# GEER 2019

GREATER EVERGLADES ECOSYSTEM RESTORATION

# IMPROVING SCIENCE COMMUNICATION WITH INFOGRAPHICS

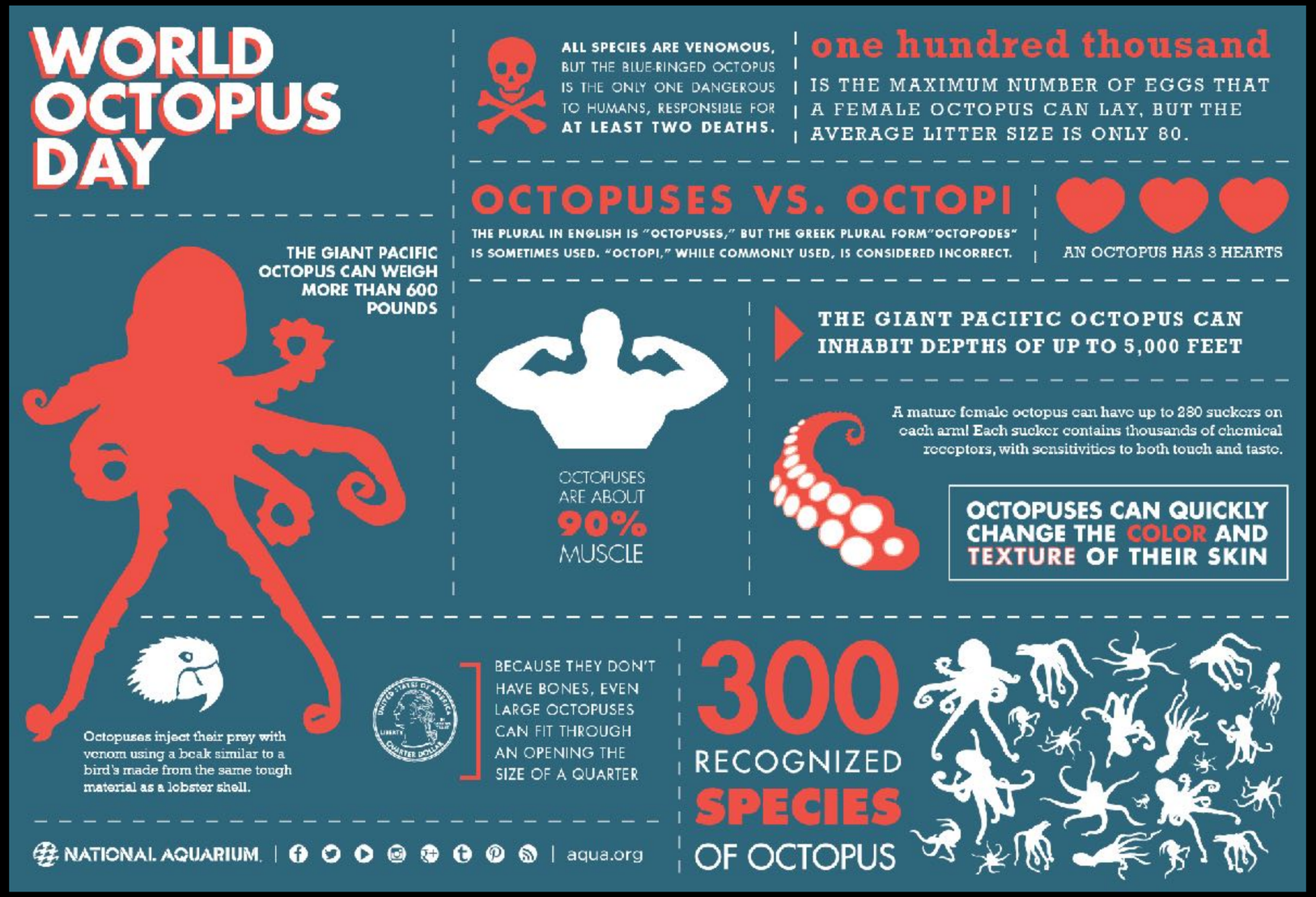
HIRAM HENRIQUEZ UNIVERSITY OF MIAMI

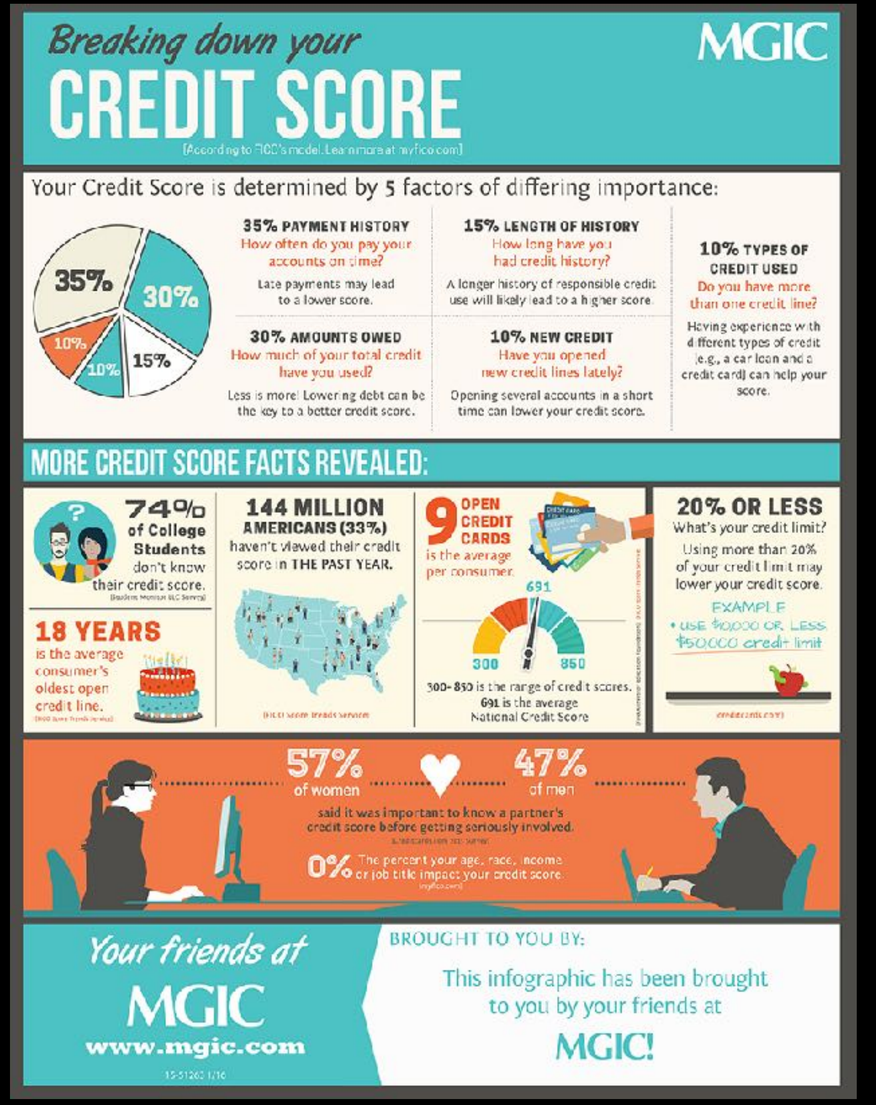
The key to any visual design is the presentation of a cohesive, structured, readable, and understandable composition.

