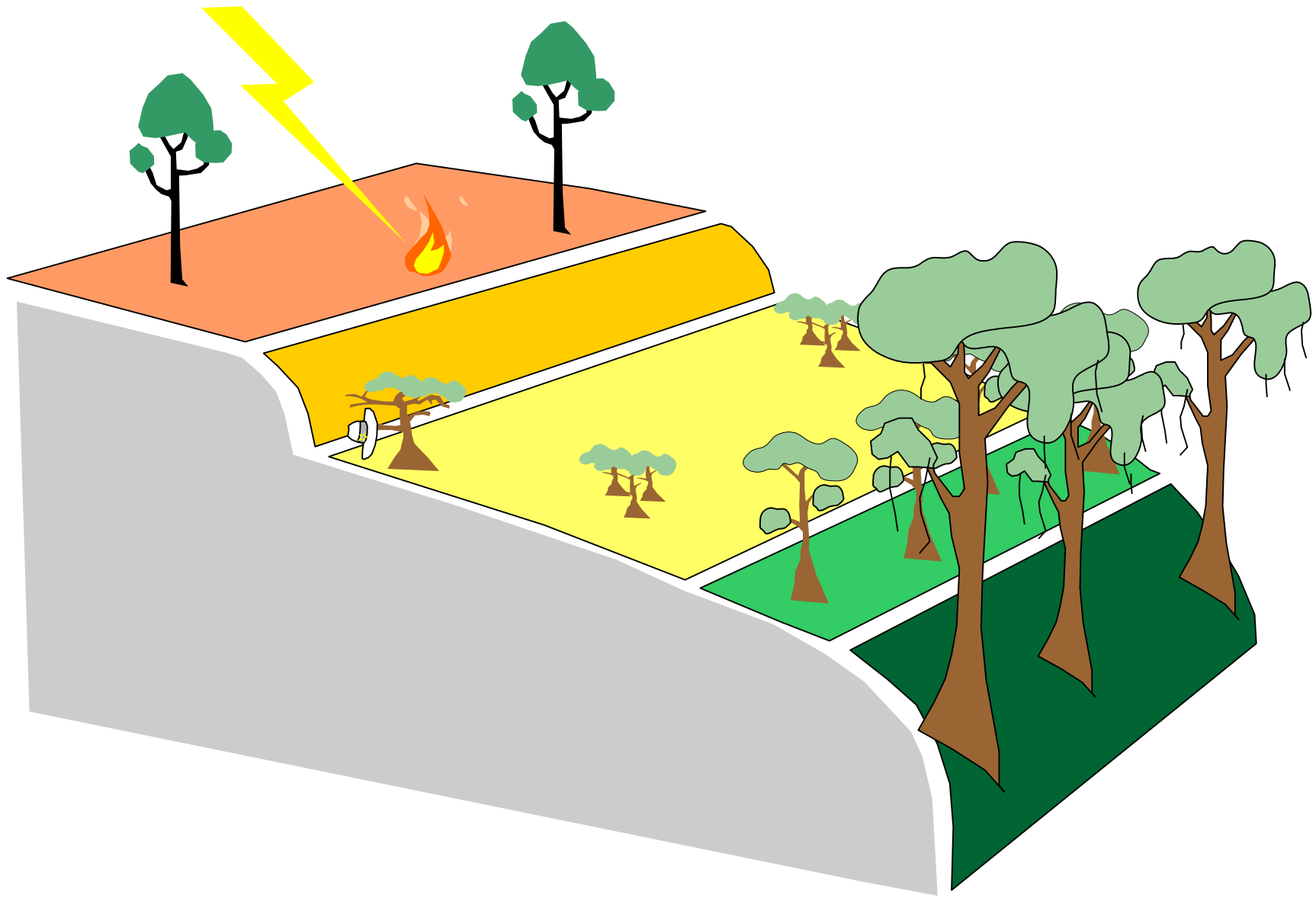


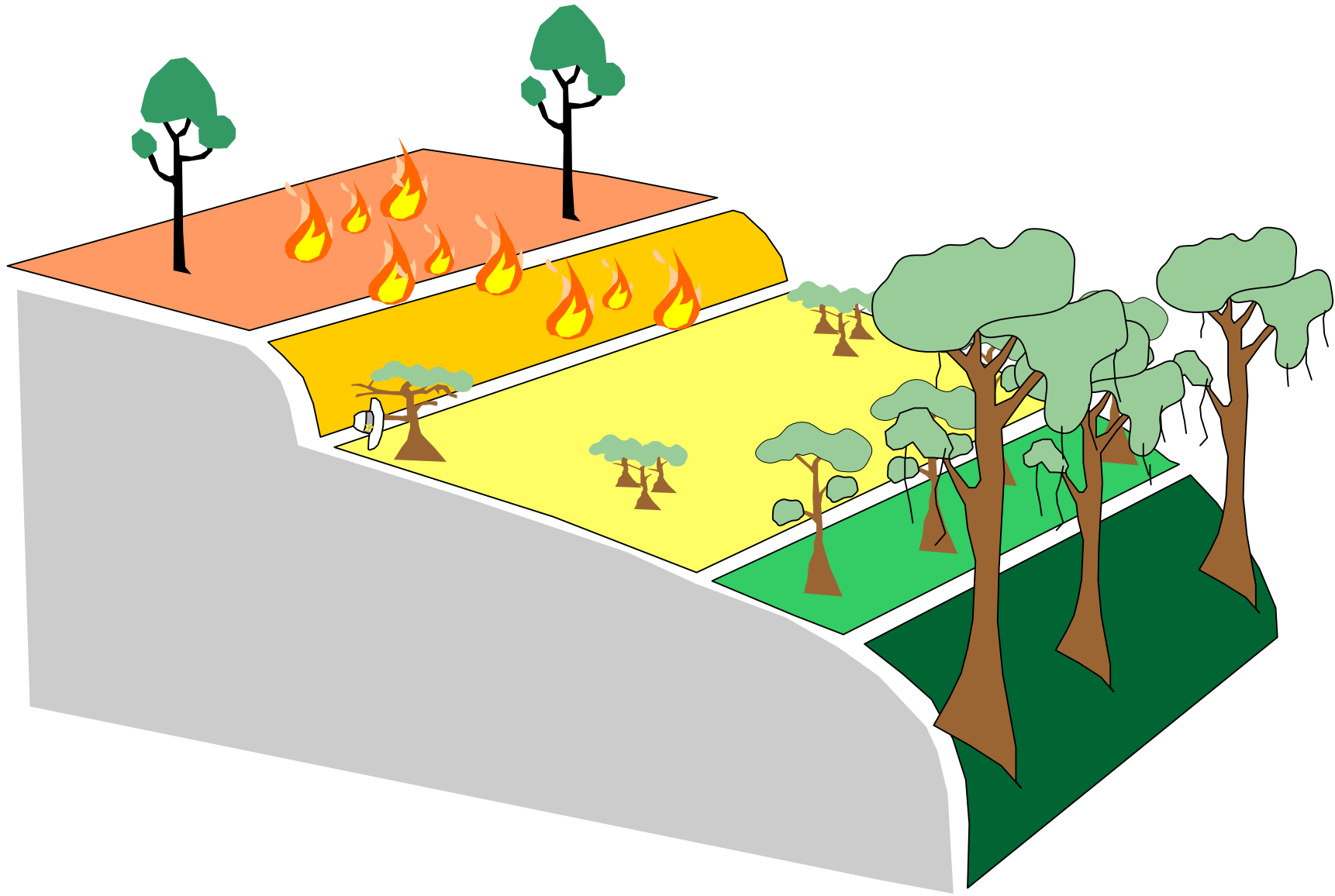


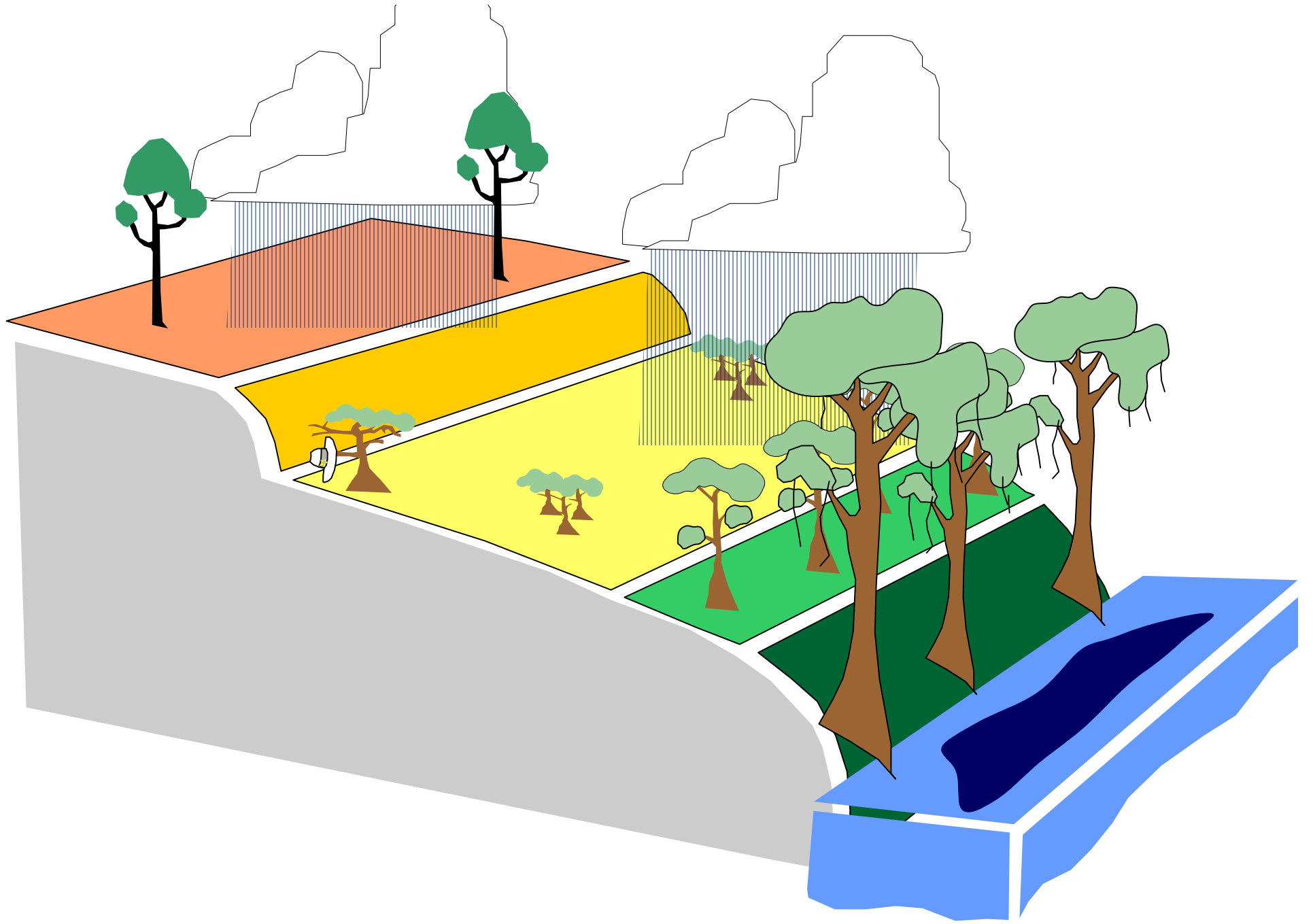




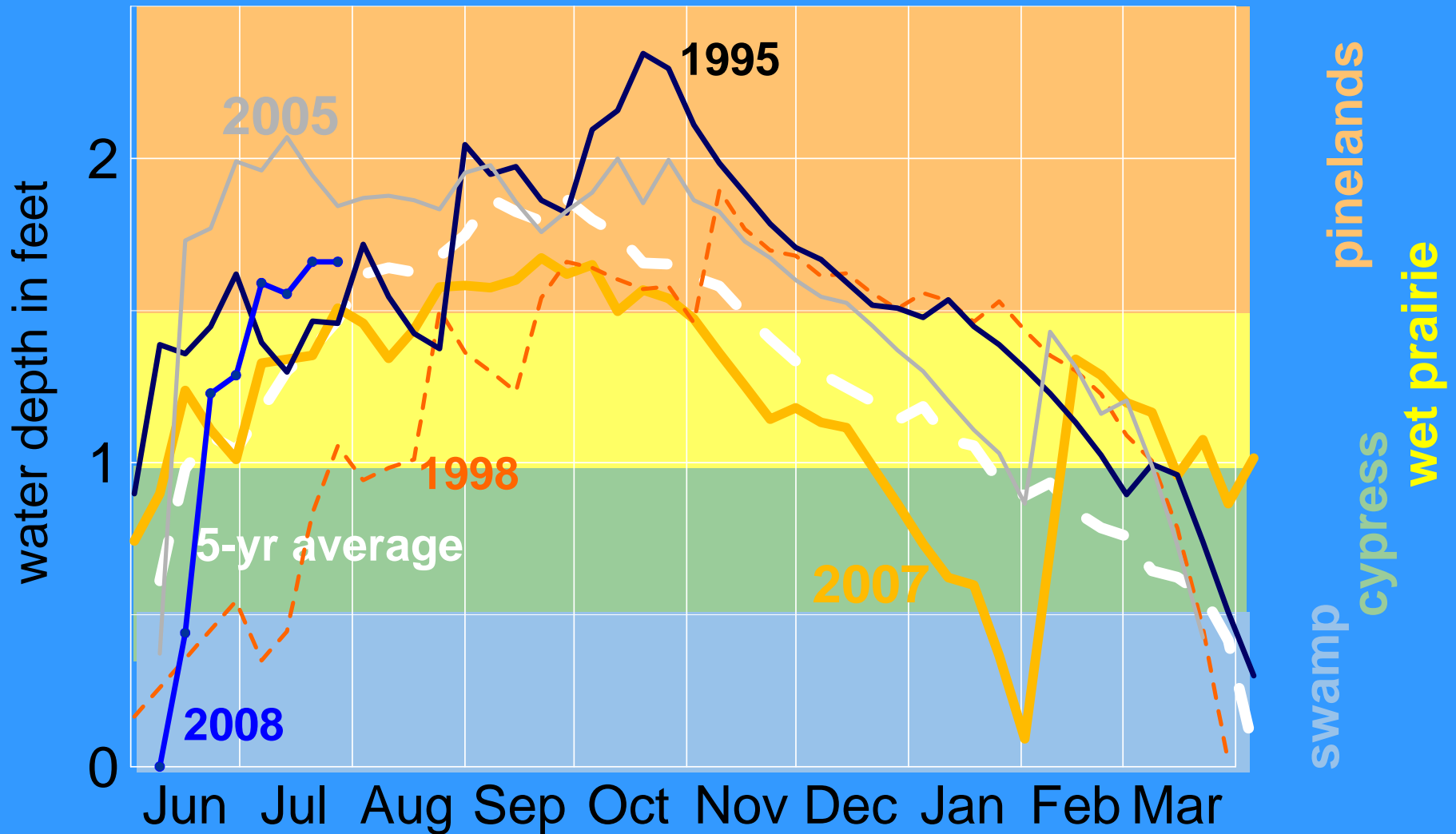








Water depth and wetting front Big Cypress Nat'l Preserve





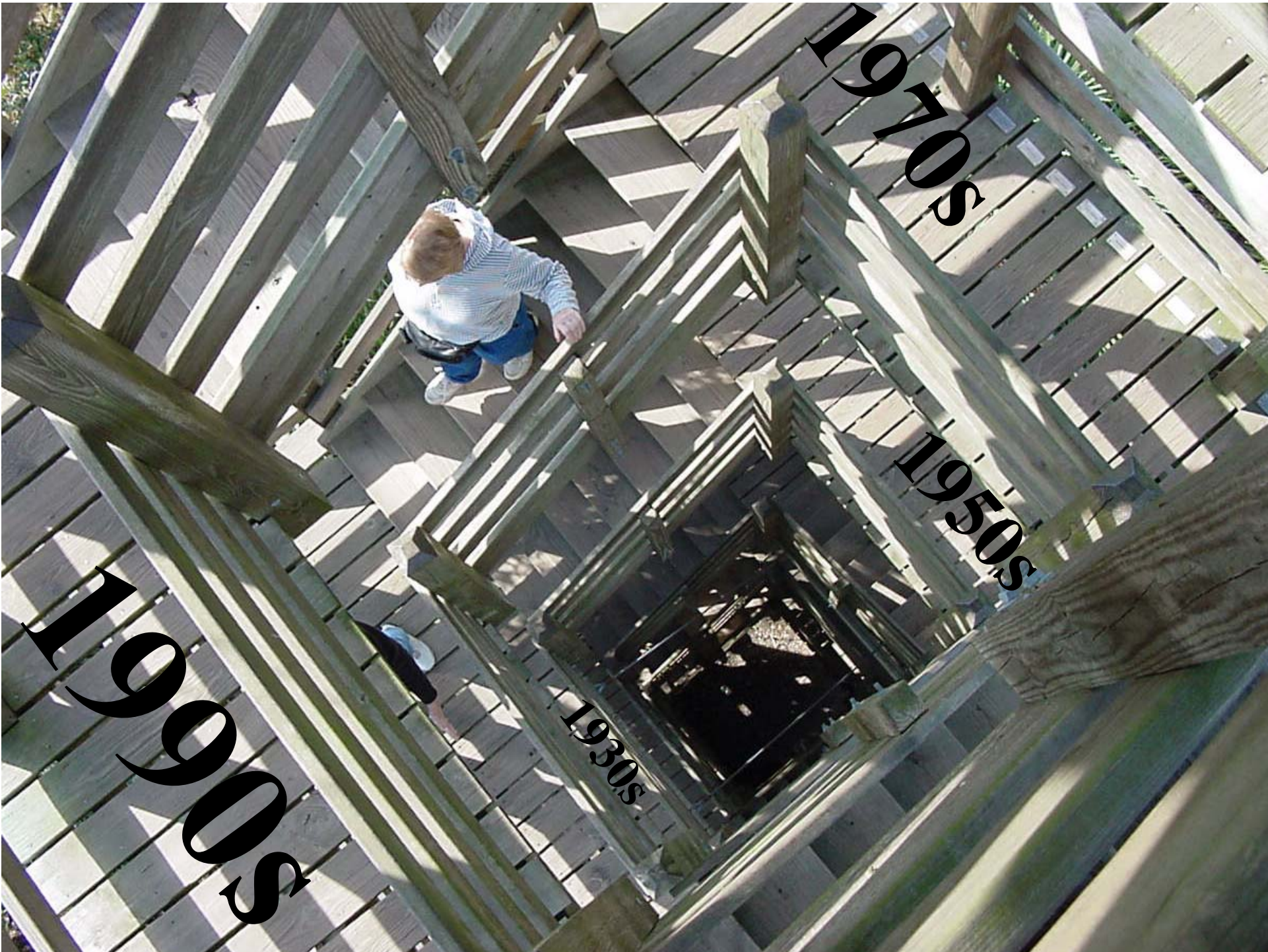
ridge

tree island

slough

Event Horizon





1970s

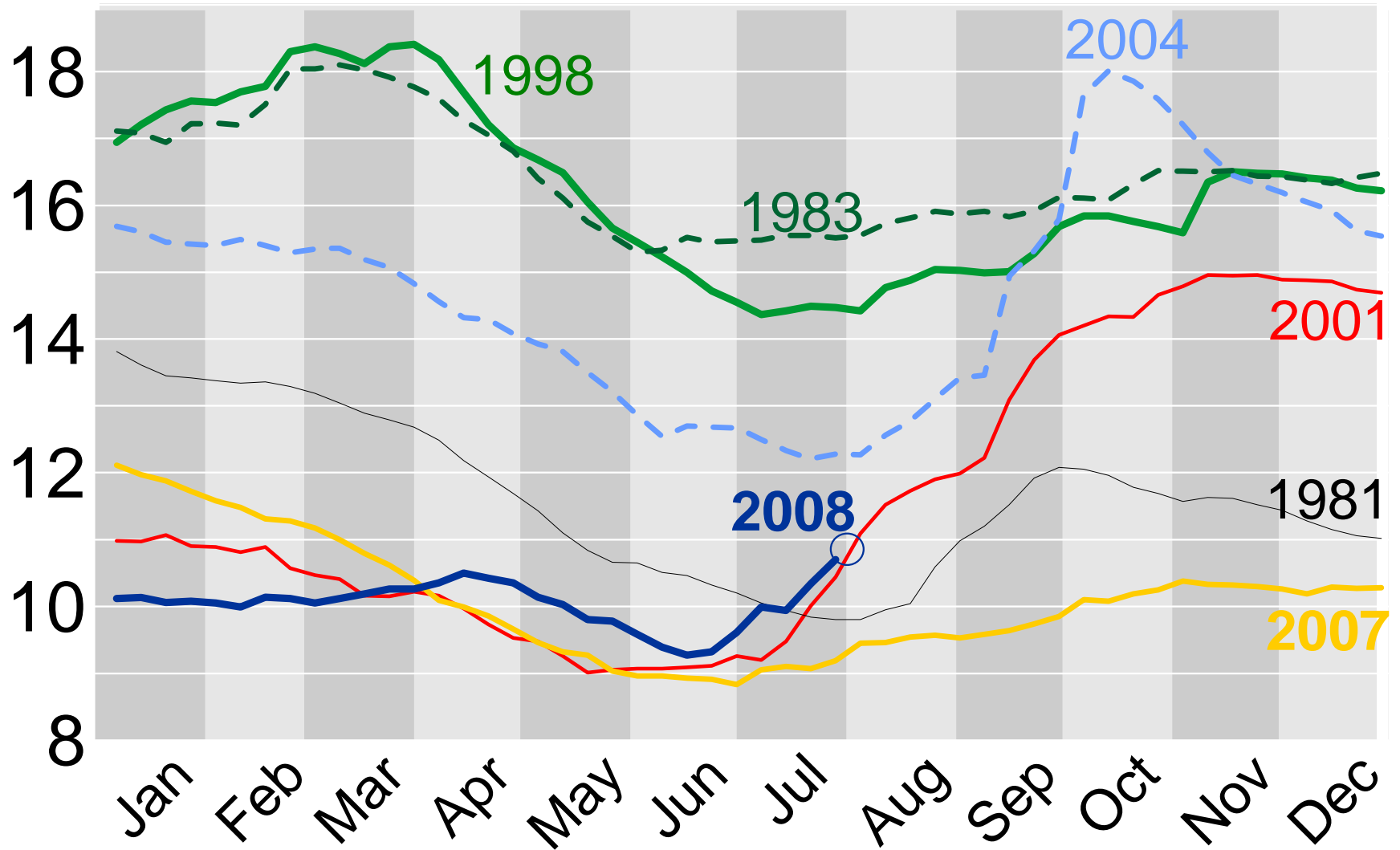
