

2015 Year of the Amphibian



Theme Introduction Presentation

-Sharon Becker

What happens when a frog parks in a No Parking Zone?



- He gets toad away!

What are they, anyways??

- Kingdom: Animal
 - Phylum: Chordates
 - Class: Amphibians
 - Orders:
 - » Anura (Frogs and Toads)
 - » Caudata (Salamanders)
 - » Gymnophiona (Caecilians – only in tropics)



“Amphibios” – Greek for “both kinds of life” (aquatic and terrestrial in one lifetime)

How many are there in NC?

- Around 90 species. That's about 30% of the amphibian species in the U.S.!



60+ Salamander species!



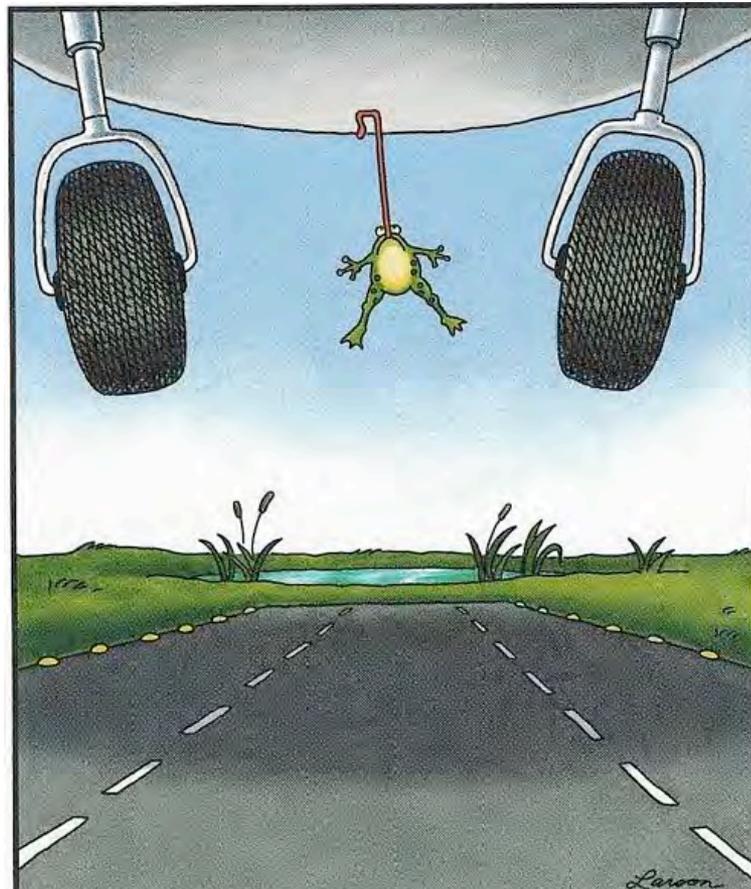
30 Frogs and Toads!

But Who CARES?!

- Vital link in food webs
- Indicator Species
- Scientific research
- Many endemic to SE U.S.
(live nowhere else)
- Great ambassadors for conservation
- High diversity in NC



Reptile? Amphibian? What's the difference???