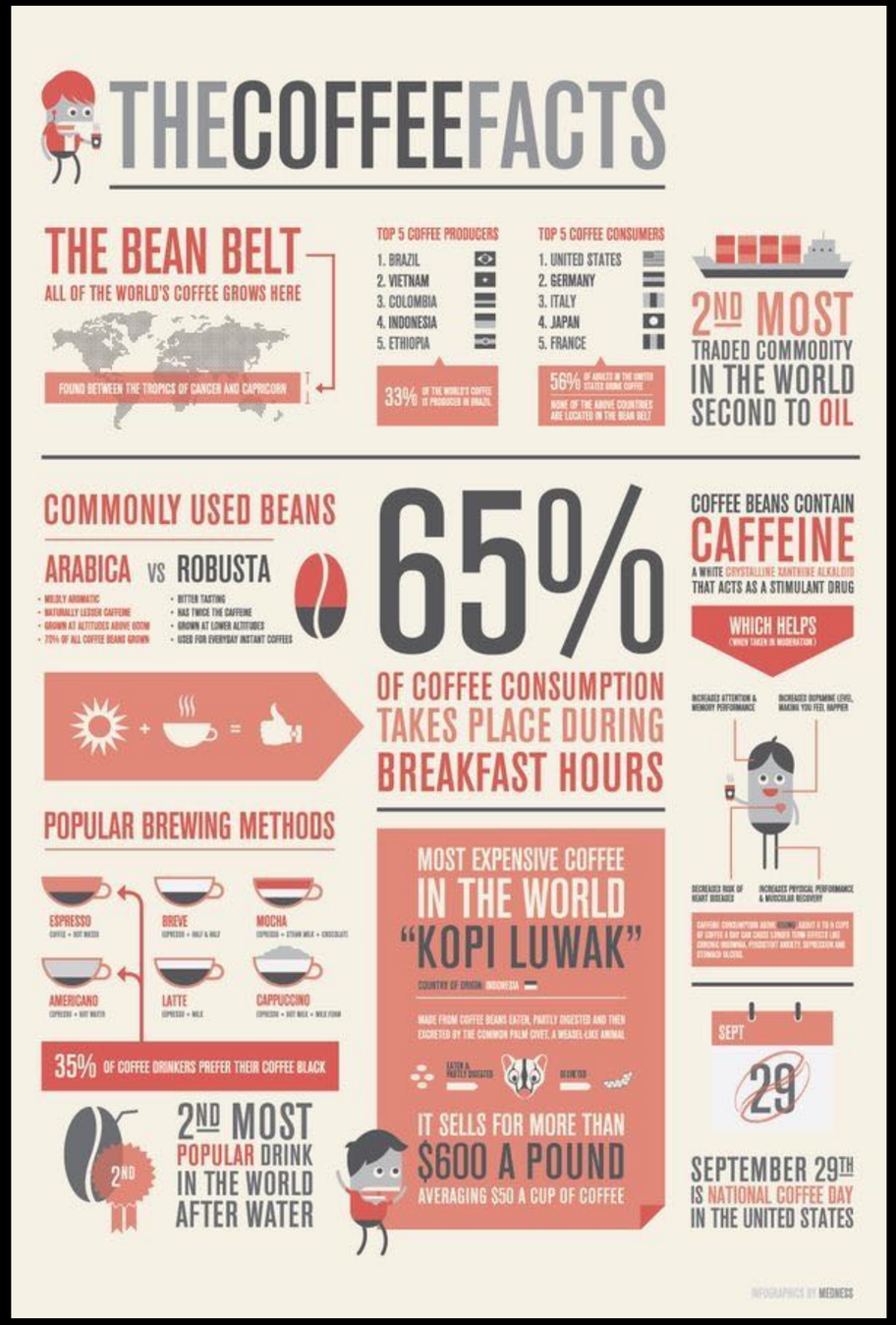
# GOOD VISUALIZATIONS…

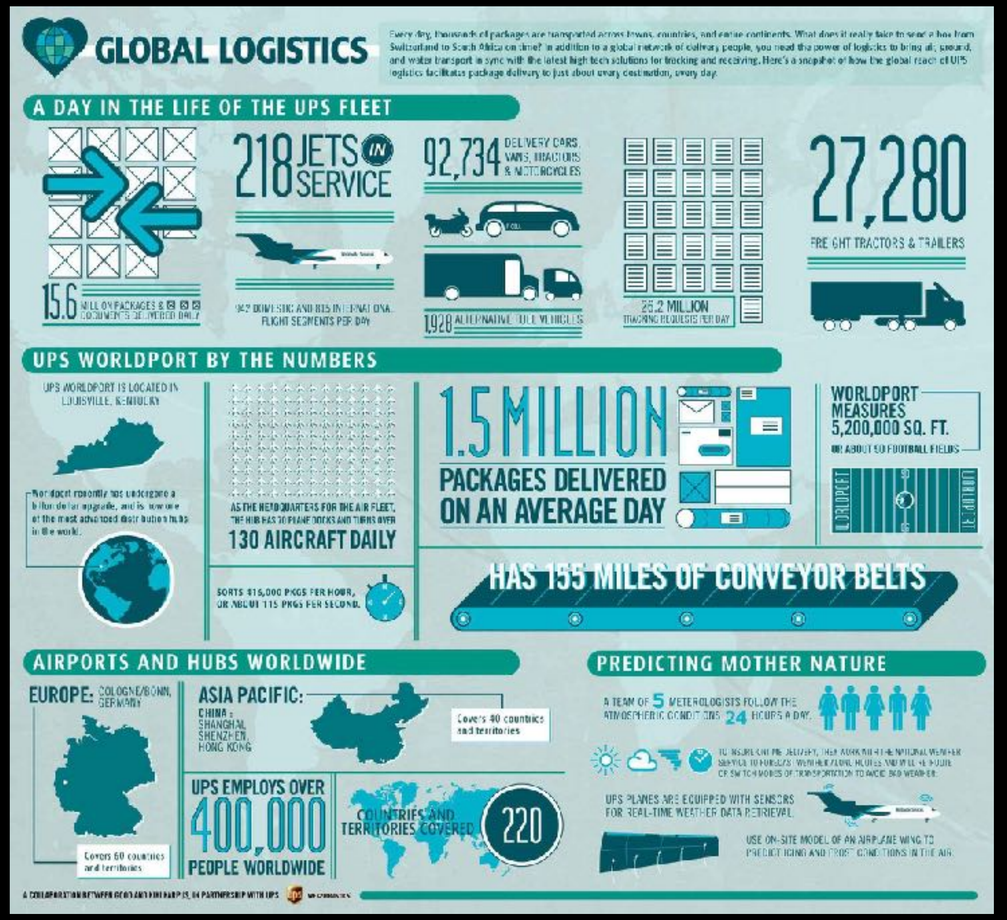
1. They show good information correctly
2. They attract readers' attention
3. They don't frustrate readers
4. They show the right amount of data

# THESE ARE NOT INFOGRAPHICS



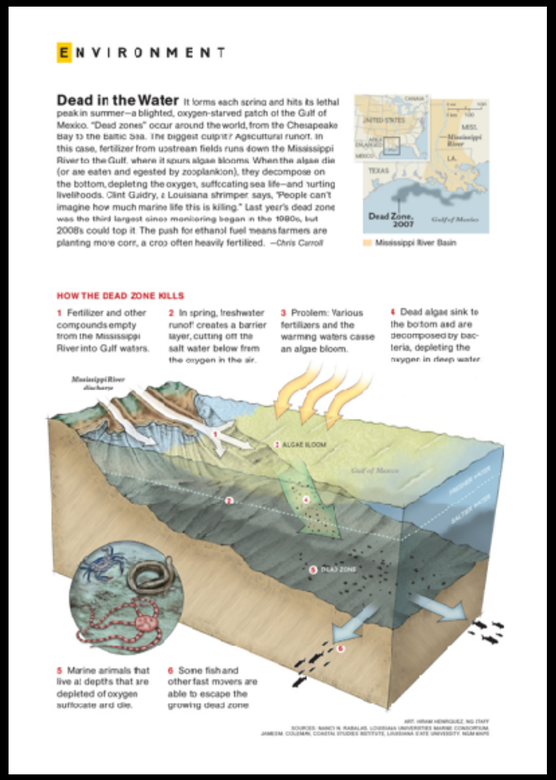






# THESE ARE DATA DUMPS

# THESE ARE INFOGRAPHICS



ENVIRONMENT

**Dead in the Water** It forms each spring and hits its lethal peak in summer—a blighted, oxygen-starved patch of the Gulf of Mexico. "Dead zones" occur around the world, from the Chesapeake Bay to the Baltic Sea. The biggest culprit? Agricultural runoff. In this case, fertilizer from upstream fields runs down the Mississippi River to the Gulf, where it spurs algae blooms. When the algae die (or are eaten and egested by zooplankton), they decompose on the bottom, depleting the oxygen, suffocating sea life—and hurting livelihoods. Clint Guidry, a Louisiana shrimper says, "People can't imagine how much marine life this is killing." Last year's dead zone was the third largest since monitoring began in the 1980s, but 2008's could top it. The push for ethanol fuel means farmers are planting more corn, a crop often heavily fertilized. —Chris Carroll

Dead Zone, 2007

Mississippi River Basin

HOW THE DEAD ZONE KILLS

1 Fertilizer and other compounds empty from the Mississippi River into Gulf waters.

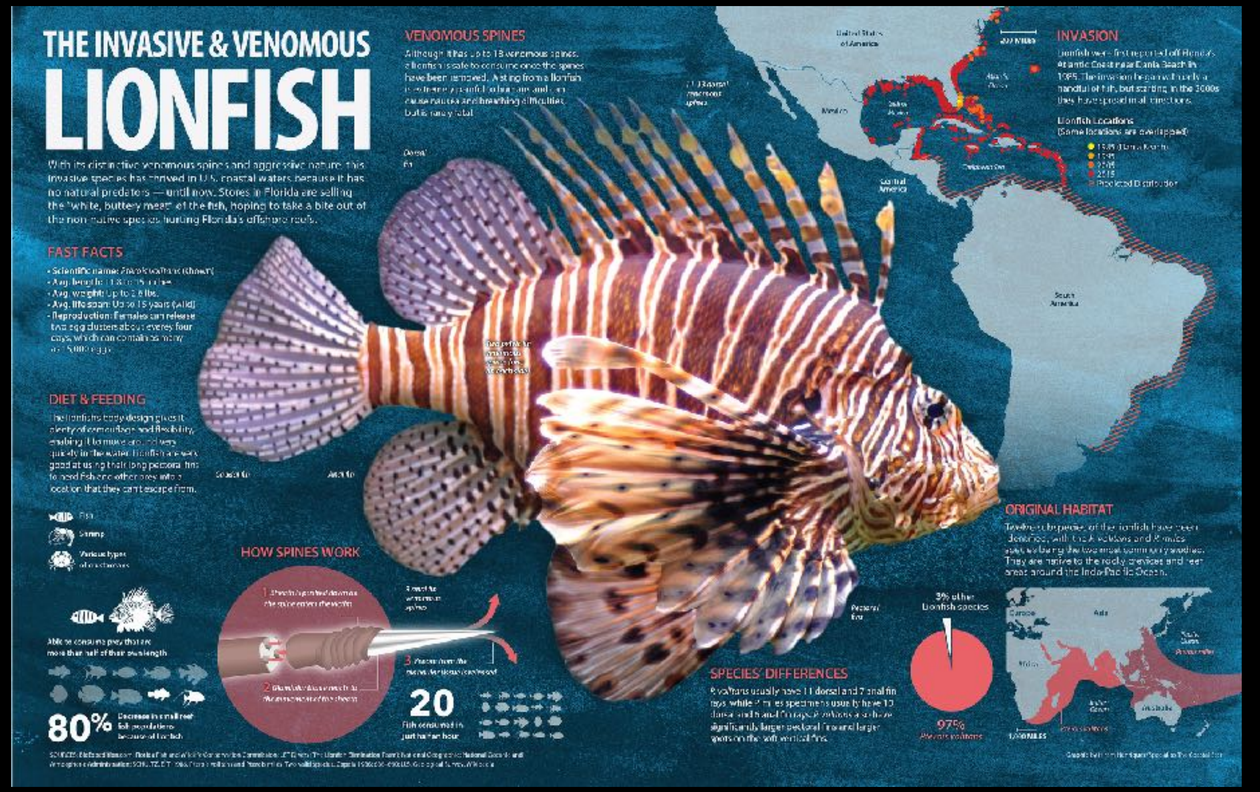
2 In spring, freshwater runoff creates a barrier layer, cutting off the salt water below from the oxygen in the air.