1950s

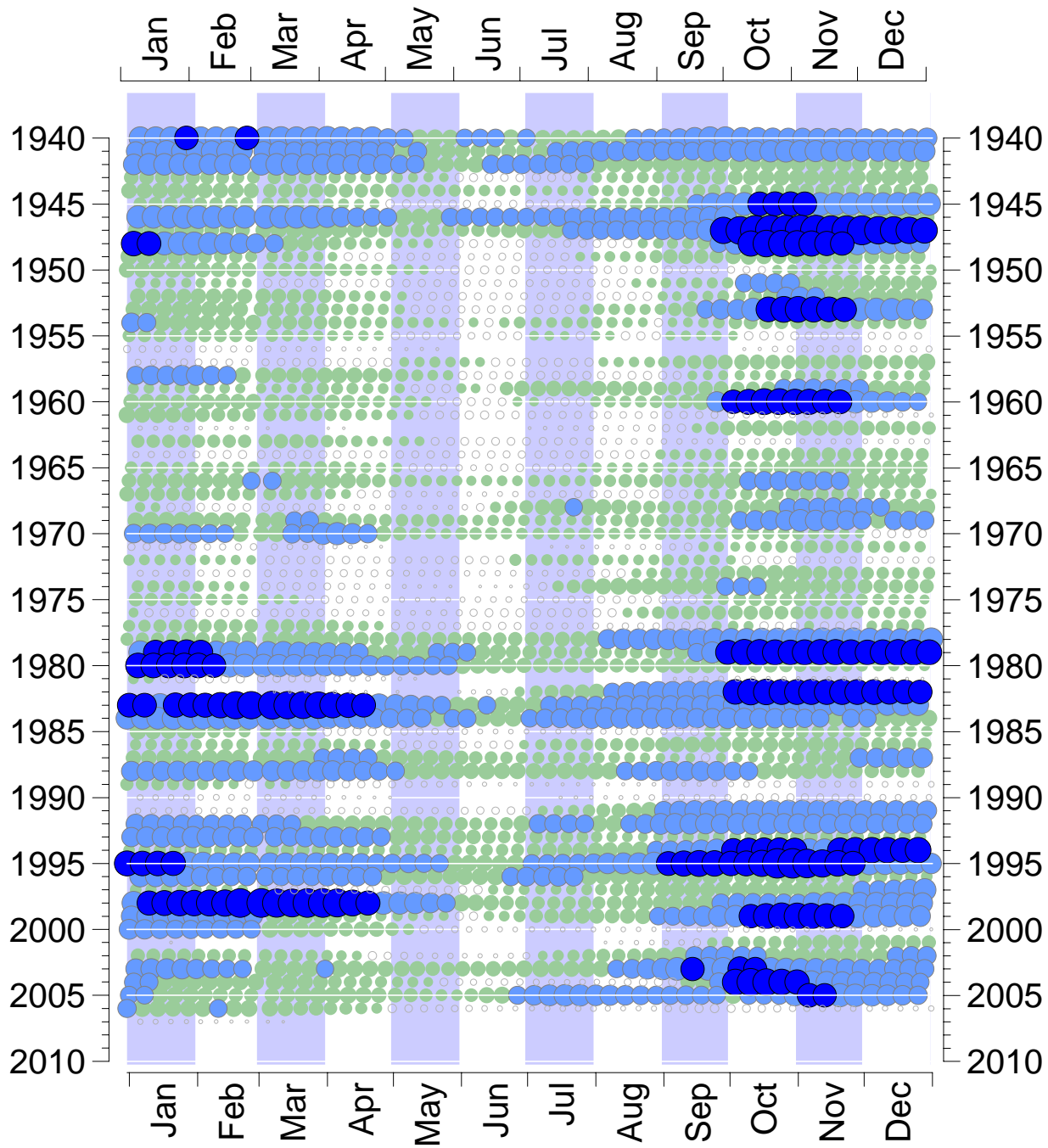
1930s

1990s

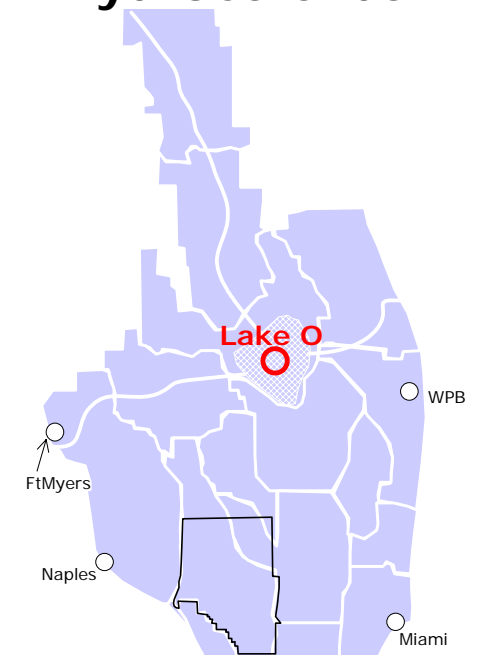
Current level of Lake Okeechobee

relative to past years (in ft above sea level)

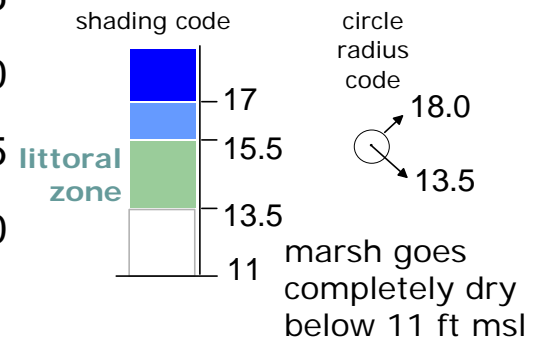




Lake O Littoral Depth HydroCalendar



EXPLANATION
Data points show weekly stage, in feet above sea level (NGVD 29)