Reptiles Vs. Amphibians



Scaly skin



Permeable, moist skin

Reptiles Vs. Amphibians



Leathery eggs

Terrestrial nests only

Jelly eggs

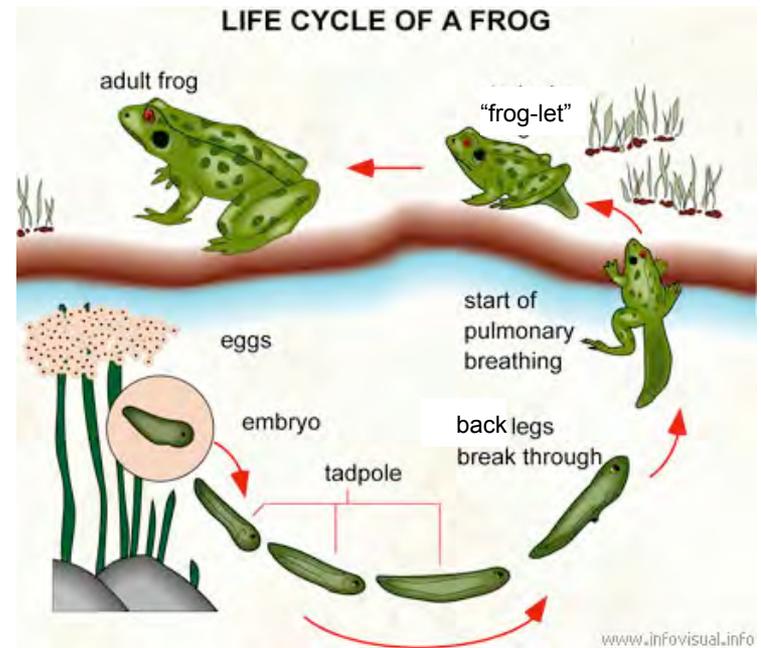
Aquatic “nests” mostly

Some terrestrial Salamanders lay in moist places (logs, rock crevices)

Reptiles Vs. Amphibians



Born as small version
of adult
(direct development)



Complete
metamorphosis
(with a few exceptions)

Reptiles Vs. Amphibians



Clawed toes

(if they have toes)

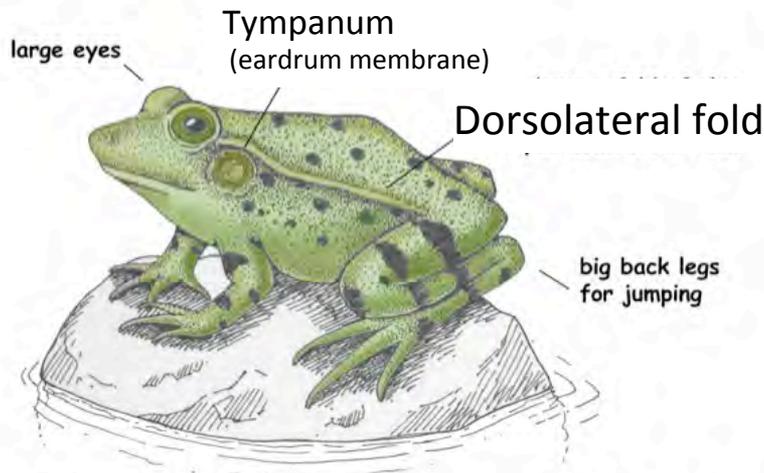


No Claws

(sticky pads on arboreal amphibians)