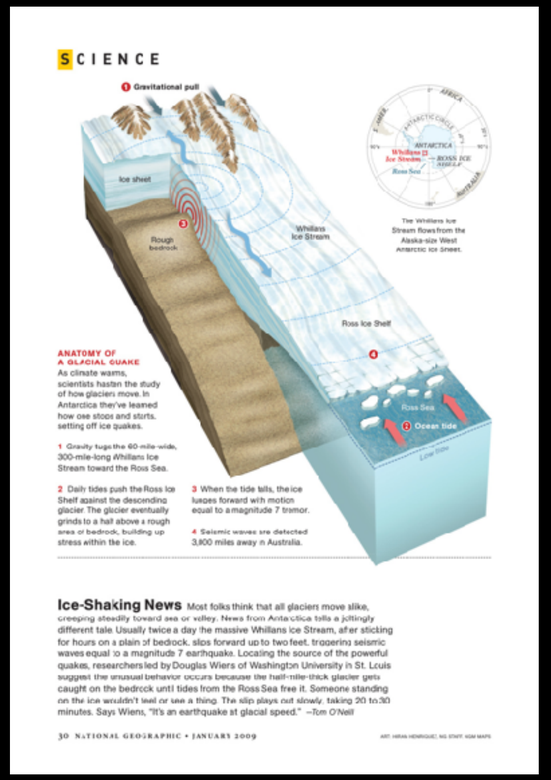
3 Problem: Various fertilizers and the warming waters cause an algae bloom.

4 Dead algae sink to the bottom and are decomposed by bacteria, depleting the oxygen in deep water.

5 Marine animals that live at depths that are depleted of oxygen suffocate and die.

6 Some fish and other fast movers are able to escape the growing dead zone.



SCIENCE

ANATOMY OF A GLACIAL QUAKE

As climate warms, scientists hasten the study of how glaciers move. In Antarctica they've learned how ice stops and starts, setting off ice quakes.

1 Gravity tugs the 60-mile-wide, 300-mile-long Whillans Ice Stream toward the Ross Sea.

2 Daily tides push the Ross Ice Shelf against the descending glacier. The glacier eventually grinds to a halt above a rough area of bedrock, building up stress within the ice.

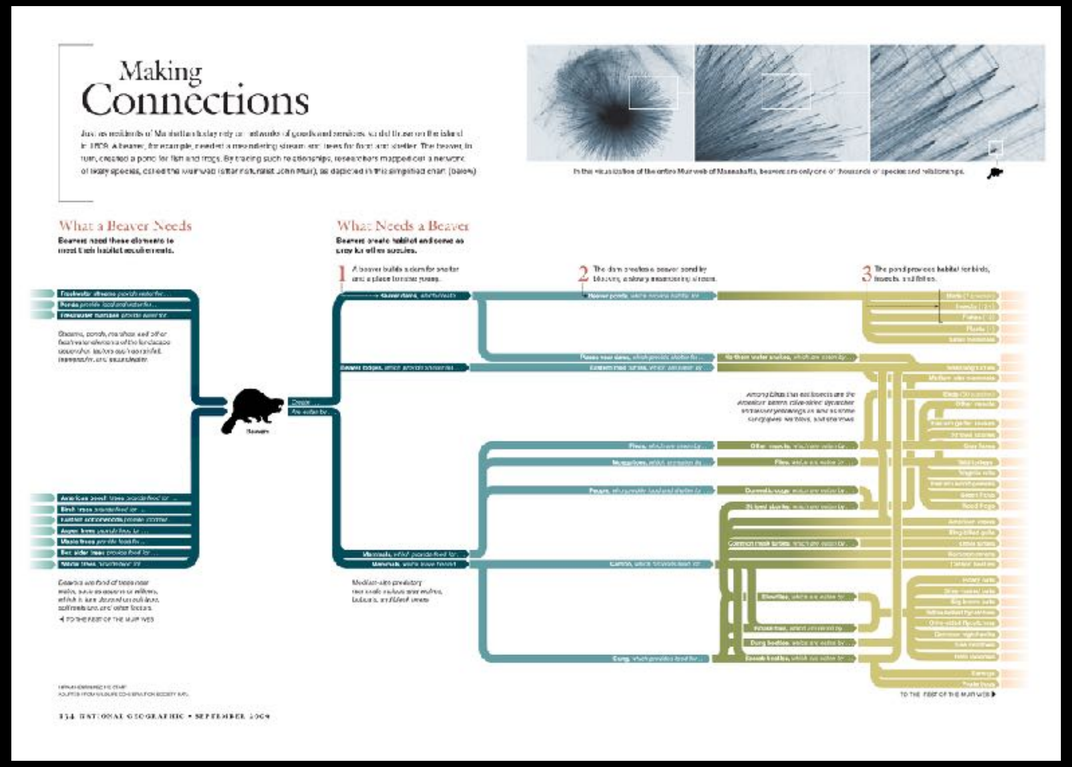
3 When the tide tills, the ice lurches forward with motion equal to a magnitude 7 tremor.

4 Seismic waves are detected 3,900 miles away in Australia.

**Ice-Shaking News** Most folks think that all glaciers move alike, creeping steadily toward sea or valley. News from Antarctica tells a jollingly different tale. Usually twice a day the massive Whillans Ice Stream, after sticking for hours on a plain of bedrock, slips forward up to two feet, triggering seismic waves equal to a magnitude 7 earthquake. Locating the source of the powerful quakes, researchers led by Douglas Wiens of Washington University in St. Louis suggest the unusual behavior occurs because the half-mile-thick glacier gets caught on the bedrock until tides from the Ross Sea free it. Someone standing on the ice wouldn't feel or see a thing. The slip plays out slowly, taking 20 to 30 minutes. Says Wiens, "It's an earthquake at glacial speed." —Tom O'Neil

30 NATIONAL GEOGRAPHIC • JANUARY 2009

# THESE ARE DATA VISUALIZATIONS

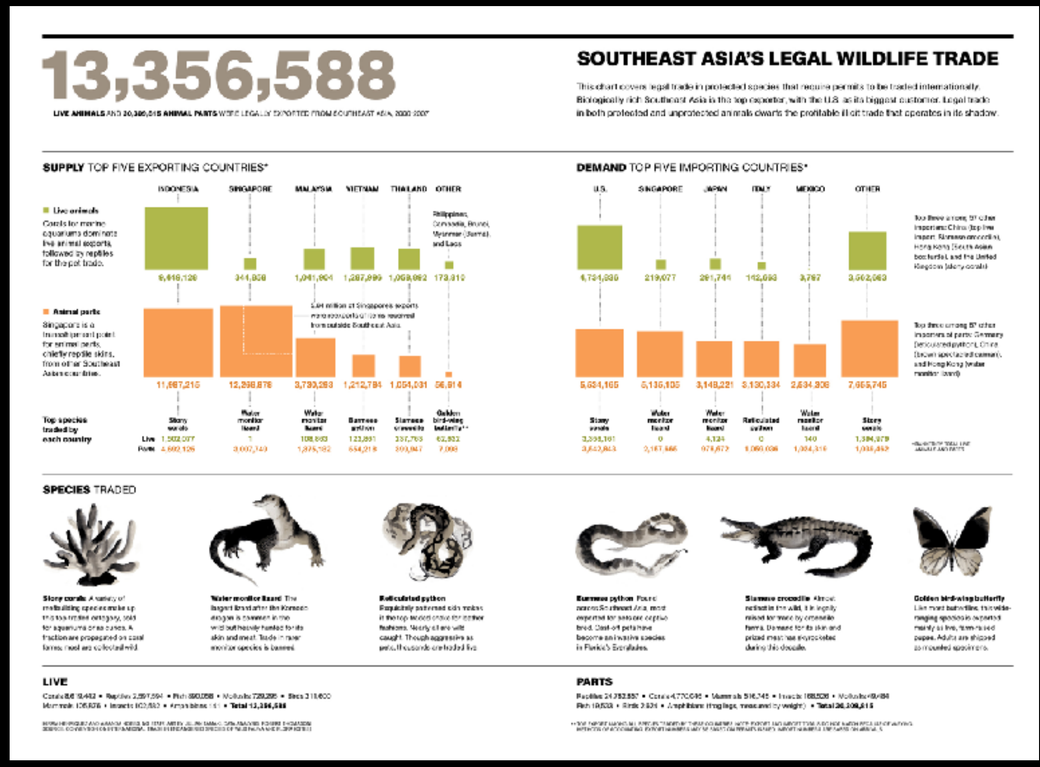


Making
Connections

What a Beaver Needs

What Needs a Beaver





13,356,588

SOUTHEAST ASIA'S LEGAL WILDLIFE TRADE

SUPPLY TOP FIVE EXPORTING COUNTRIES*

DEMAND TOP FIVE IMPORTING COUNTRIES*

SPECIES TRADED

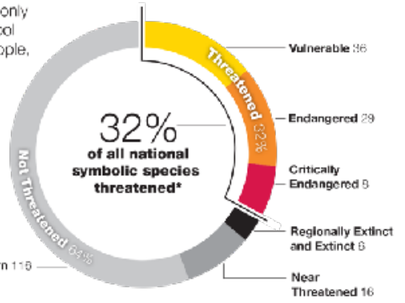
LIVE

PARTS

HIRAM HENRIQUEZ UNIVERSITY OF MIAMI

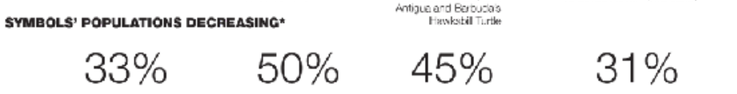
# NATIONAL SYMBOLS ENDANGERED

A person's national identity can be linked to not only the state or nation they belong to, but to a symbol which represents and embodies the nation's people, values, goals, or history. The national animal or plant is a symbol of this identity, selected for holding cultural, historical, economic, and/or religious significance. However, the planet's animal national symbols may be under threat of extinction due to human population growth.