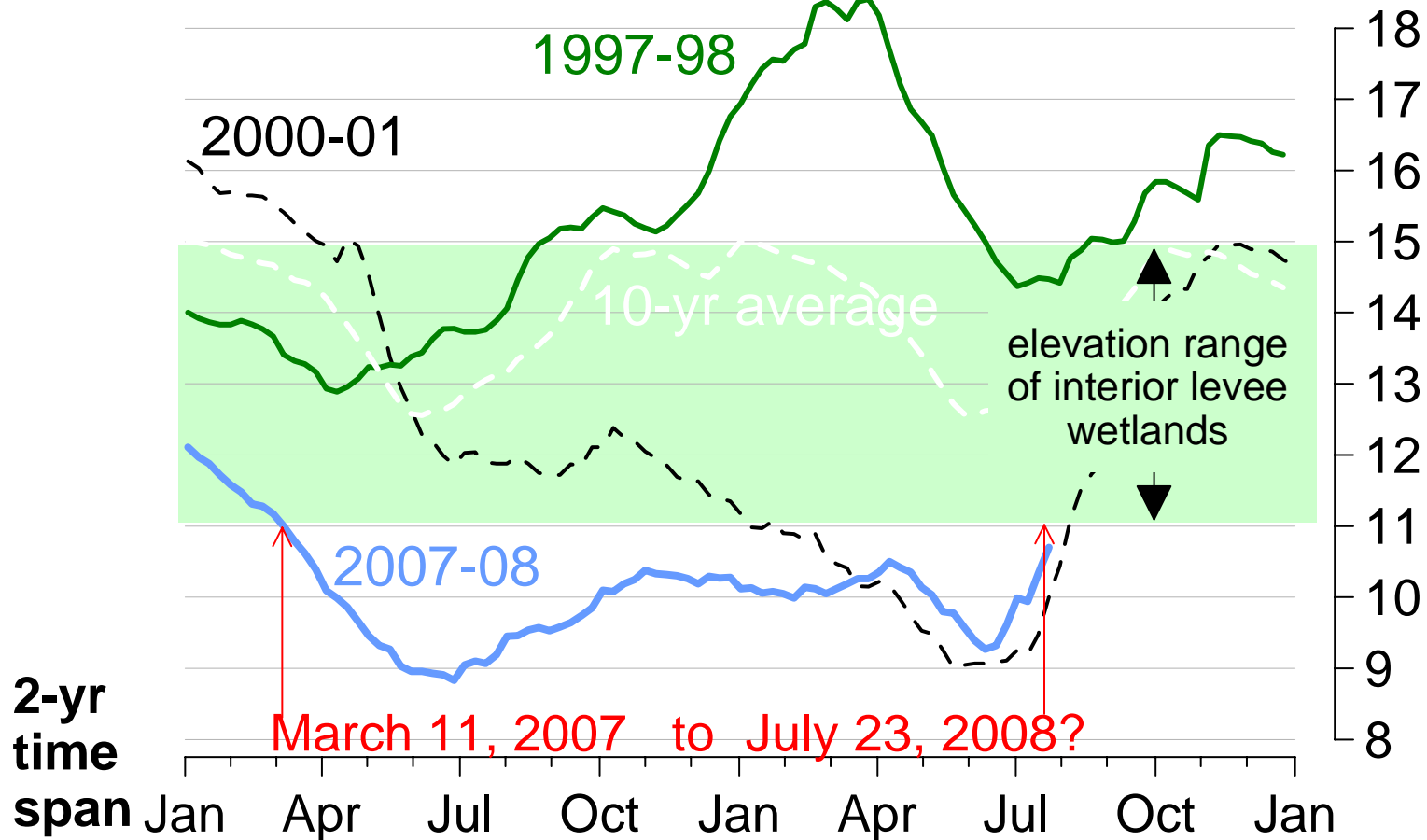


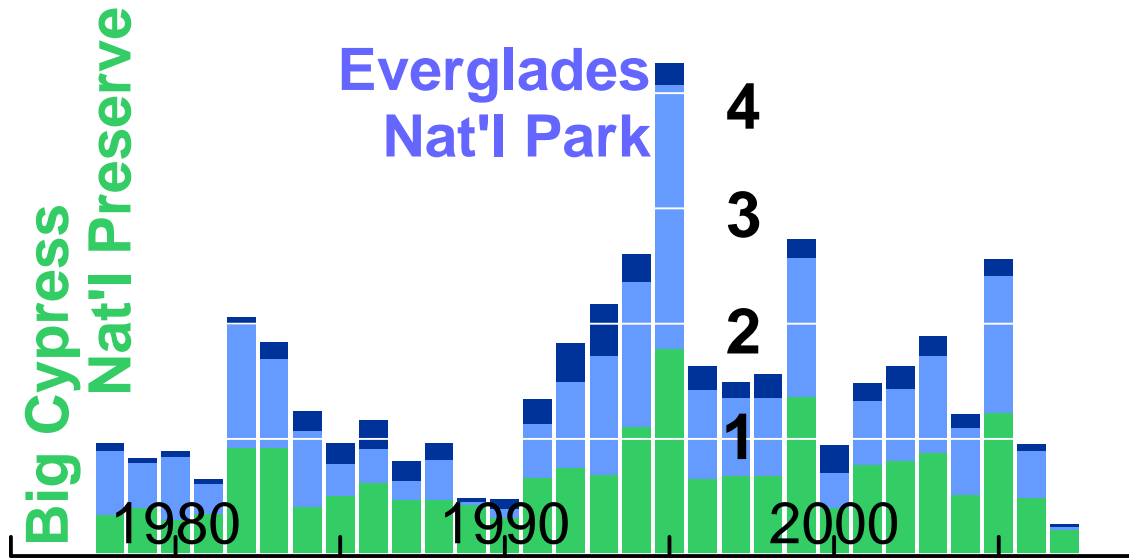
500 days below 11 ft ... and running

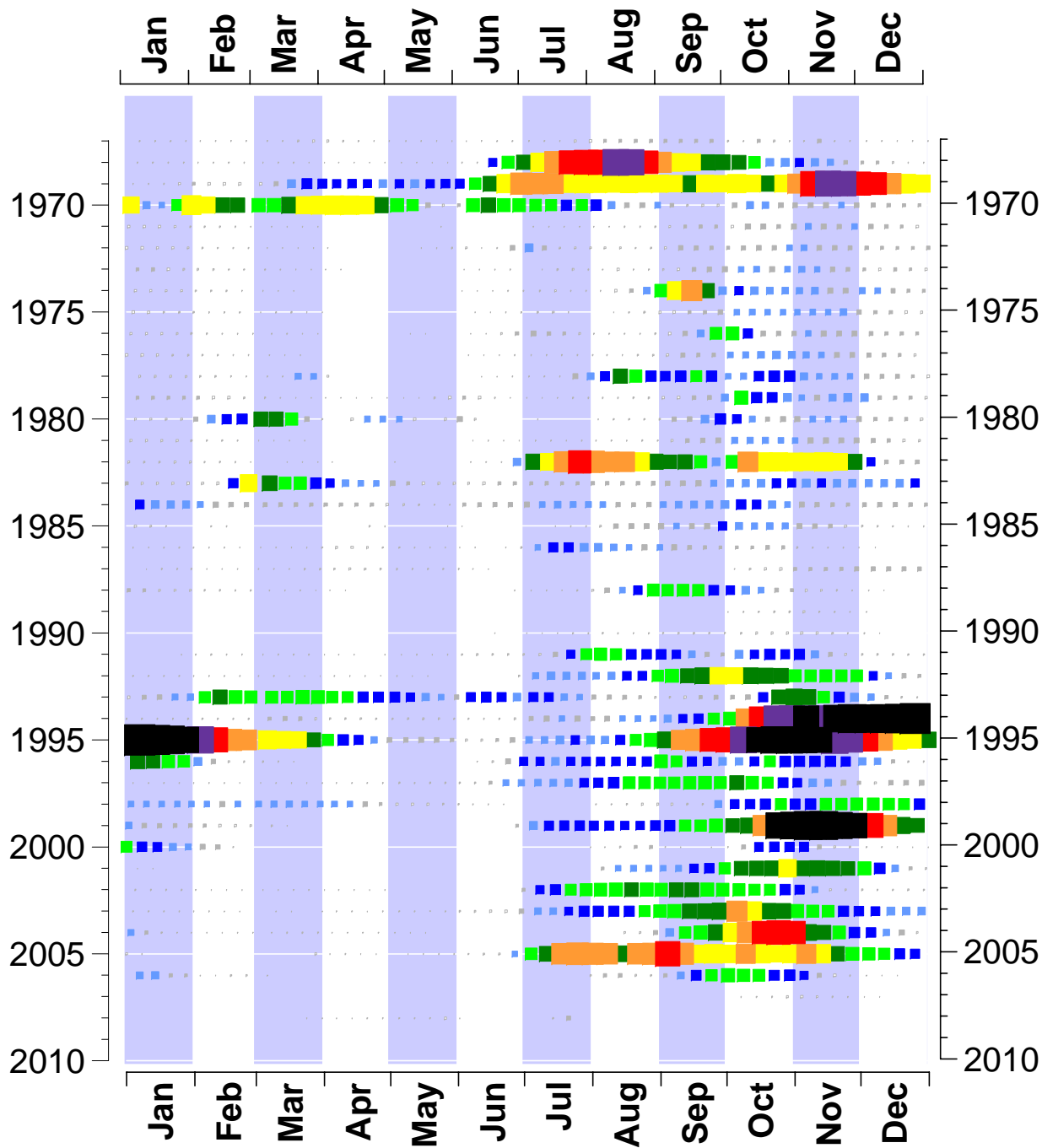
Comparison of current drought of century (2007-08)
to previous drought of the century (2000-01)
Also note height of lake during 1998 El Nino.

Lake stage

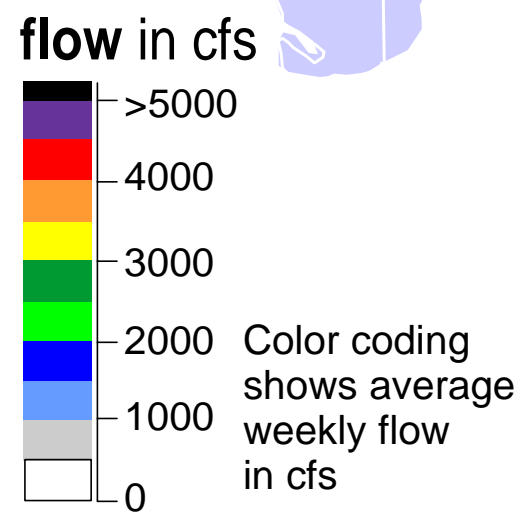
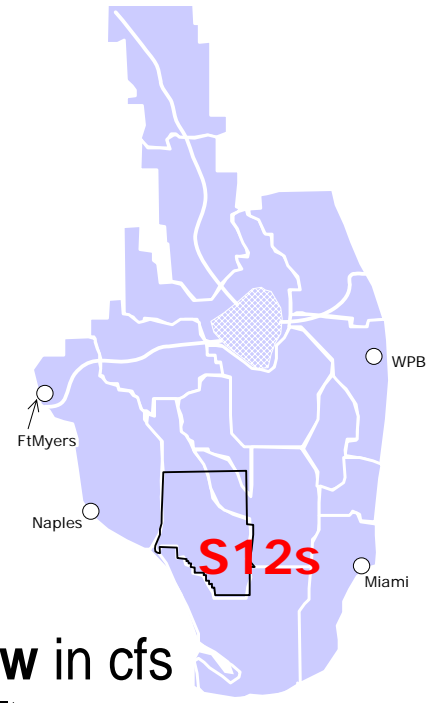
in feet msl

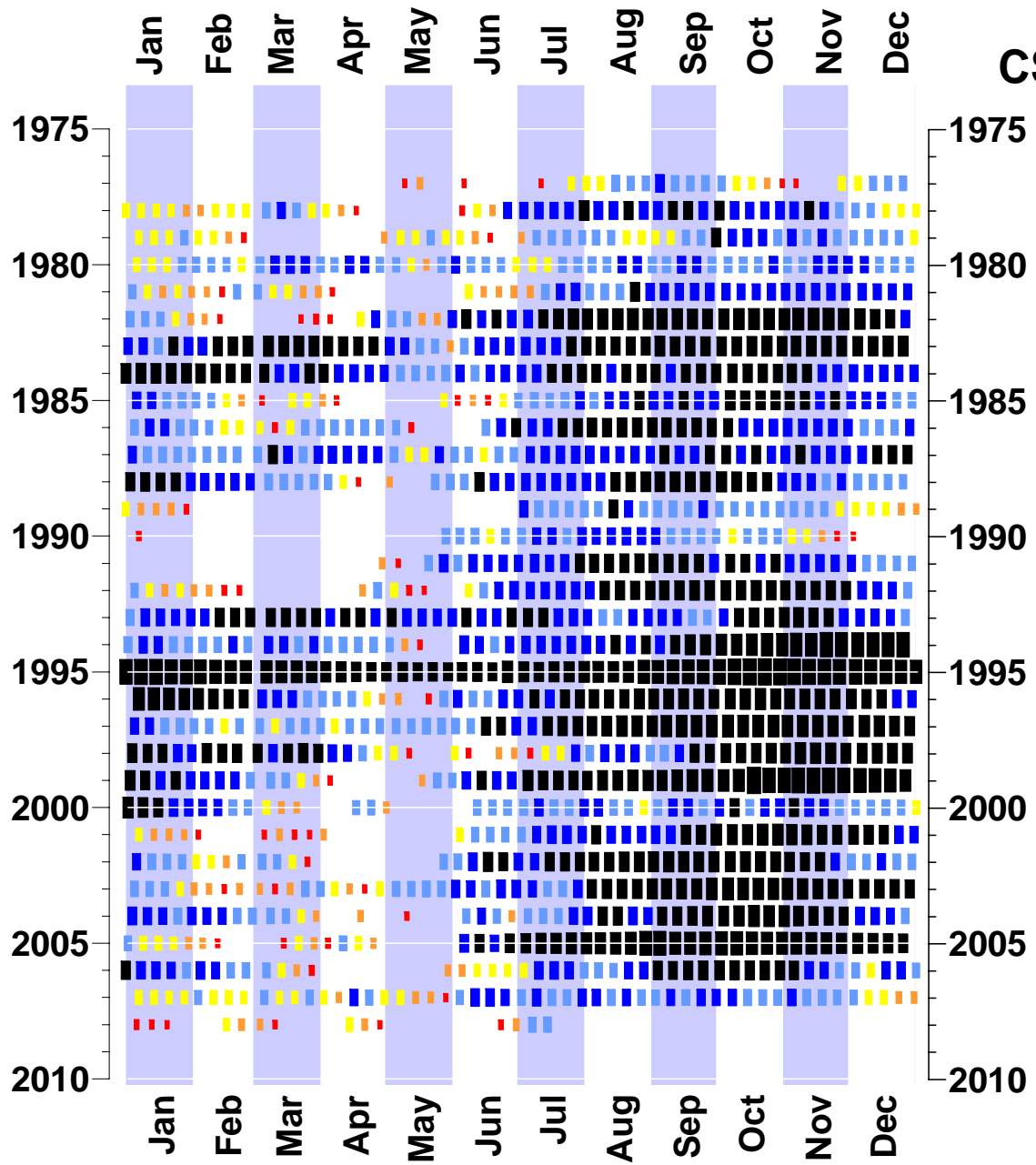






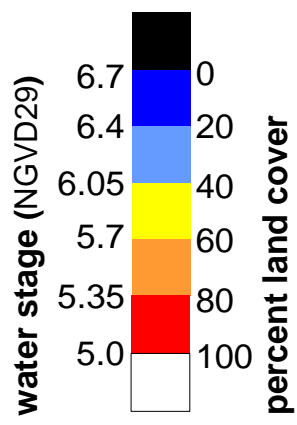
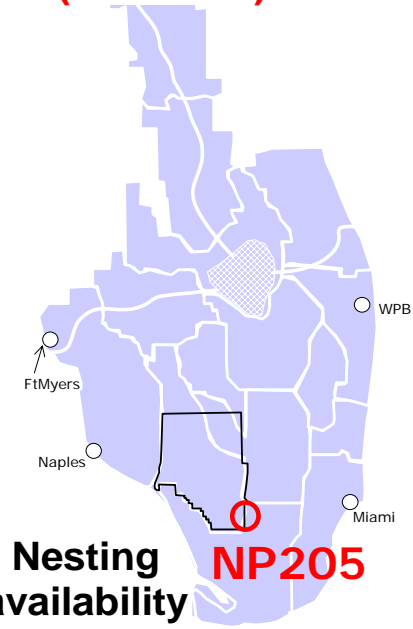
Structural Discharge Calendar for S12s





CSSS-Subpopulation A

Nesting Availability Calendar
(at NP205)