Anatomy

These terms are useful in species ID

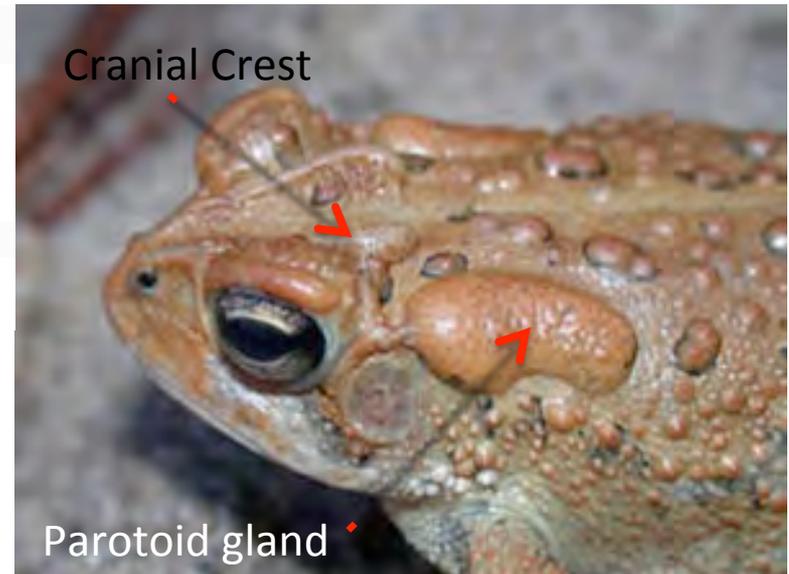


www.exploringnature.org

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Frog

Toad

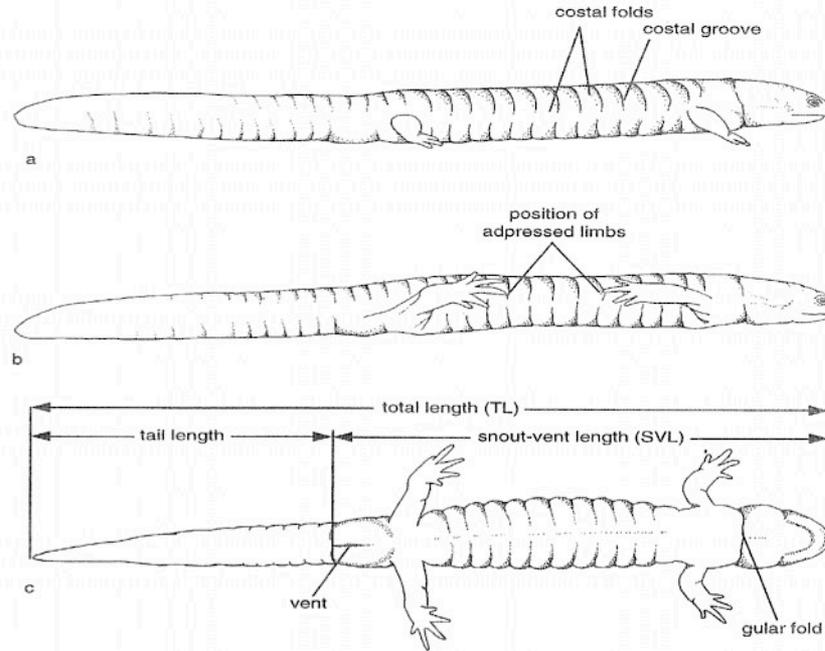


Parotoid gland

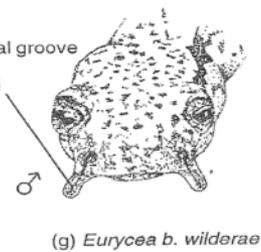
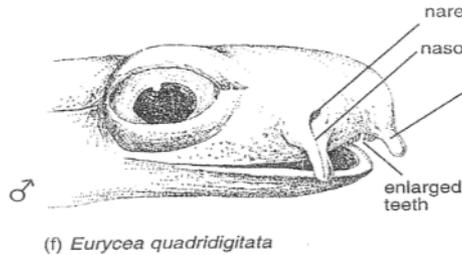
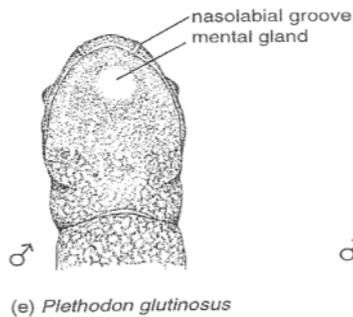
contains toxins to defend against predators

Salamander Anatomy

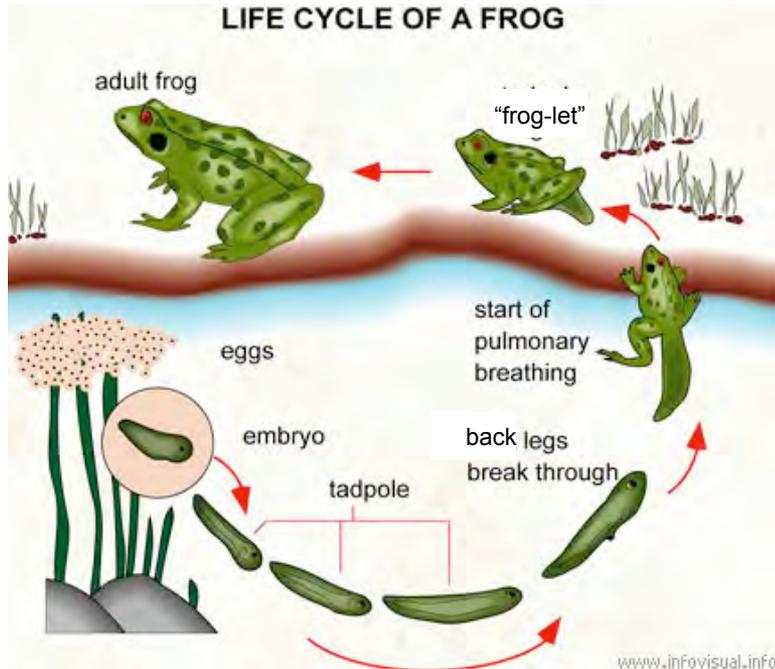
Fig. 6. Profiles of *Ambystoma* showing position of adpressed limbs and reference points for measuring length (illustrations by D. A. Thomas).