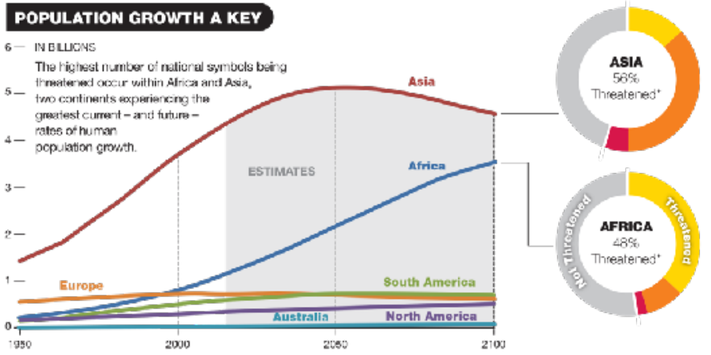



## SYMBOLS PER REGION

There are 231 IUCN listed National Symbols among the 146 countries assessed. Sixty countries, such as Angola, Bermuda, Canada, Greenland, Mexico, and Puerto Rico, have multiple symbols.

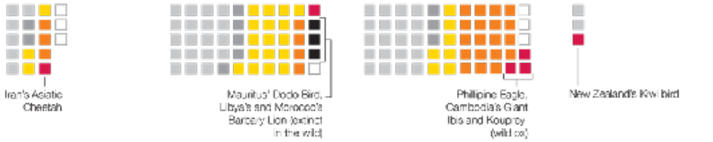




## POPULATION GROWTH A KEY





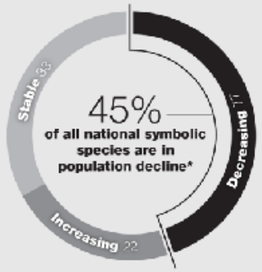






## SYMBOLS IN DECLINE

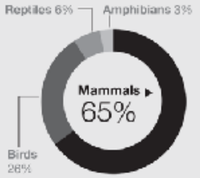
The data shows that the proverbial "wheels" linking humanity and nature in its purest form (i.e. national symbols) are "falling off," evidenced by almost half of the modern world's most celebrated animals are threatened with extinction, and almost three quarters of all threatened symbols show population declines.




### EXPERIENCING POPULATION DECLINES


### TYPES OF ANIMALS

Threatened national symbols differed significantly by animal type, with the highest being mammals. These include highly charismatic megafauna such as the big cats and elephants.




### PRIMARY THREATS

Habitat loss due to human population growth is the largest threat, with exploitation and human conflict (overlap between resources, habitats, and nutritional needs of society and wild populations) are almost equal.


### NATIONAL PROTECTION

Less than a fifth of all symbols have some form of national protective status within the associated nation.


*Percentages rounded; excludes extinct species, species not evaluated and insufficient data not counted

IUCN=International Union for Conservation of Nature
SOURCES: The Energy Collective, CIA World Factbook

GRAPHIC BY HIRAM HENRIQUEZ

TANNEHILL'S CHANCE TO MAKE AMENDS

DOLPHINS AT TEXANS TONIGHT, 1D

BAHAMAS REPATRIATES 24 CUBAN MIGRANTS

AMERICAS, 5A

Miami Herald

SATURDAY, AUGUST 17, 2013 | $1.00 | FINAL EDITION | MIAMIHERALD.COM

On the brink of disaster

VULNERABLE: Steel wall holds back water from Lake Okeechobee as the Army Corps of Engineers works on the 80-year-old Herbert Hoover Dike. The dike remains on a national shortlist of unsafe Class 1 dams.

A project to shore up the levee around Lake Okeechobee has made progress — but not enough to avert catastrophe

BY CURTIS MORGAN

CANAL POINT — For two decades, reports from government engineers and outside experts have reached largely the same conclusion about the Herbert Hoover Dike. The levee ringing Lake Okeechobee is a disaster waiting only for high water to happen.

Even after the U.S. Army Corps of Engineers completed a $320 million-plus overhaul to shore up its most vulnerable stretch this year, the dike remains on a national shortlist of unsafe Class 1 dams. It's a category defined as either "almost certain to fail under normal operations" or at extreme risk of failure with high fatalities and economic losses.

The Corps "is less defensive rate" for dams is once every 10,000 years. One 2011 risk assessment estimated the dike's probable failure rate at every 14 years.

"Right now, Herbert Hoover is one of a handful of our

*TURN TO OKEECHOBEE, 16A

Lake O flood zones

A breach in the 143-mile-long Herbert Hoover Dike could flood vast swaths surrounding Lake Okeechobee. A 2011 study commissioned by the U.S. Army Corps of Engineers analyzed the impact of failures along sections of the levee, called reaches. The Corps cautions that the computer-based simulation, based on an unlikely 25-foot water level in the lake, shows only general areas that could flood. Depths would vary and not every area would be impacted at one time.



Source: U.S. Army Corps of Engineers

PAMELA R. / MIAMI HERALD STAFF

STEROIDS SCANDAL

Grand jury digs into MLB 'secrets'

■ The MLB scandal intensified as a grand jury took possession of records showing ballplayers' — and others' — steroid use.

BY JULIE K. BROWN

If Major League Baseball's "dirty doctor" suspended ballplayers thought their steroid problems were behind them, they were wrong.

On Friday, the whistleblower whose records linked New York Yankees slugger Alex Rodriguez and 12 other ballplayers to a South Florida doping clinic was summoned before a federal grand jury, two sources close to the case told the Miami Herald.

Porter Fischer, the clinic's former marketing director, was ordered to turn over the records that shook Major League Baseball to its foundation and may lead to criminal drug charges against the clinic's owner, Anthony Bosch, his partners, his suppliers and, depending on their involvement, even his clients.

"It's going to make a lot of people start sweating now," said Miami lawyer David Weinstein, former chief of narcotics for the U.S. Attorney's Office in Miami.

"This was pretty much the players' dirty little secret. Now someone else is looking at their dirty little secret."

Among Bosch's alleged clients: more than 100 athletes, as well as police officers, lawyers, judges and high school students.

Federal investigators are zeroing in on the clinic's entire distribution network, including looking into

*TURN TO MLB, 2A

ECONOMY

Beacon Council ends guessing game, picks outsider as new chief

■ Miami-Dade's economic-development group opted against a local insider, instead hiring North Carolina native Larry Williams from the Atlanta Chamber of Commerce.

BY DOUGLAS HANKS

The Beacon Council topped its new president and CEO a veteran of the economic-development front who currently runs the technology arm of the