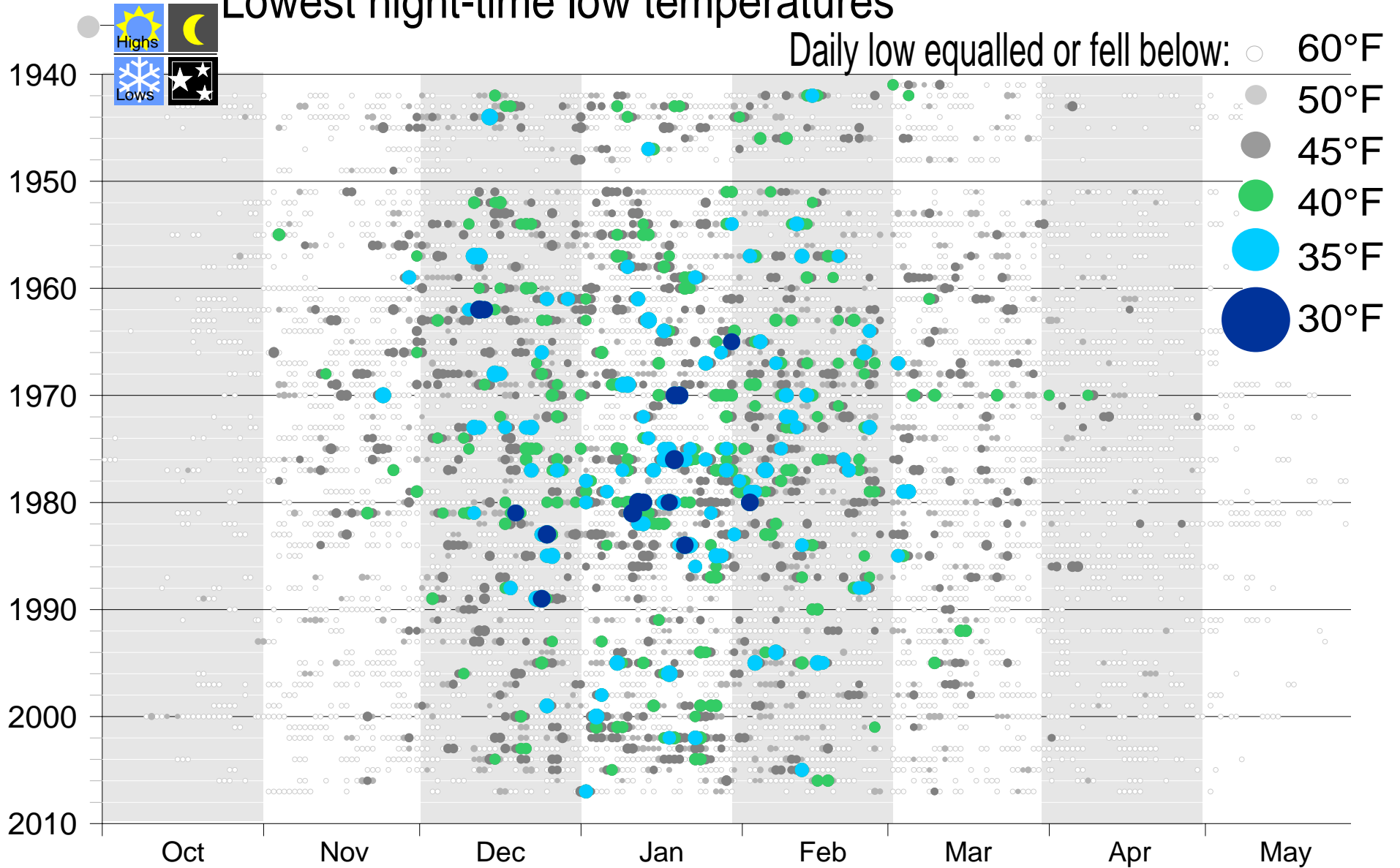


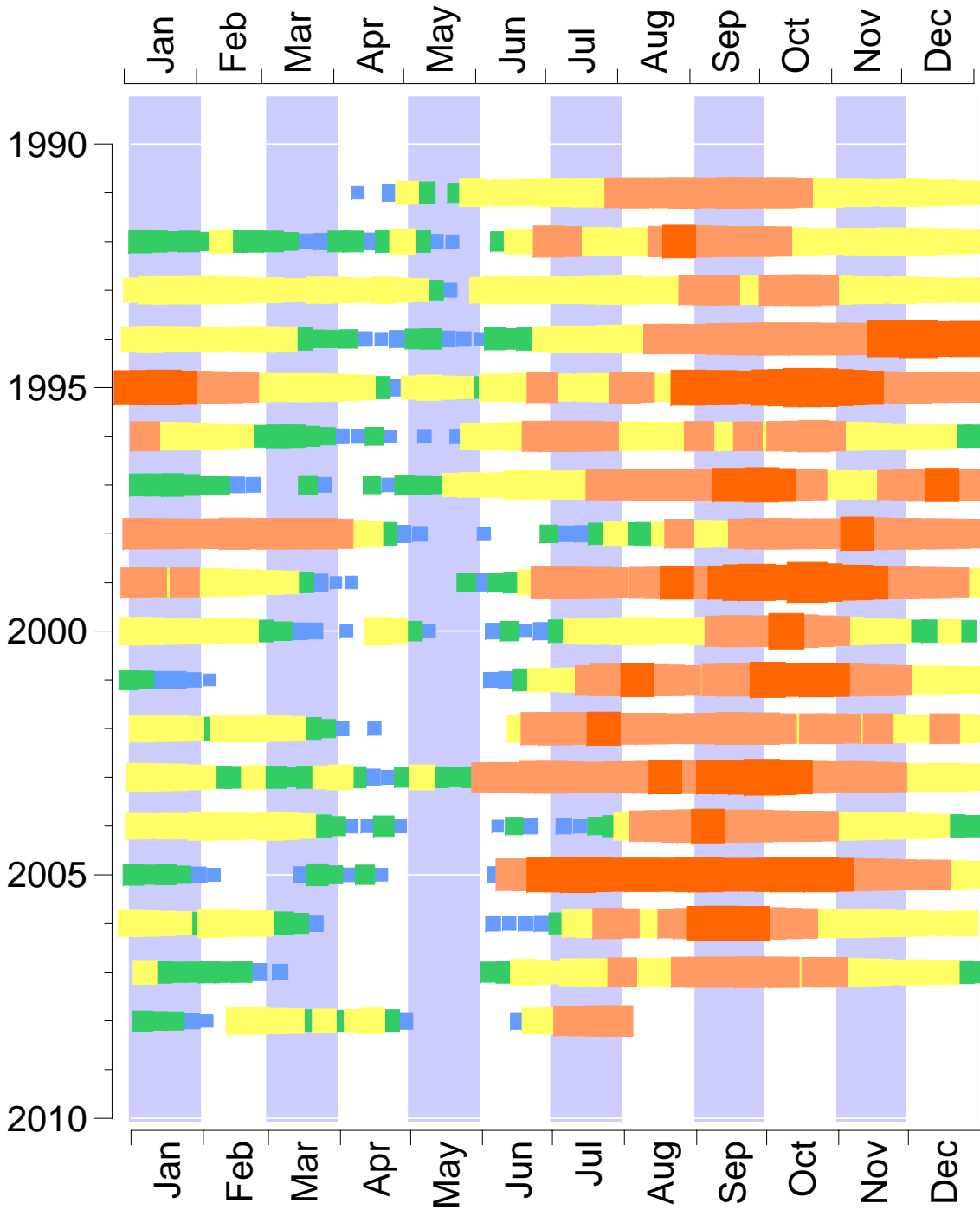
Explanation
 Percentage of wet prairie habitat available for Cape Sable Seaside Sparrow nesting

Historical calendar of Naples coldest nights, FL

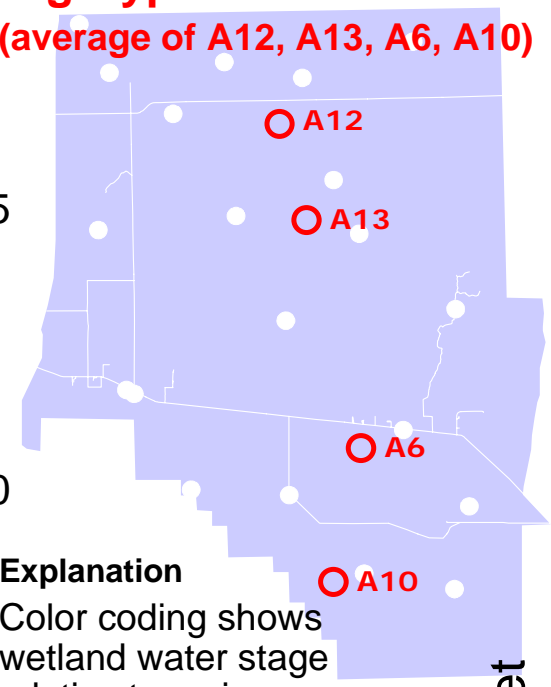
Lowest night-time low temperatures

Daily low equalled or fell below:





Landscape Hydroperiod Calendar for Big Cypress Nat'l Preserve (average of A12, A13, A6, A10)



Explanation
Color coding shows wetland water stage relative to major landscape types

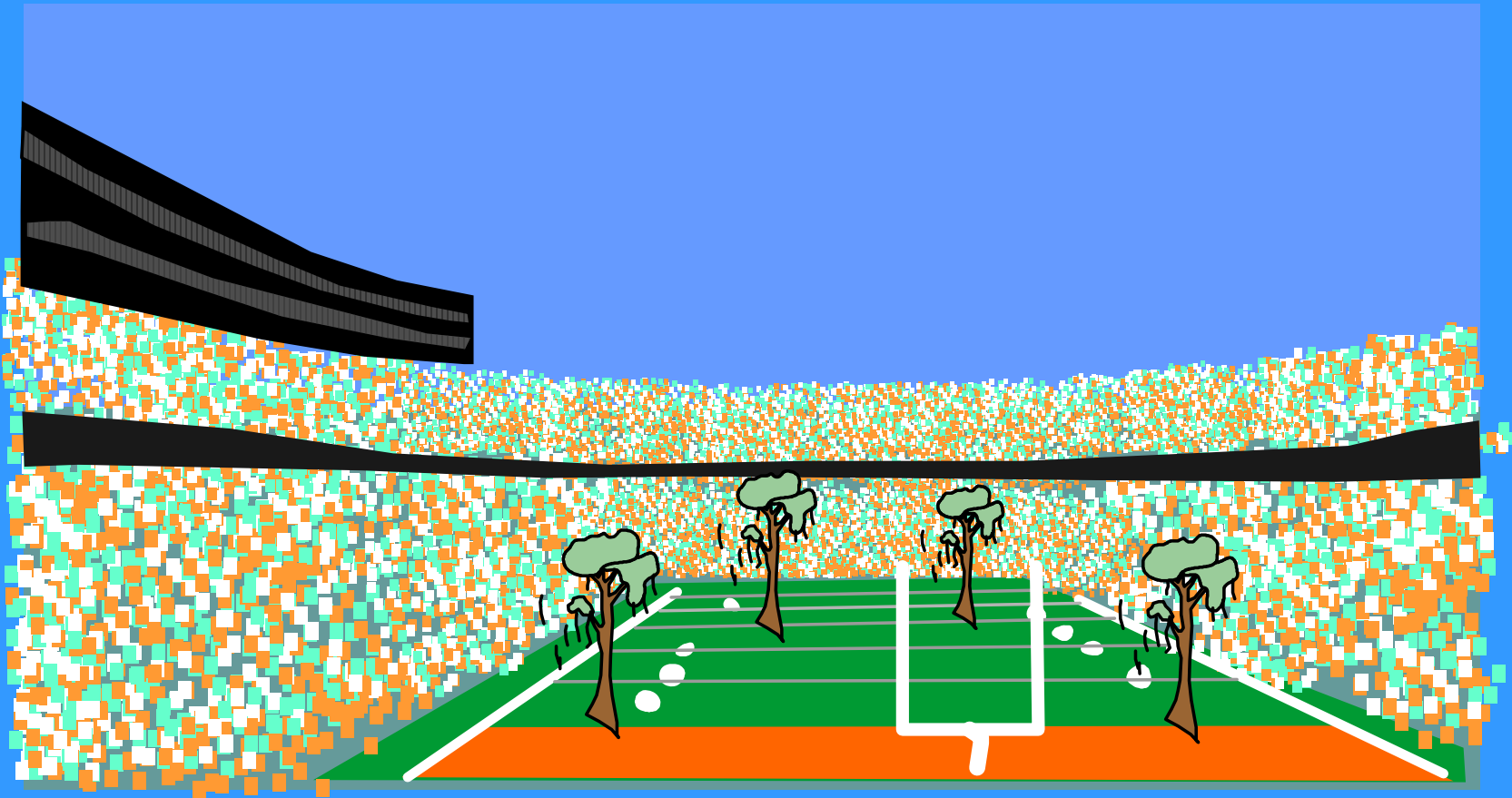
- xeric uplands
- mesic uplands
- hydric uplands
- prairie*
- cypress
- swamp forest
- marsh