Some Secondary Sex Characteristics



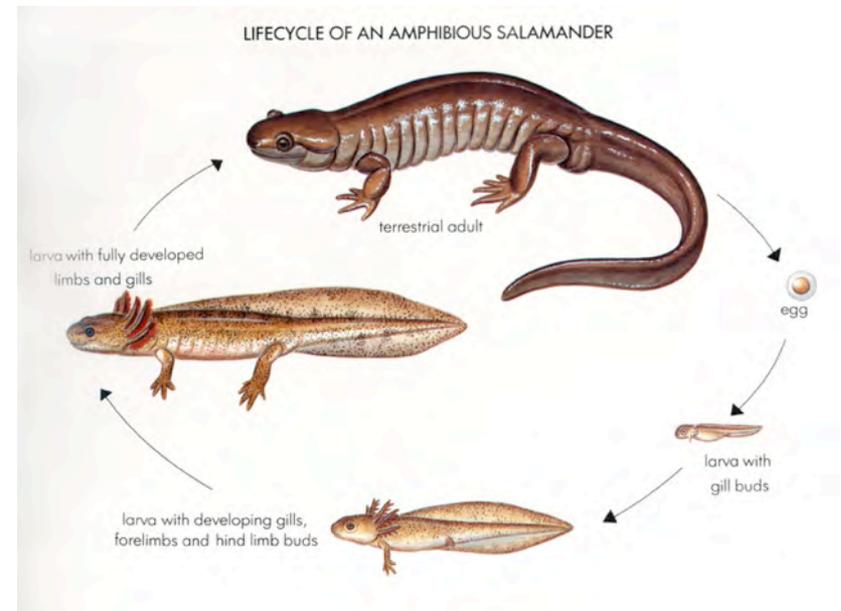
Life cycle



Tadpole is a name for the frog aquatic larval stage but doesn't apply to salamanders

Complete Metamorphosis
= complete change between stages

Several salamanders break from the amphibious life cycle. Some remain fully aquatic & retain gills as adults; others are completely terrestrial and the gilled larval stage occurs inside the egg prior to hatching.



Eggs

- Laid in water or moist environments; no egg shell
- Masses, strings or laid individually (species specific)
- Lay from a few to several thousand eggs at one time
- External fertilization (frogs), internal (most salamanders)



Larval Stage

- After hatching, larva for a few weeks to years (in permanent water sources)
- Breathe with gills first, develop lungs
- Salamanders: external gills
- Frogs: covered gills
- Eat & don't be eaten! (mainly invertebrates & plant matter; some are cannibalistic)
- High mortality this stage



Frog tadpoles



Salamander larva

Adults

- Emerge from water, disperse in semi-terrestrial habitat
- Major changes occur quickly before emergence (frogs)
- NC species entirely carnivorous as adults



There's always an exception...

- Eastern Newt have 4 stages in life cycle
- Aquatic egg & larva
- Emerge as terrestrial red eft, remain for several years
- Adult newt changes color, tail morphology & becomes aquatic again



Juvenile red eft stage



Adult newt stage

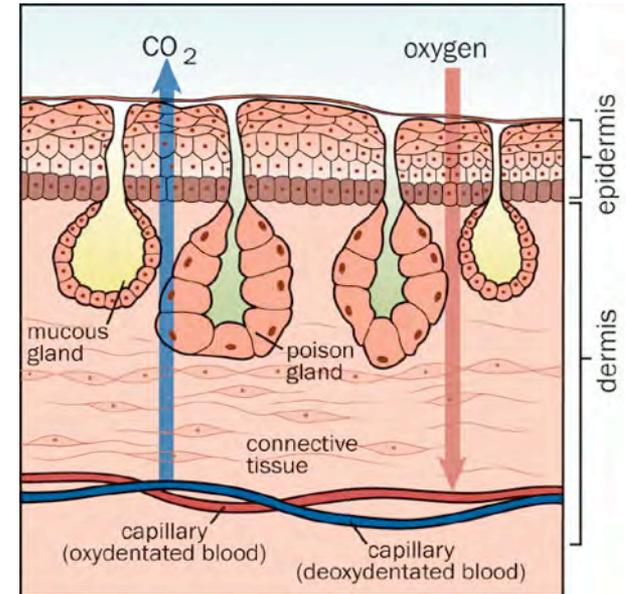
Life spans

- Though metamorphosis occurs in weeks, adults live for years
- Some short-lived; chorus frogs only 2-3 yrs
- Some long-lived; hellbenders potentially 25-30 years