# MIAMI HERALD

## AUG. 17, 2013

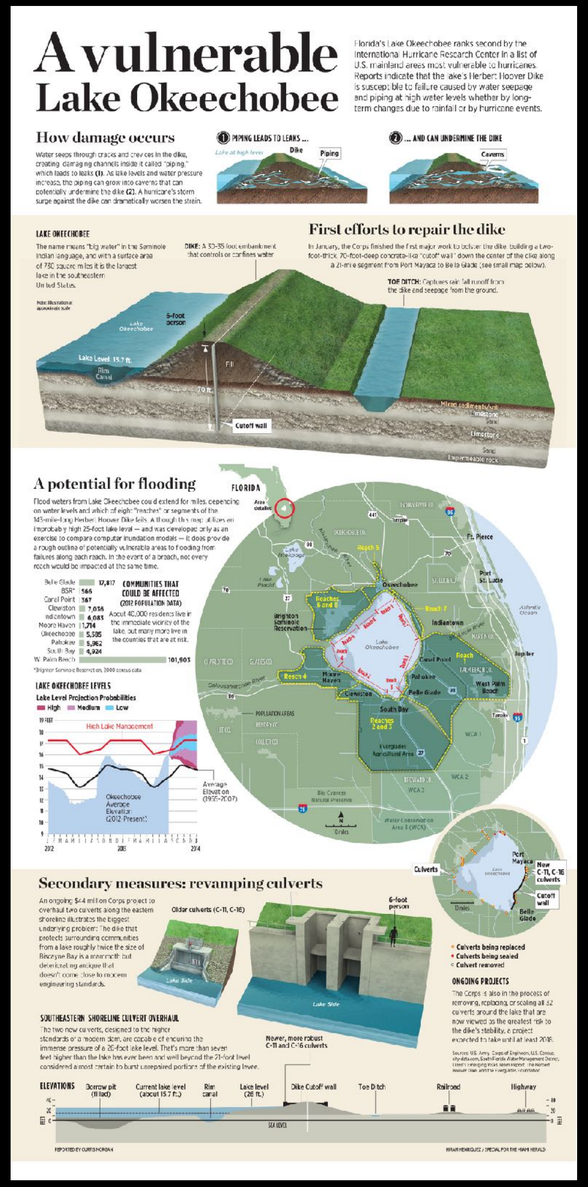
ORIGINAL STORY ONLINE HITS

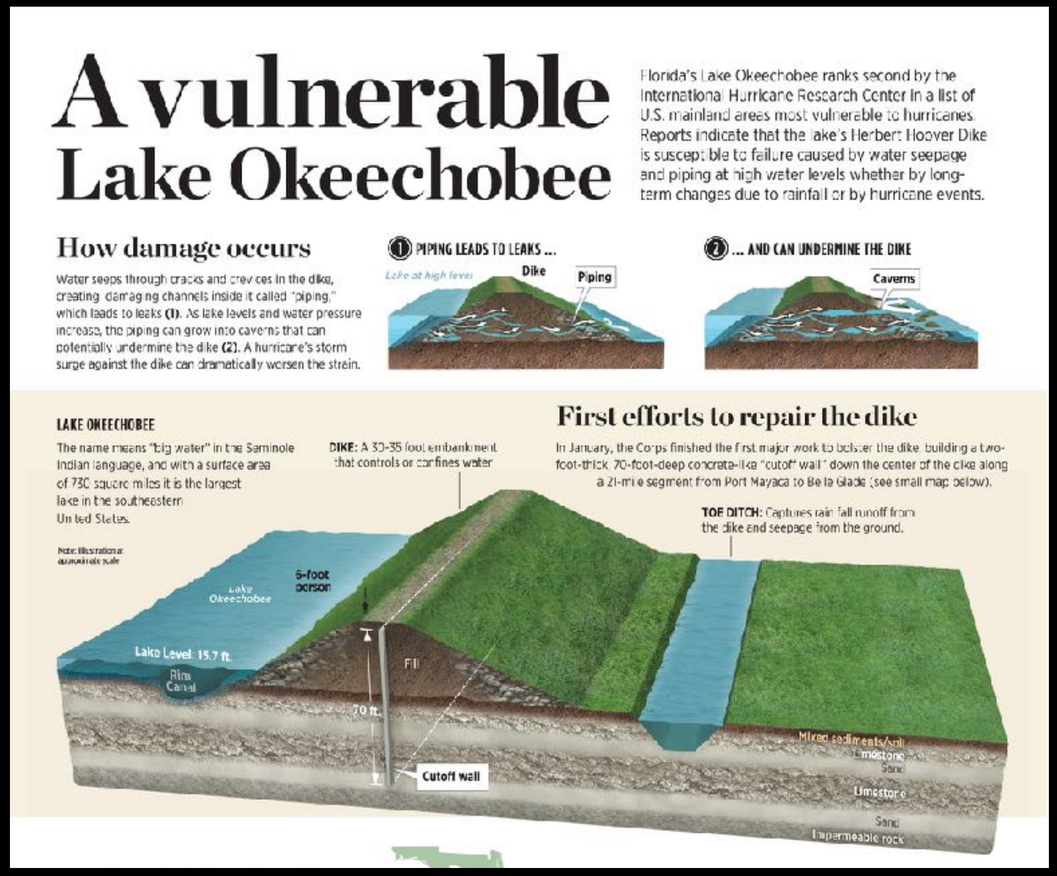
From August 16 to September 19, 2013

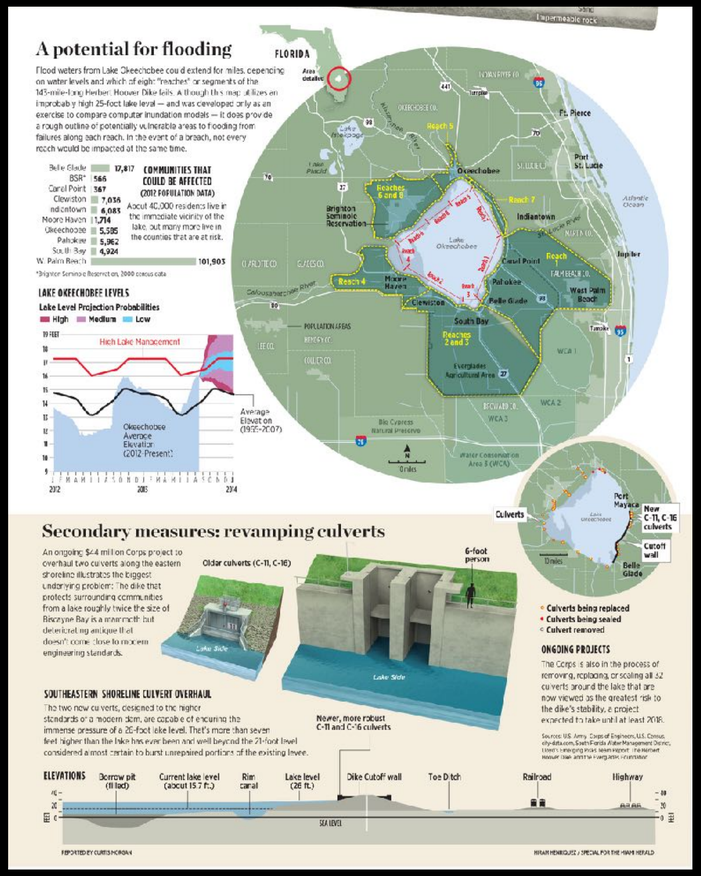
# 7,058 people

viewed the original story online (without a graphic).

# PRINT GRAPHIC | SEPT. 20, 2013




http://news-viz.com/lake-o-flood.html

# MIAMI HERALD

## SEPT. 20, 2013

### INTERACTIVE ONLINE HITS

From September 20 to October 31

# 13,670 people

viewed the graphic at the story level
(52 people viewed the standalone PDF)

Visualization can have
multiple purposes and
use different styles


http://news-viz.com/phosphorus/index.html

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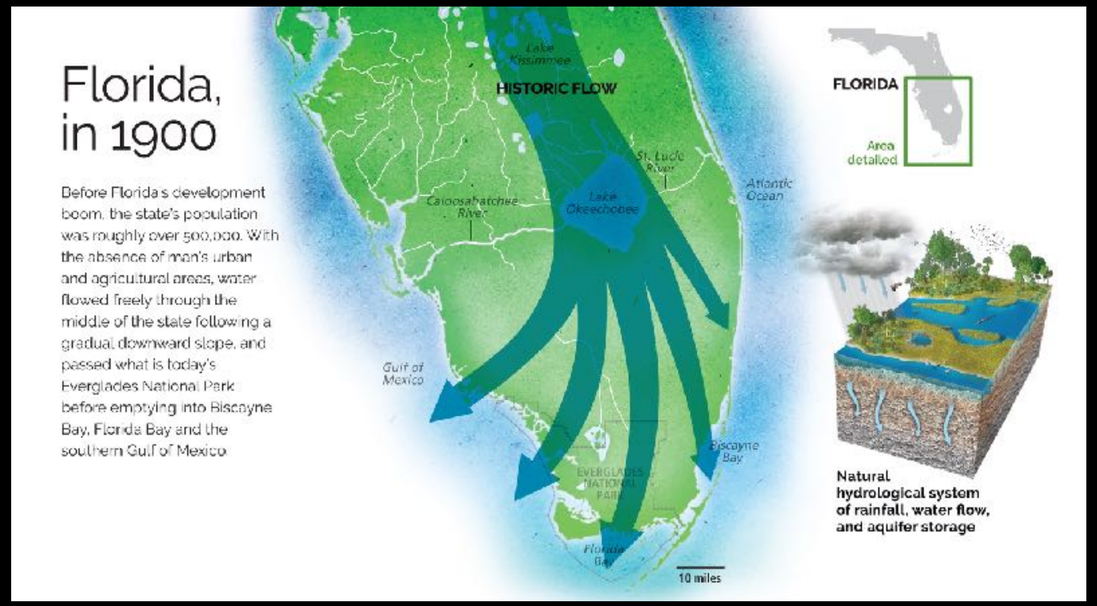
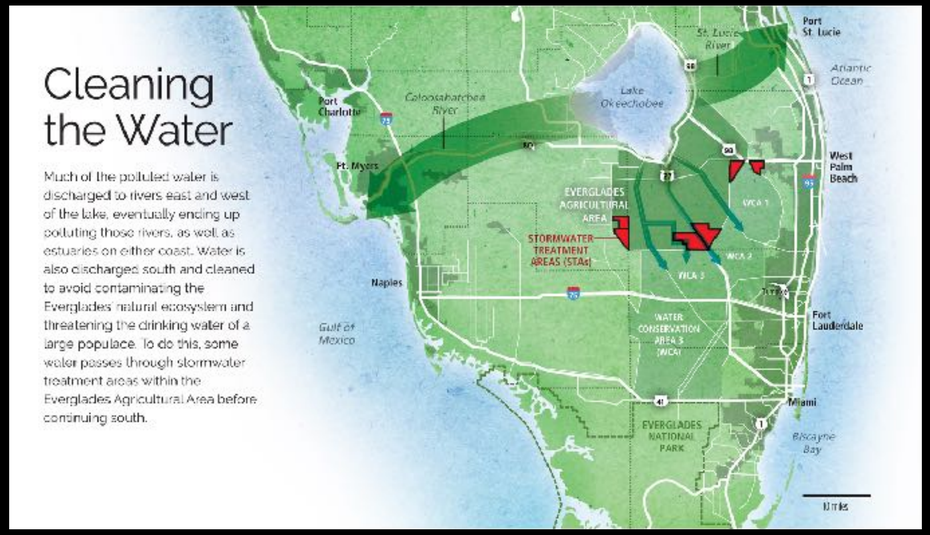
# MAPS