water depth in feet

* prairie coding includes dwarf cypress



Watersheds as sports team



1 acre



US Army Corps
of Engineers

W. P. Franklin Visitor Center

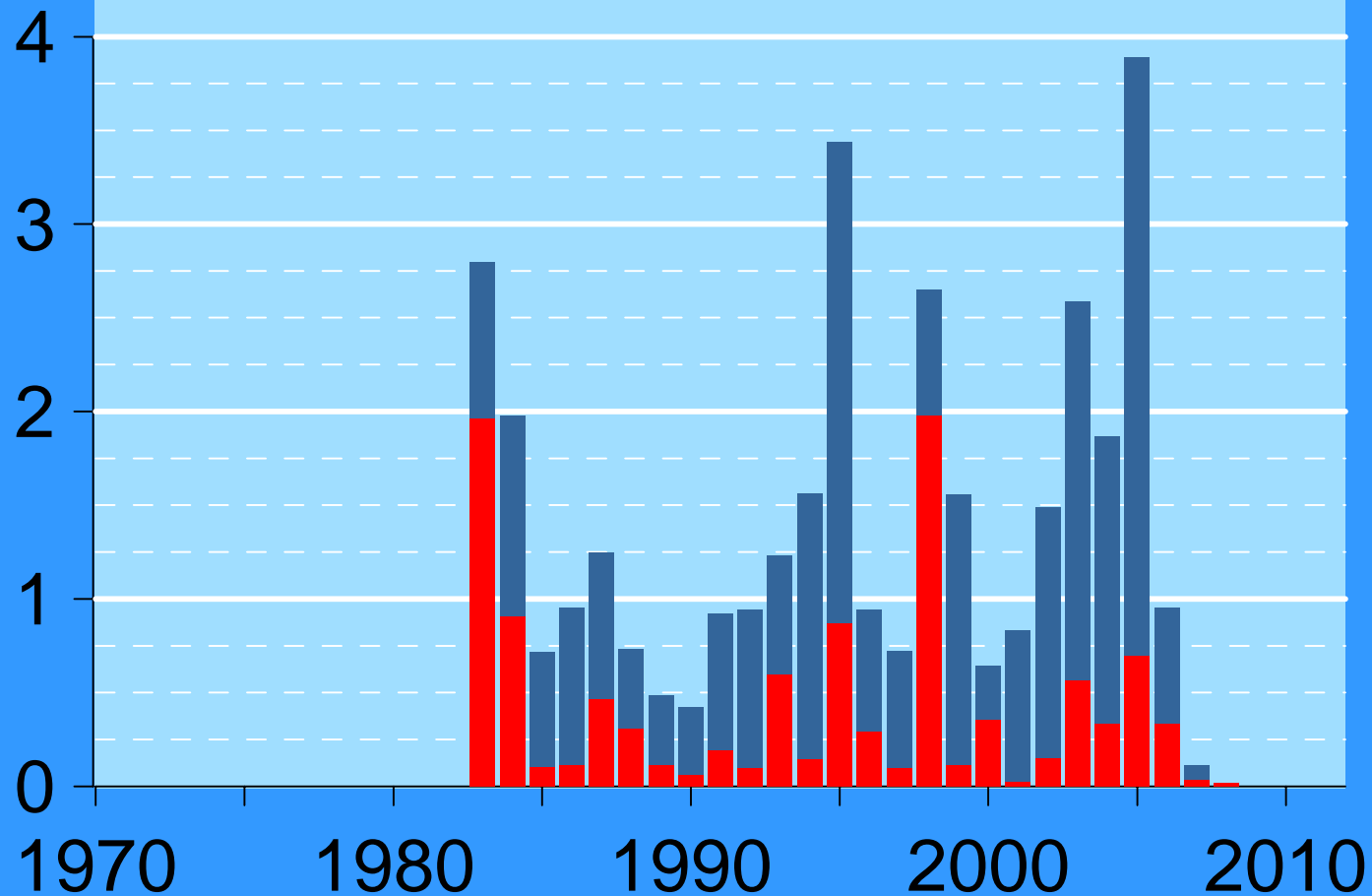


Annual Flow Volume

in millions of acre-feet

S79

year
in full
year
to date

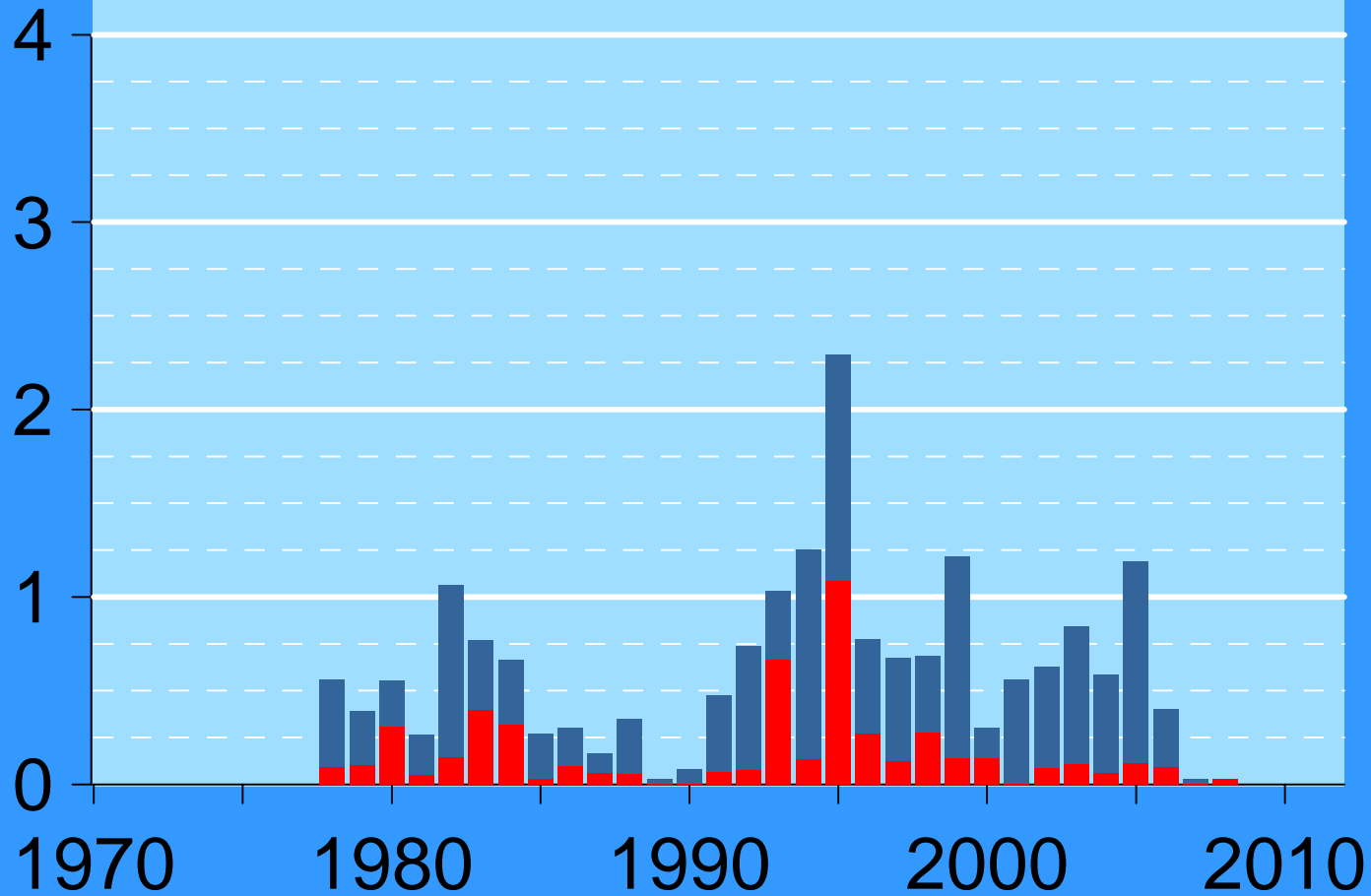


Annual Flow Volume

in millions of acre-feet

S12s

year
in full
year
to date



Use stadium model
as **hydrologic yardstick**
South Florida-wide

Or for comparison to
**National
League of
Watersheds**

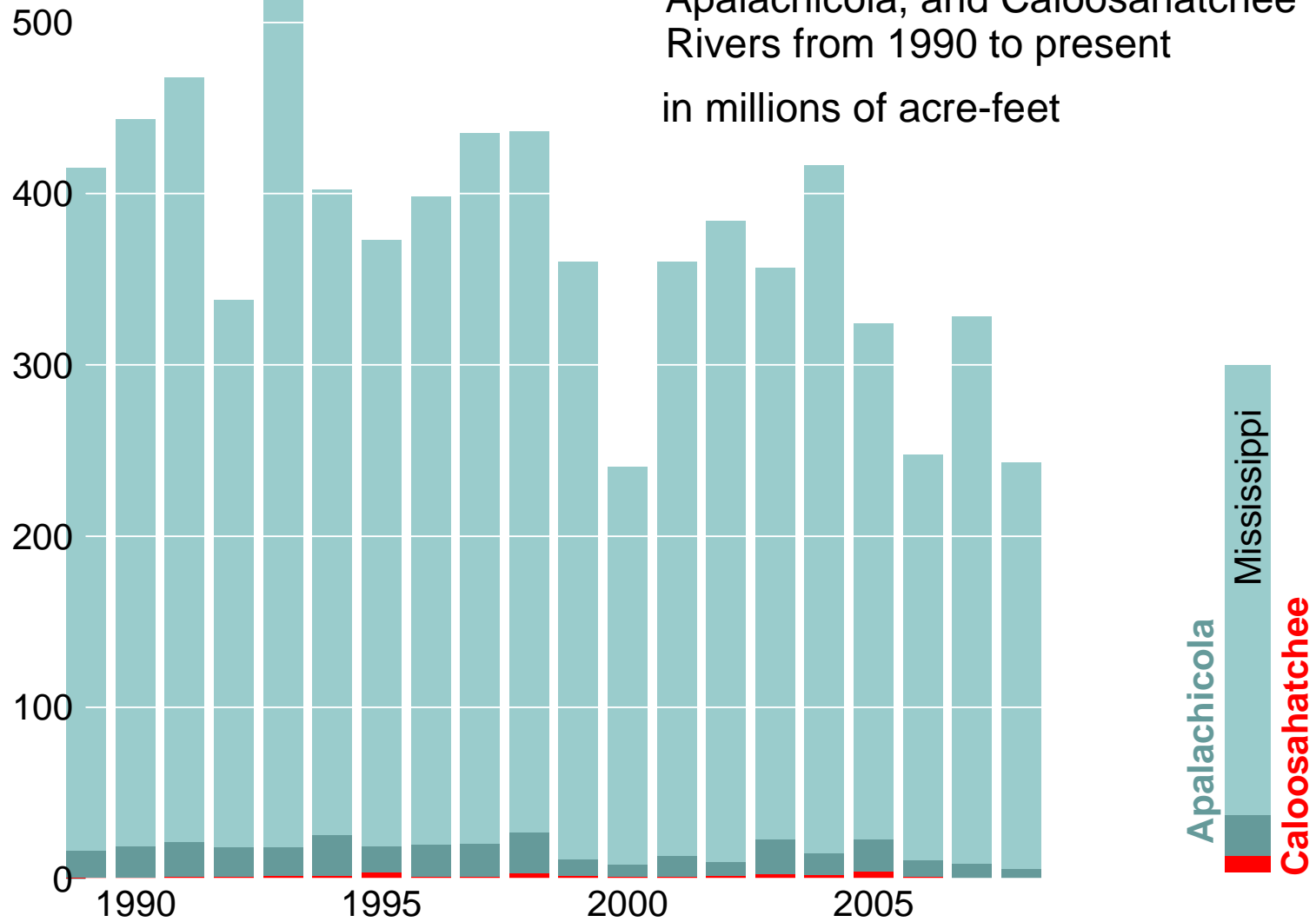




Into the Gulf

Annual flow volumes discharged into Gulf of Mexico from Mississippi, Apalachicola, and Caloosahatchee Rivers from 1990 to present