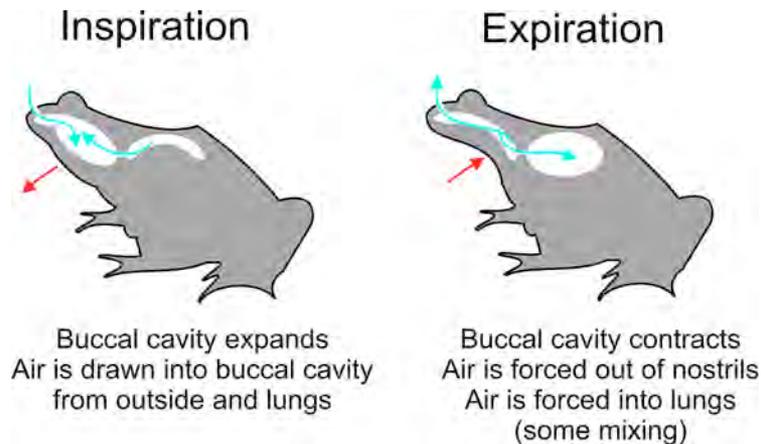
Amphibian Skin

- **Permeable** – not solid barrier to environment; allows for gas exchange in skin
- **Produce toxins & mucus** (maintain moisture & defense)
- **Able to regenerate digits, limbs, & tails**
- **Widely used in scientific & medical research** (from tissue regeneration & cancer treatments to evolutionary biology & genetics)



Respiration

- **Gills** — permanently aquatic species & larvae
- **Skin** — all amphibians to some extent, only form of respiration for Plethodontidae (lungless salamander family)
- **Lungs** — frogs use a process called buccal pumping; essentially gulping air into lungs



Size

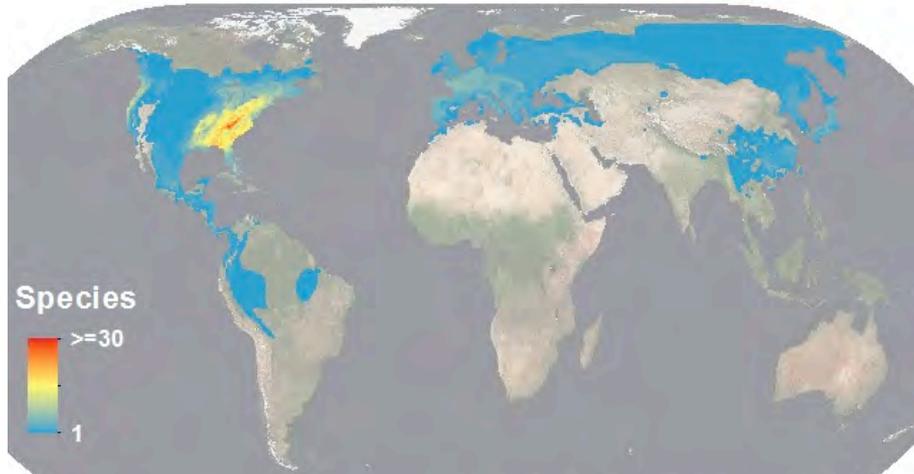
- Longest/biggest:
 - Two-toed Amphiuma (up to 46")
 - American Bullfrog (up to 8")
- Smallest:
 - Pygmy Salamander (up to 2")
 - Little Grass Frog (up to 0.75")
 - Smallest vertebrate in the U.S.