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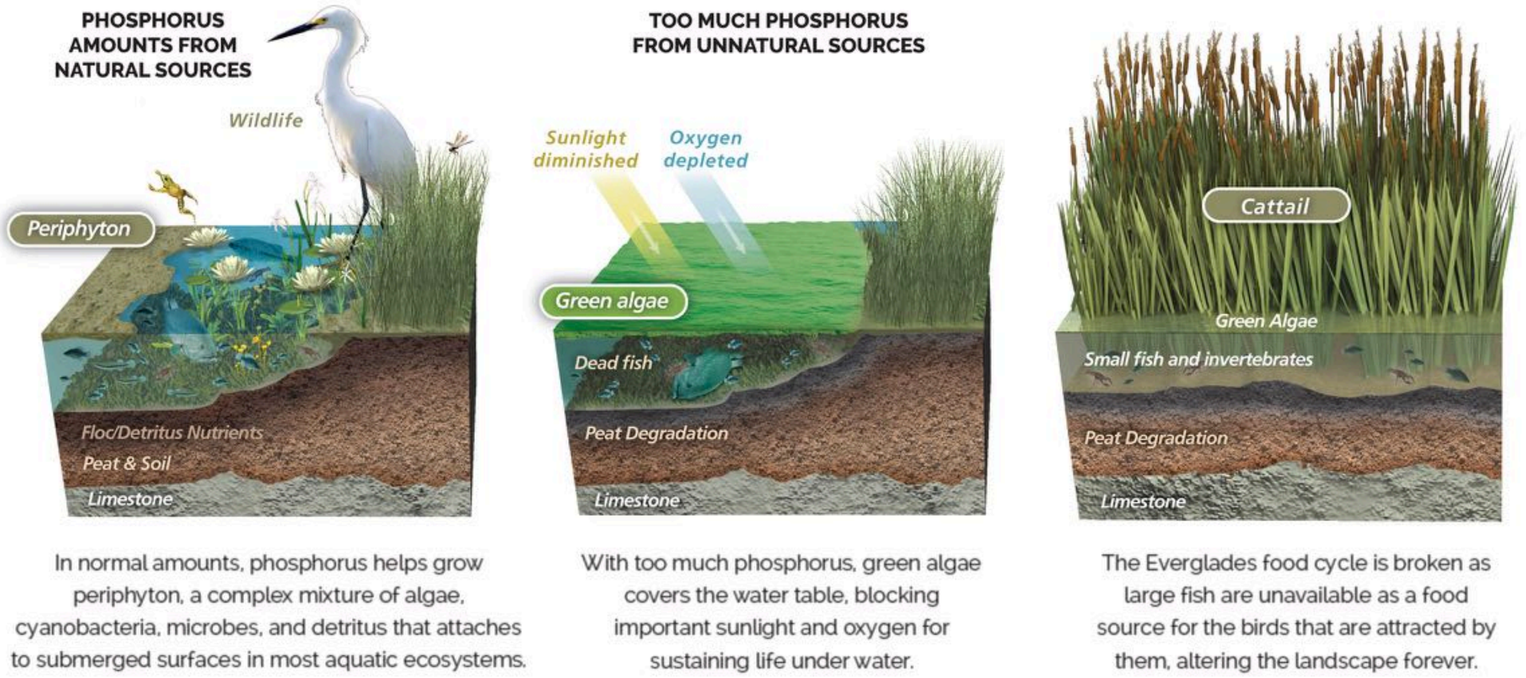
# Affecting Water Quality




In normal amounts, phosphorus helps grow periphyton, a complex mixture of algae, cyanobacteria, microbes, and detritus that attaches to submerged surfaces in most aquatic ecosystems.

With too much phosphorus, green algae covers the water table, blocking important sunlight and oxygen for sustaining life under water.

The Everglades food cycle is broken as large fish are unavailable as a food source for the birds that are attracted by them, altering the landscape forever.

# 3D ILLUSTRATIONS

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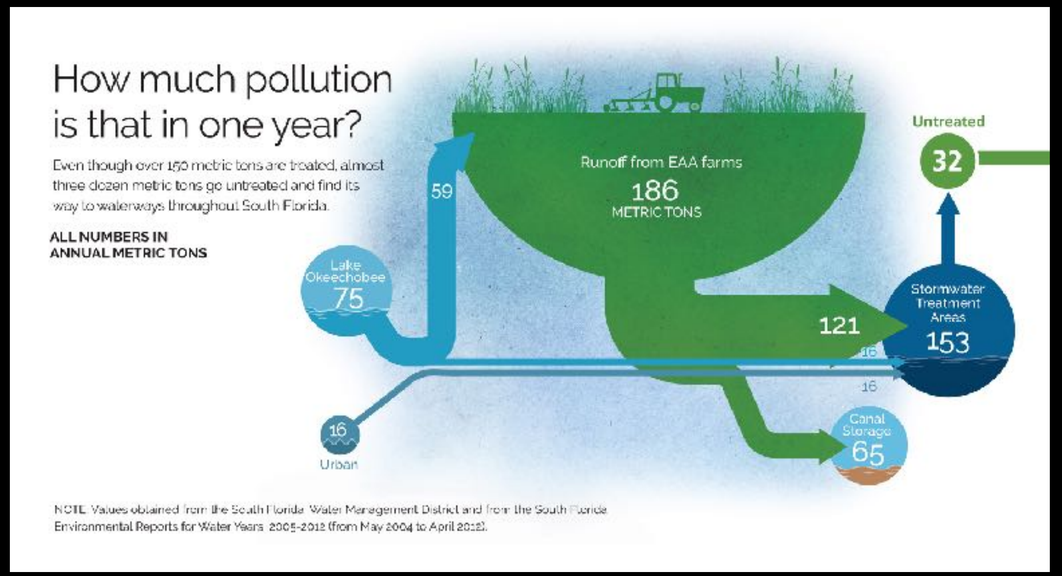
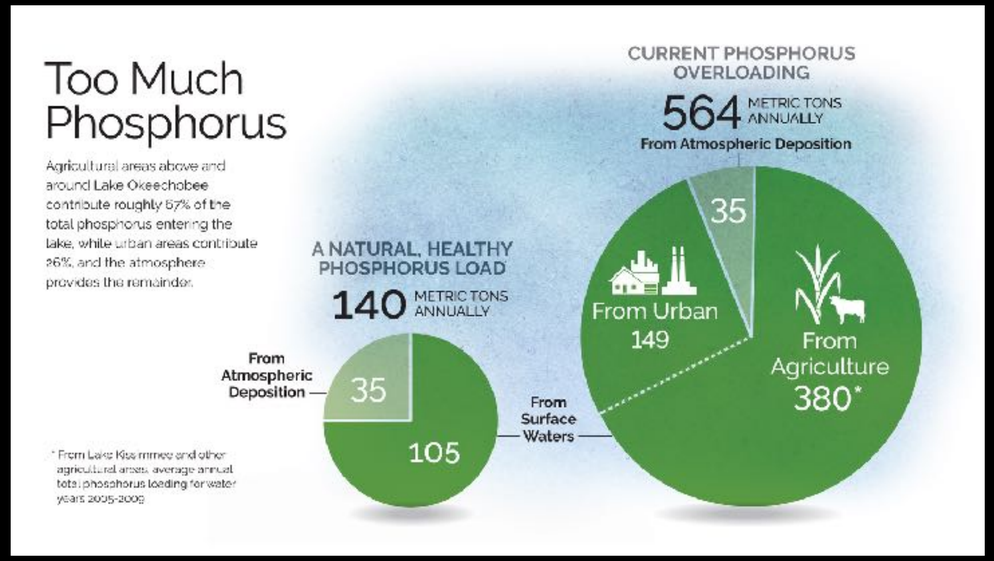
# VECTOR ART


# CHARTS

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# GEER 2019

GREATER EVERGLADES ECOSYSTEM RESTORATION

# MORE EXAMPLES

HIRAM HENRIQUEZ UNIVERSITY OF MIAMI

# THE NORTH AMERICAN BISON

## *A New National Symbol*

The National Bison Legacy Act, passed in late April by the U.S. House of Representatives, aims to honor the North American bison as the national mammal of the United States. It must now get Senate approval before heading to the President's desk for his signature, bringing the iconic animal one step closer to receiving the recognition many groups have pushed for.

### FAST FACTS

- **Population:** Estimated 545,000
- **Height:** 6-6.5 feet at the shoulder
- **Length:** 10-12.5 feet
- **Weight:** 900-2,000 lbs.
- **Vertical jump:** 6 feet
- **Running speed:** 35-40 mph
- **Lifespan:** 18-22 years (wild); over 30 years (captivity)
- **Mating Season:** June-September
- **Gestation:** 270-285 days; calf is born April-May
- **Litter size:** 1 calf


### HISTORY & RANGE

Though it once grazed the plains of most of the U.S. in the millions, the population dwindled to a little over a thousand at the turn of the 20th century. Its decline coincided in large part with its mass slaughter during the years of the nation's westward expansion.