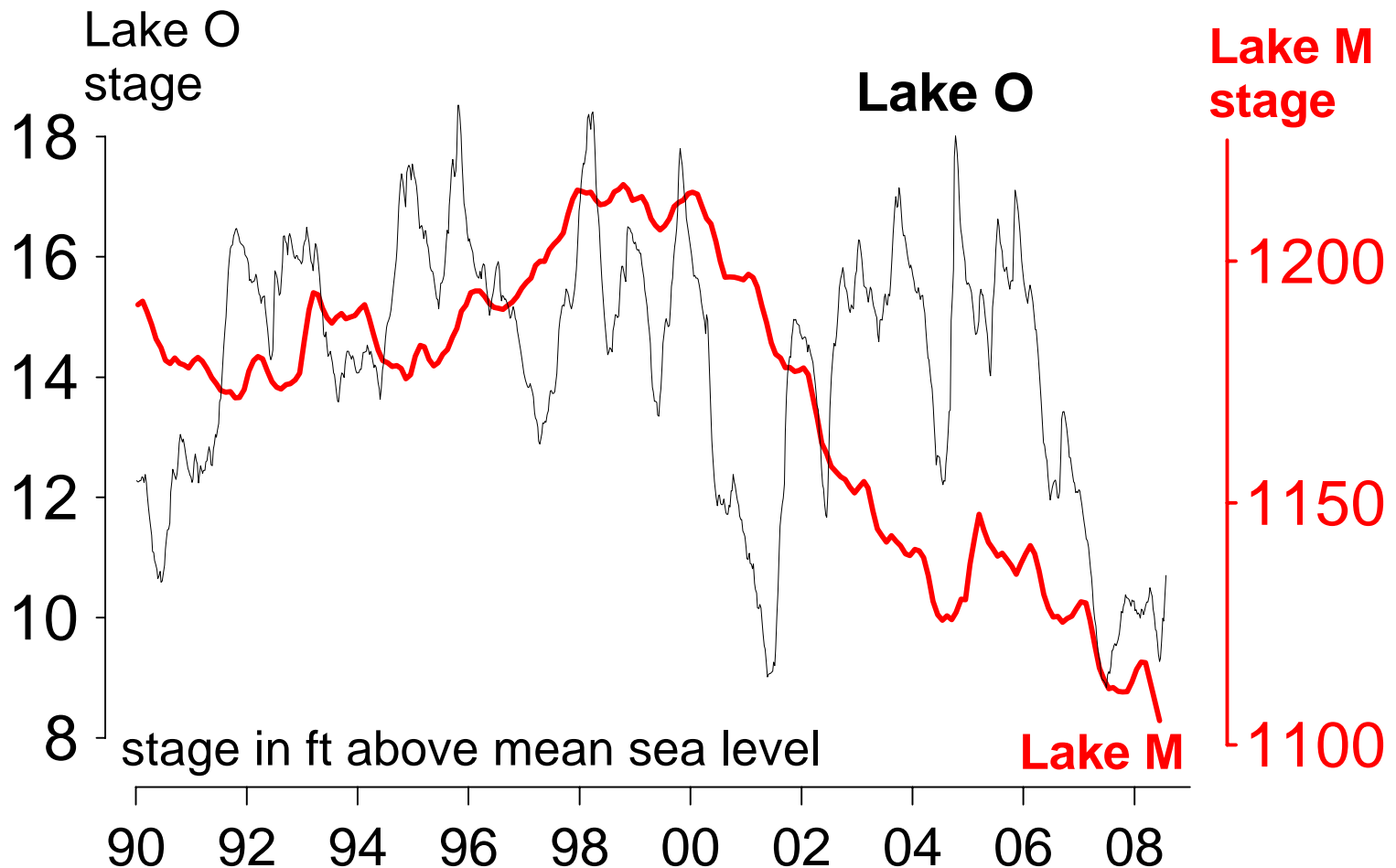
in millions of acre-feet



Hoover vs Hoover

Hoover Dam 9-yr drought at Lake Mead

Herbert Hoover Dike 2-yr drought at Lake O



Barber shop



ence. Using mark-resighting statistical models, we analyzed 19 years of photo data and detected significant annual variation in adult survival for a subpopulation of manatees in the northern Gulf of Mexico. That variation coincided with year classes of major hurricanes (Category 3 or greater on the Saffir-Simpson Hurricane Scale) and a major winter storm occurred in the northern Gulf of Mexico. Mean survival probability over 19 years with no or low intensity storms was 0.972 (approximate 95% confidence interval = 0.961–0.980) but dropped to 0.936 (0.884–0.971) in 1985 with Hurricanes Andrew and Juan; to 0.909 (0.837–0.951) in 1993 with the March “Storm of the Century”; to 0.817 (0.735–0.878) in 1995 with Hurricanes Opal, Erin, and Allison. These survival probability were not catastrophic in magnitude and were detected because of state-of-the-art statistical techniques and the quality of the data. Because of this small population range extensively along the north Gulf coast of Florida, it is possible to resolve storm effects on a regional scale rather than the site-specific common to studies of more sedentary species. This is the first empirical evidence of storm effects on manatee survival and suggests a cause-effect relationship. Decreases in survival could be due to direct mortality, indirect mortality, and/or semi-direct mortality in the region as a consequence of storms. Future impacts to the population by a single catastrophic hurricane, or series of smaller hurricanes, could increase the probability of population decline. With the advent in 1995 of a new 25- to 30-yr cycle of greater hurricanes and the longer term change possible with global climate change, it becomes all the more important to reduce mortality and injury from boats and other human causes and to reduce the loss of foraging habitat to coastal development.

words: climate change; Florida; Gulf of Mexico; hurricanes; manatees; marine mammal capture; photo-identification; seagrass; survival probabilities; *Trichechus manatus*.

INTRODUCTION

Populations can be shaped by periodic disturbance and intense storms, which can alter community, and ecosystem processes. Little is known about hurricane effects on terrestrial and forest ecosystem processes (Foster et al. 1997, Cooper-Ellis et al. 1997). Limited information is available on animal populations and the complex interactions of species in marine systems. Effects on animal populations can be direct or indirect consequences for how habitats and ecosystems function and recover (Michener et al. 1997). Populations, however, are differentially affected by storms. Individuals can be killed outright or suffer health and reproduction due to community changes. Some populations may be minimally affected and recover quickly, while others may be impacted substantially. Disturbance may affect population size, life-history strategies, and behaviors to cope with intense storms. Disturbance can affect resources, community dynamics, and resources or habitat critical to breeding and survival. Factors determining impact (Waide et al. 1997, Spiller et al. 1998).

Understanding how animal populations are affected by hurricanes generally has been limited by the lack of pre-hurricane data necessary to make meaningful comparisons. Controlled experiments to measure hurricane effects are often precluded for mobile species by their mobility (Tanner et al. 1991). This is the first empirical evidence for storm effects on survival for a large marine mammal population (*Trichechus manatus latirostris*). Mark-resighting statistical models now give