Species Richness

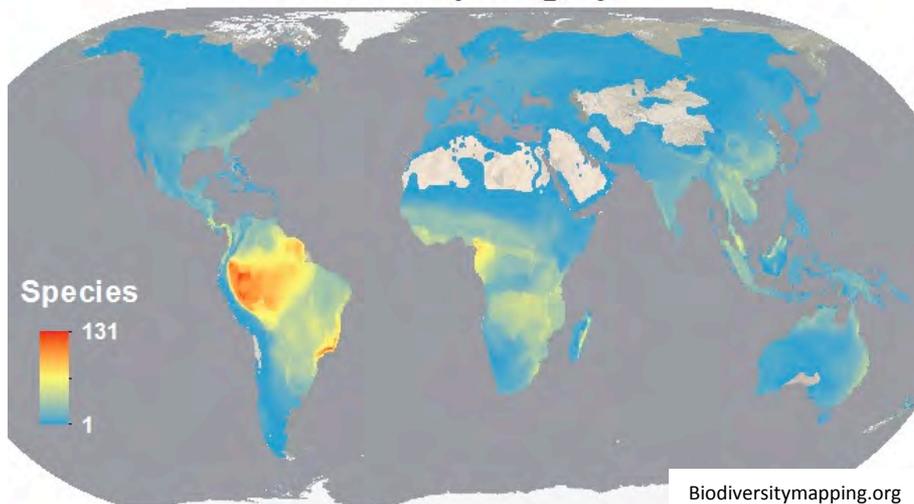
(# of species present)

Caudata (Salamanders)



- World-renown diversity in our mountains

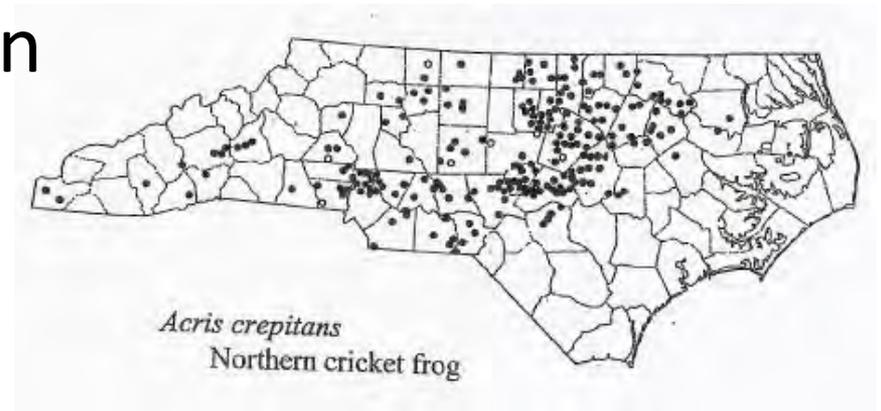
Anura (frogs)



- Coastal plain - high frog diversity for U.S.