- **Pre-1800s range** (60 million)
- **1840** (35.6 million)
- **1870** (5.5 million)
- **1889** (Almost extinct)
- **2003** (Est. 500,000)


### TWO TYPES

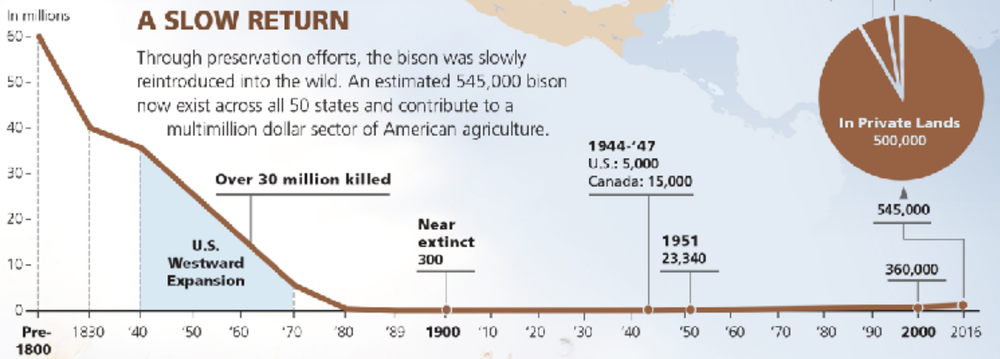
Largest pop. of Wood bison
**10,000**
*Wood Buffalo National Park*

Largest pop. of Plains bison
**4,000**
*Yellowstone National Park*

Although ecologically extinct throughout most of their historic range, the remaining few roam private lands, national parks and small wildlife areas.

### A SLOW RETURN

Through preservation efforts, the bison was slowly reintroduced into the wild. An estimated 545,000 bison now exist across all 50 states and contribute to a multimillion dollar sector of American agriculture.





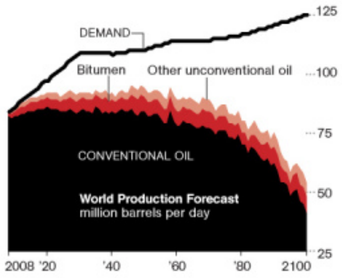


SOURCES: InterTribal Buffalo Council, CNN, William Hornaday, *The Extermination of the American Bison*, 1989, National Bison Association, Wildlife Conservation Society, Defenders of Wildlife, Wikipedia

Graphic by Hiram Henriquez

**"The fact that we're willing to move four tons of earth for a single barrel really shows that the world is running out of easy oil."**

—SIMON DYER, PEMBINA INSTITUTE




**Within the next few decades**, production of conventional oil around the world is projected to level off, then decline, even as demand continues to grow. Production from unconventional sources such as oil sands are also expected to drop if governments impose constraints to protect the environment.

cubic yards of sediment that once covered the bitumen, thereby bringing it within reach of shovels—and in some places all the way to the surface. On a hot summer day along the Athabasca, near Fort McKay for example, bitumen oozes from the riverbank and casts an oily sheen on the water. Early fur traders reported seeing the stuff and watching natives use it to caulk their canoes. At room temperature, bitumen is like molasses, and below 50°F or so it is hard as a hockey puck, as Canadians invariably put it. Once upon a time, though, it was light crude, the same liquid that oil companies have been pumping from deep traps in southern Alberta for nearly a century. Tens of millions of years ago, geologists think, a large volume of that oil was pushed northeastward, perhaps by the rise of the Rocky Mountains. In the process it also migrated upward, along sloping layers of sediment, until eventually it reached depths shallow and cool enough for bacteria to thrive. Those bacteria degraded the oil to bitumen.

The Alberta government estimates that the province's three main oil sands deposits, of which the Athabasca one is the largest, contain 173 billion barrels of oil that are economically recoverable today. "The size of that, on the world stage—it's massive," says Rick George, CEO of Suncor, which opened the first mine on the Athabasca River in 1967. In 2003, when the *Oil & Gas Journal* added the Alberta oil sands to its list of proven reserves, it immediately propelled Canada to second place, behind Saudi Arabia, among oil-producing nations. The proven reserves in the oil sands are eight times those of the entire U.S. "And that number will do nothing but go up," says George. The Alberta Energy Resources and Conservation Board estimates that more than 300 billion barrels may one day be recoverable from the oil sands; it puts the total size of the deposit at 1.7 trillion barrels.

Getting oil from oil sands is simple but not easy. The giant electric shovels that rule the

*Robert Kunzig wrote about drought in the West in February 2008. Peter Essick's most recent assignment was photographing the Ozark Highlands Trail.*

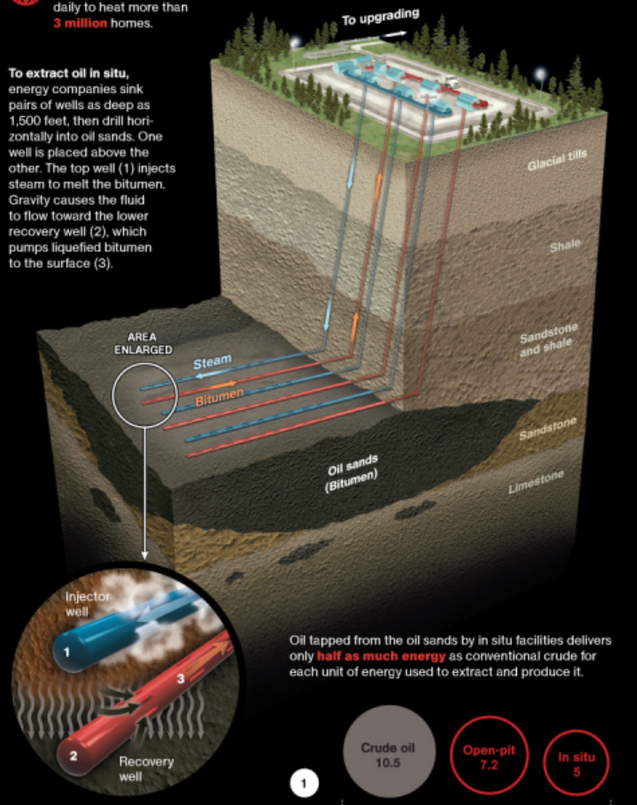


## Black Gold Too Deep to Mine

About 80 percent of the bitumen potentially recoverable from Canada's oil sands is in deposits deeper than 200 feet, requiring more energy to extract than bitumen from surface mines. Injecting steam into wells and upgrading the bitumen consumes vast amounts of water and natural gas.

Oil sands production uses enough natural gas daily to heat more than **3 million** homes.

**To extract oil in situ,** energy companies sink pairs of wells as deep as 1,500 feet, then drill horizontally into oil sands. One well is placed above the other. The top well (1) injects steam to melt the bitumen. Gravity causes the fluid to flow toward the lower recovery well (2), which pumps liquefied bitumen to the surface (3).




Oil tapped from the oil sands by in situ facilities delivers only **half as much energy** as conventional crude for each unit of energy used to extract and produce it.




Bitumen extraction and upgrading emits up to **3 times** more $CO_2$ per barrel than conventional oil.


HIRAM HENRIQUEZ, NG STAFF

SOURCES: ALBERTA GEOLOGICAL SURVEY; U.S. DEPARTMENT OF ENERGY; ENERGY INFORMATION ADMINISTRATION 2008; PEMBINA INSTITUTE

# A push to drill

Unless Congress acts, the Bush administration will allow oil and gas exploration as close as 100 miles to Florida's coast in July 2007.

BY WILLIAM E. GIBSON
WASHINGTON BUREAU CHIEF

WASHINGTON • President Bush startled the nation, especially environmentalists in Florida, when he took up a cause this year reminiscent of Jimmy Carter's pledging basic for conservation and alternative fuels in the 1970s.

"I have come today to discuss unbelievable opportunities for our country to achieve a great national goal, and that is to end our addiction to oil," Bush said, at a lectureary in Colorado, repeating a line from his state of the Union Address.

"I know it sounds odd for a Texan to say that," the former oilman remarked, drawing rueful laughter.