ivory tower



Flipping the switch

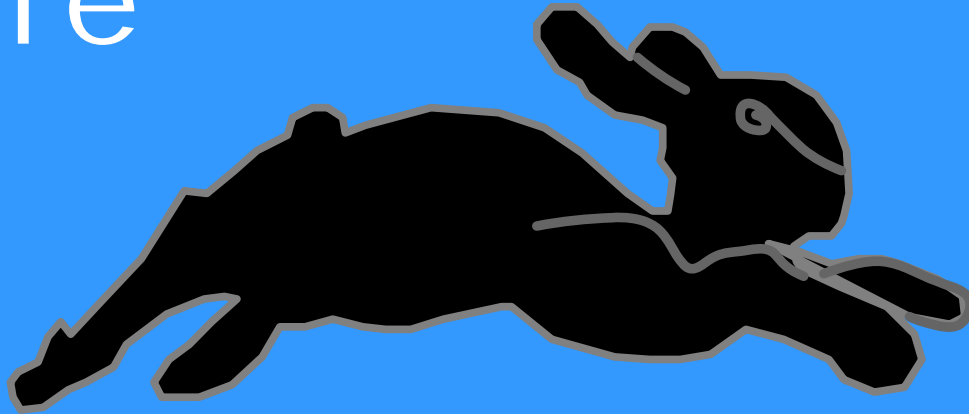


Soaking in season

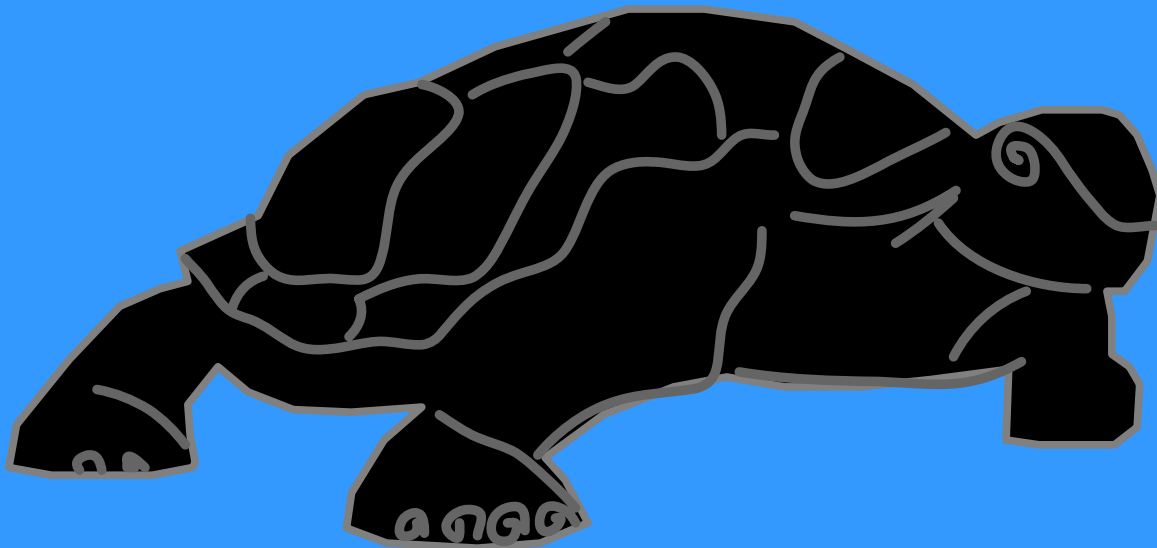


4 meteorological horsemen

Hare



rainfall



evaporation

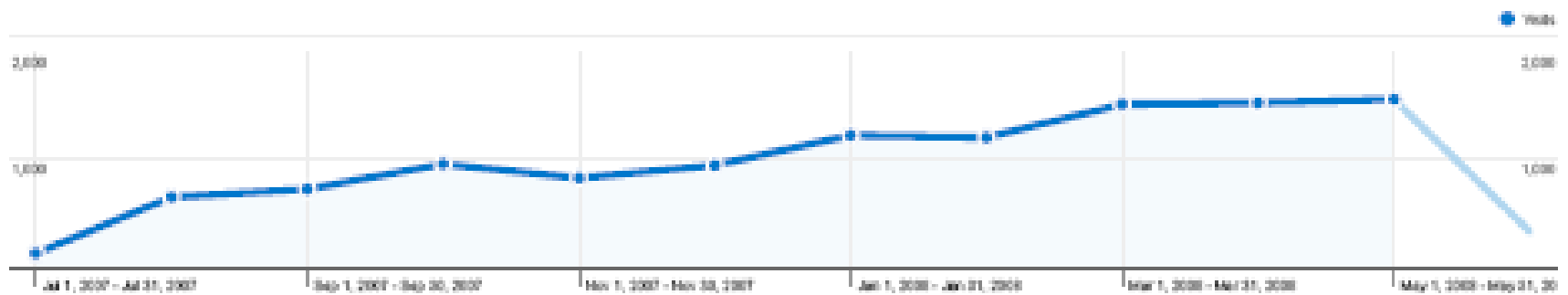
and the Tortoise

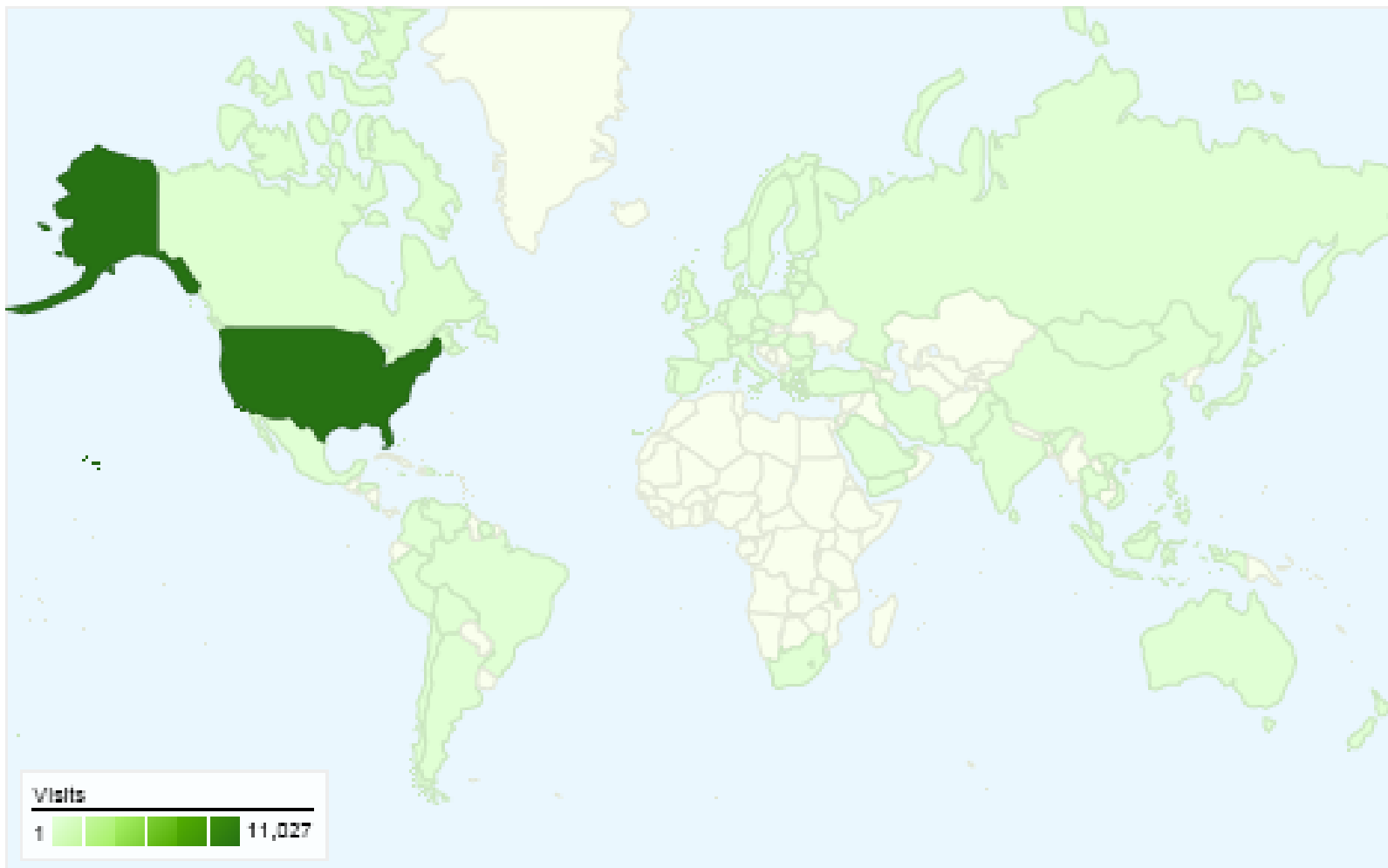


Web Trends

sfwj.blogspot.com
Dashboard

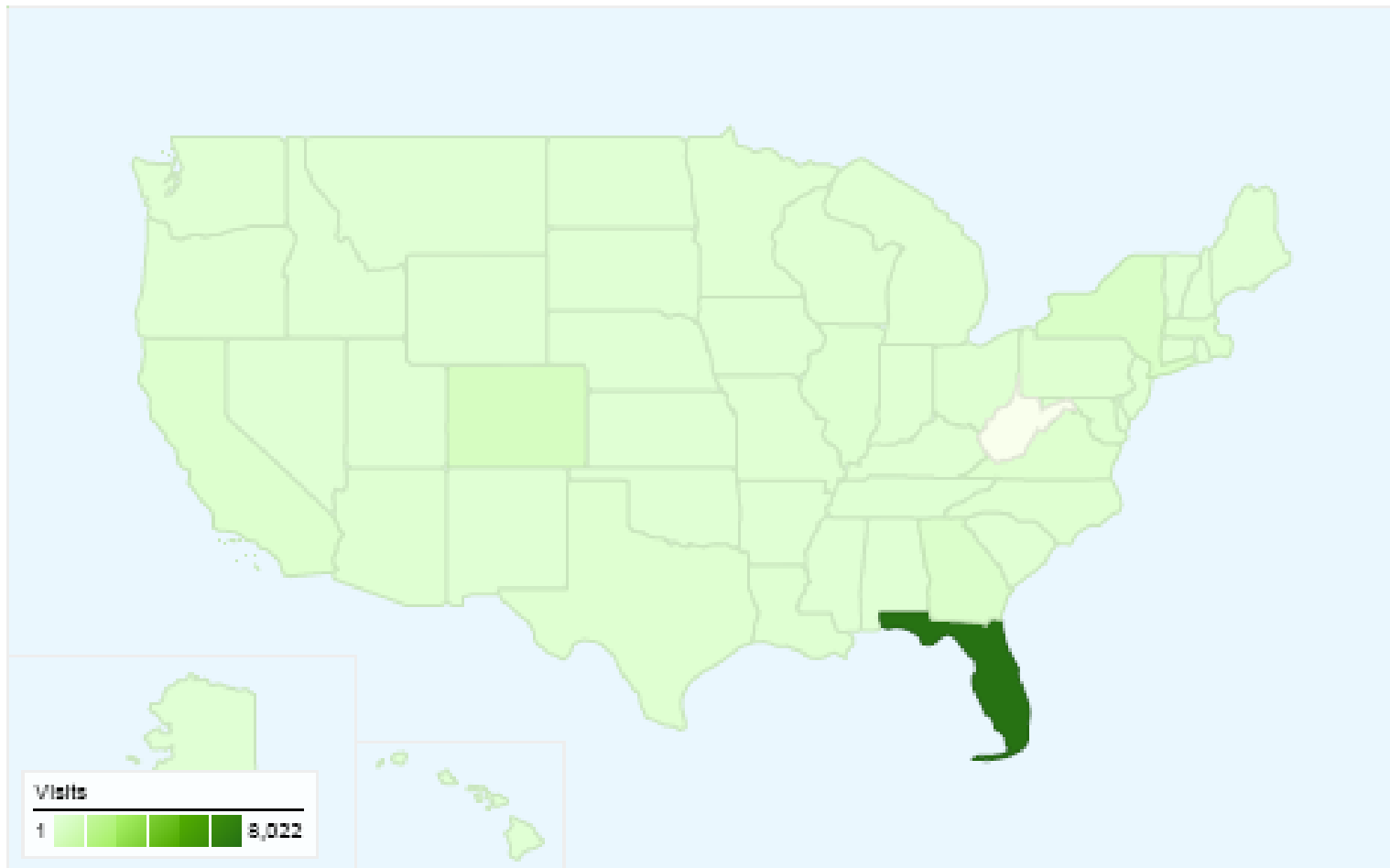
Jul 1, 2007 - Jun 5, 2008
Comparing to: Site





11,657 visits came from 75 countries/territories

Global

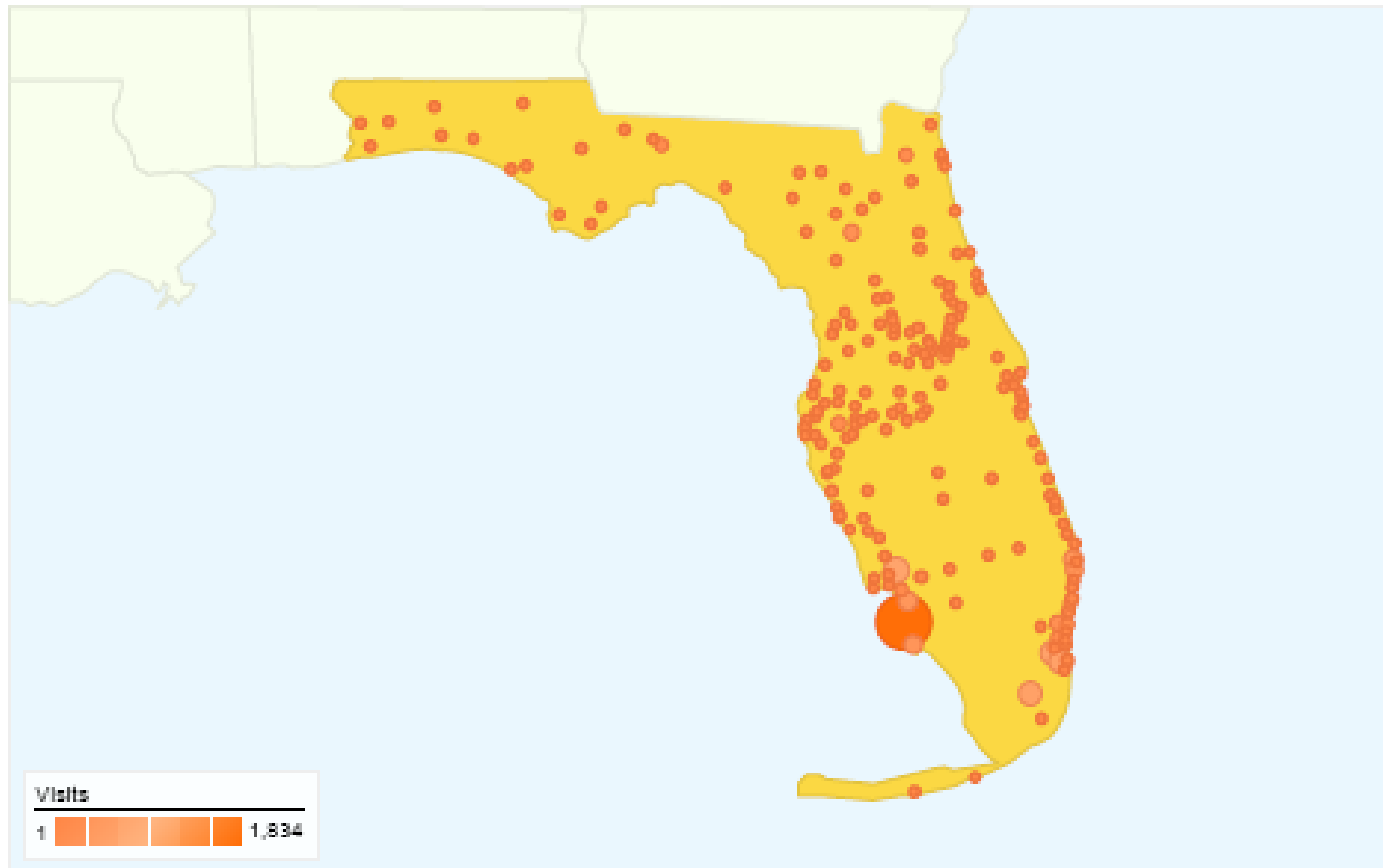


This country/territory sent 11,027 visits via 51 regions

National

Site Usage

Region	Visits	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate
Visits 11,027 % of Site Total: 94.60%	Pages/Visit 1.61 Site Avg: 1.59 (-1.20%)	Avg. Time on Site 00:01:48 Site Avg: 00:01:44 (4.23%)	% New Visits 48.04% Site Avg: 50.21% (-4.33%)	Bounce Rate 74.24% Site Avg: 74.77% (-0.71%)	
Florida	8,022	1.68	00:02:02	39.92%	72.21%
Colorado	471	1.35	00:01:12	37.58%	82.17%
New York	328	1.46	00:01:15	87.50%	75.61%
(not set)	239	1.53	00:02:06	47.70%	73.22%
Georgia	229	1.79	00:01:23	64.63%	75.98%