Distribution

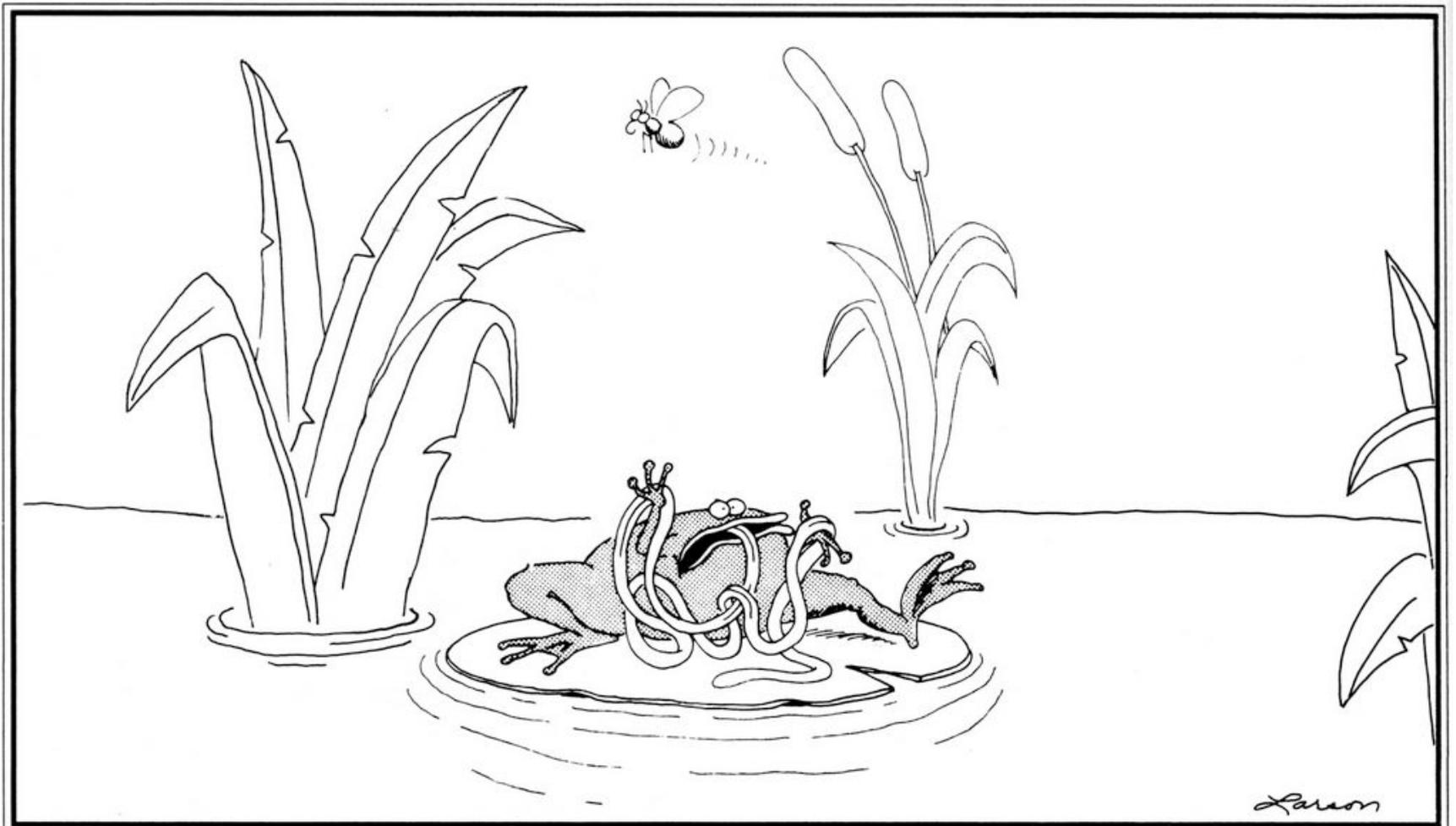
- Temp. and precipitation dependent
- Access to water
- Habitat for seasonal migration
- Terrain (mntns & ravines isolate species)
- Several endemic species



[Distribution Map](#) courtesy of NC MNS and NCPARC



Amphibian Behavior



"Blasted recoil unit!"

Behavior - Courtship

- Most amphibians have high breeding site fidelity but can colonize new sites
- Frogs & Toads
 - Call to find mates
 - [Amplexus](#) – grasp for external fertilization
- Salamanders
 - Produce pheromones to attract mates
 - Males produce sperm packets ([spermatophores](#)); guide females to them
 - Some lay eggs soon after, others store sperm internally for months
 - Many behaviors associated with courtship & [picking up](#) spermatophores



Behavior – Frog calls

- Males call during breeding season
- Species specific calls
- Seasonal cues (rain, warmer temps, & day-length)
- Make sound with vocal cords; use vocal sac (loose throat skin) to amplify



Behavior - Thermoregulation

- Ectothermic is scientific term
 - “Ecto” = external
 - “thermic” = temperature
- Body temp. is regulated by environmental temp.
- Bask in sun or on warm objects (rocks, road)
- Seeks water, hides in cool places (under rocks, logs, or leaf litter)



Behavior - Torpor

- Torpor vs. hibernation – torpor is short term inactivity; may become active then inactive again repeatedly during a season
- When temp's & precip are unsuitable, become inactive (underground, bottom of ponds, tree holes)
- Hot dry summer days
 - waiting for rain & night time
- Cold winter days
 - Slow metabolism down but can be active on warm days (not hibernation)



Behavior – Water Dependency

- Water is essential for survival
- Eggs have no shell & dry out quickly
- Larva require aquatic habitat
- Even the most terrestrial adults depend on water
 - Thin skin dries out quickly
 - Skin must remain moist for respiration



Behavior – Seasonal Migration

- Many amphibians migrate to/from breeding areas
- Remember, eggs must be in water/moist places
- Best time to find/hear species
- Move on warm rainy nights
(spring & fall especially)
- Return to same breeding site



Behavior - Defense

- Secrete toxins from skin
 - Taste bad & harmful to predator
- Defensive posturing
- Frogs & toads bloat to look larger
- Break off tail to escape



Toxins and bloating



Raised tail posture

Tricks to ID'ing

- ID to family level first
- Consider time of year
- Consider habitat type
- Familiarize yourself with photos
- Remember appearances change & variation occurs
- Use more than one field mark



Don't make it harder than it needs to be

How to find Amphibians

- Learn what seasons species are active (timing is key!)
- Nocturnal
- Water sources (vernal pools, rivers, seeps, swamps, ditches)
- Leaf litter, logs & rocks.
Remember, set it back the same way!