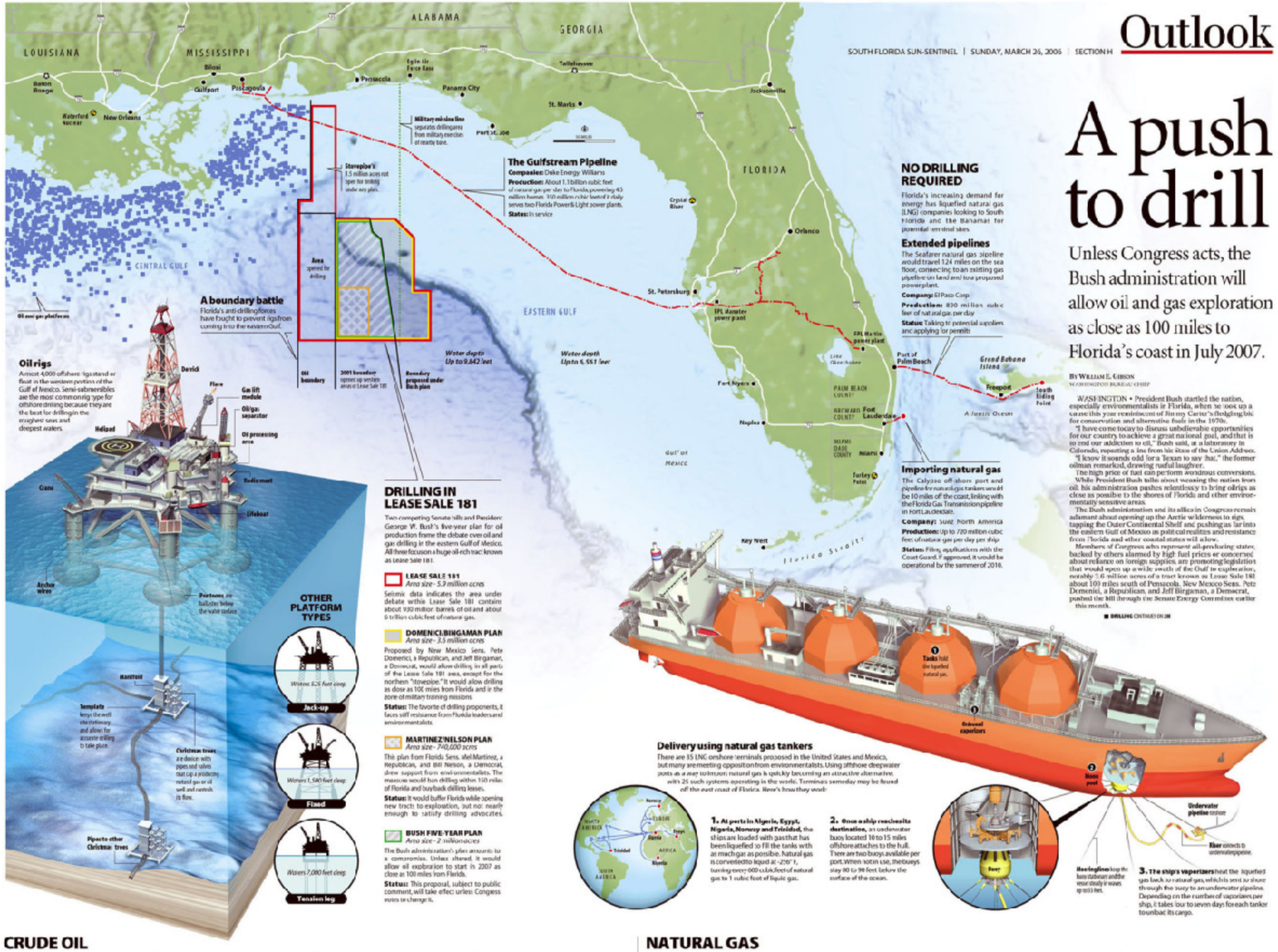
The high price of fuel can perform wondrous conversions.

While President Bush talks about weaning the nation from oil, his administration pushes relentlessly to bring oilrigs as close as possible to the shores of Florida and other environmentally sensitive areas.

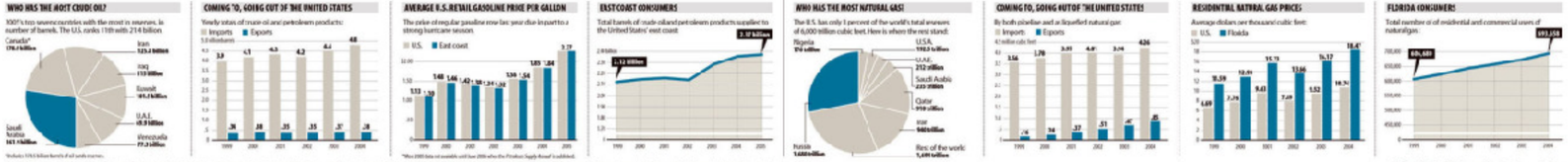
The Bush administration and its allies in Congress remain adamant about opening up the Arctic wilderness in rigs tapping the Outer Continental Shelf and pushing gas far into the eastern Gulf of Mexico as political realities and resistance from Florida and other coastal states will allow.

Members of Congress who represent oil-producing states, backed by others alarmed by high fuel prices or concerned about reliance on foreign supplies, are promoting legislation that would open up a wide swath of the Gulf to exploration, notably 1.6 million acres of a tract known as Lease Sale 181 about 100 miles south of Pensacola. New Mexico Sens. Pete Domenici, a Republican, and Jeff Bingaman, a Democrat, pushed the bill through the Senate Energy Committee earlier this month.

■ DRILLING CONTINUED ON 2H




## CRUDE OIL




## NATURAL GAS

SCIENCE NEWS

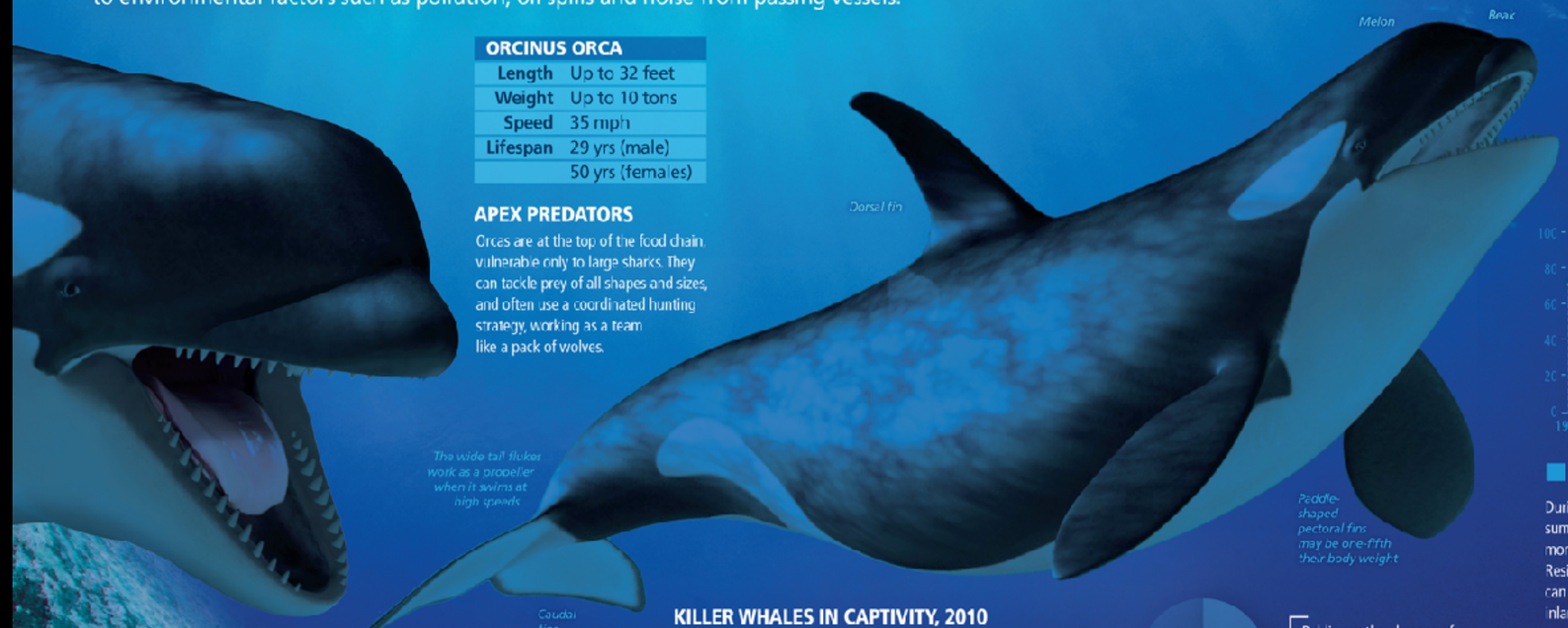
# CONSERVING THE SOUTHERN RESIDENT KILLER WHALES

NOAA Fisheries will soon include Lolita, Miami Seaquarium's killer whale, in the endangered species listing for Southern Resident Killer Whales that spend much of the year in the inland waters of Washington and British Columbia. Their population was depleted between 1965 and 1975 because of captures conducted for marine parks, and their numbers remain low due to environmental factors such as pollution, oil spills and noise from passing vessels.

| ORCINUS ORCA | |
|---|---|
| Length | Up to 32 feet |
| Weight | Up to 10 tons |
| Speed | 35 mph |
| Lifespan | 29 yrs (male) |
| | 50 yrs (females) |

## APEX PREDATORS

Orcas are at the top of the food chain, vulnerable only to large sharks. They can tackle prey of all shapes and sizes, and often use a coordinated hunting strategy, working as a team like a pack of wolves.

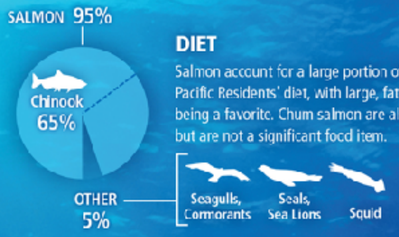




## KILLER WHALES IN CAPTIVITY, 2010

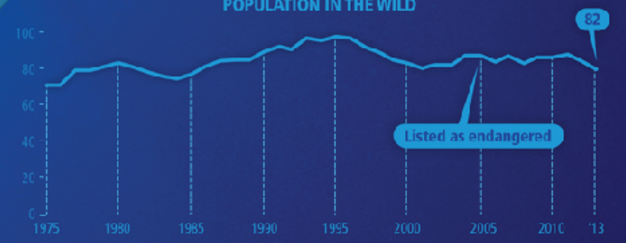


## DIET




Salmon account for a large portion of these northeast Pacific Residents' diet, with large, fatty Chinooks being a favorite. Chum salmon are also eaten, but are not a significant food item.


## SOUTHERN RESIDENT KILLER WHALE POPULATION IN THE WILD




## CRITICAL HABITAT*

During the spring, summer, and fall months, the Southern Resident population can be found in the inland waters of Puget Sound and nearby waters. In the winter, they forage along the West Coast as far south as central California.


*Nov. 2006

SOURCES: National Oceanic and Atmospheric Administration National Fisheries Science Center; *The Encyclopedia of Animals; Smithsonian Handbooks Mammals; The Independent*, UK; Animal Welfare Institute

Graphic: Hiram Henriquez
3D model: Triduza

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GREATER EVERGLADES ECOSYSTEM RESTORATION

HIRAM HENRIQUEZ UNIVERSITY OF MIAMI