Massachusetts	166	1.56	00:03:19	63.86%	72.89%
California	143	1.14	00:00:39	95.80%	88.81%
Virginia	134	1.19	00:00:34	67.16%	85.07%
Maryland	113	1.88	00:00:56	36.28%	67.26%



Florida-wide

This state sent 8,022 visits via 191 cities

Site Usage

City	Visits	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate
Visits 8,022 % of Site Total: 68.82%	Pages/Visit 1.68 Site Avg: 1.59 (5.67%)	Avg. Time on Site 00:02:02 Site Avg: 00:01:44 (17.65%)	% New Visits 39.92% Site Avg: 59.21% (-20.50%)	Bounce Rate 72.21% Site Avg: 74.77% (-3.42%)	
Naples	1,834	2.08	00:03:29	10.80%	64.12%
Ft Myers	597	1.72	00:01:50	45.90%	70.02%
Hialeah	557	1.36	00:00:59	41.83%	81.69%
Miami	528	1.46	00:01:29	56.82%	76.52%
Homestead	522	1.42	00:01:02	19.73%	79.50%
Bonita Springs	328	1.83	00:02:19	25.00%	69.82%
West Palm Beach	316	1.79	00:02:30	45.25%	68.35%
(not set)	293	1.81	00:02:52	17.75%	65.53%
Marco Island	292	2.00	00:03:17	1.37%	67.47%
Lake Worth	242	1.52	00:02:01	54.55%	78.10%

Not quite 5 minutes

The South Florida Watershed Journal



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