Frogs Vs. Toads?

Is there a difference?

- Superficially, yes.
- Bufonidae (“true toad” family)
- Ranidae (“true frog” family)
- Many Anurans don’t fit either category perfectly
- Toads: (generally)
 - Are more terrestrial
 - Have thicker, more warty skin
 - Have shorter back legs
 - Toads are a type of frog but frogs can’t be a type of toad... remember, all in the same Order Anura



RW Van Devender
Carolina Gopher Frog



C. Dykstra
Eastern Narrow-mouthed Toad

Conservation



"Skinny legs! ... I got skinny legs!"

"42% of the world's frog species are declining rapidly and in danger of extinction in our lifetimes. Since 1980, 122 amphibian species are thought to have gone extinct, compared to just five bird species and no mammals over the same period. This is an unprecedented rate of species loss and deserves an unprecedented conservation response" – Smithsonian Conservation Biology Institute

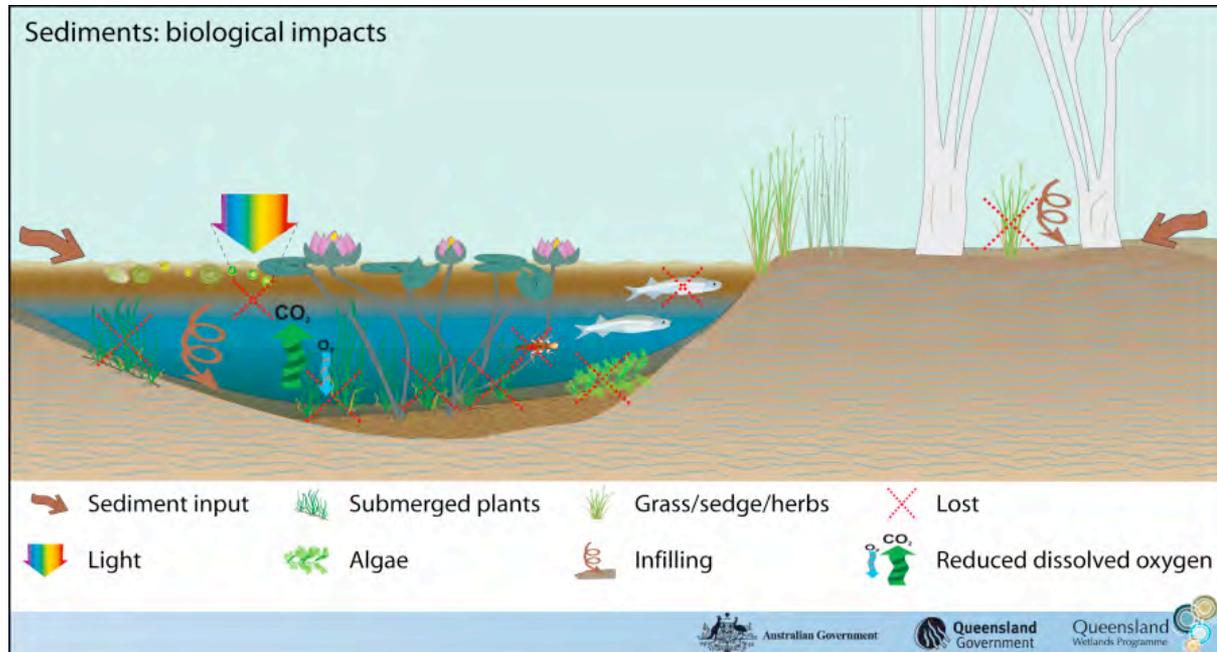
Conservation – habitat

- Loss
 - Wetlands/vernal pools filled in or leveled
 - Urban sprawl
- Fragmentation (isolation)
 - Spaces between habitats are no longer habitable (needed during migration)
 - Roads source of high mortality



Conservation - sedimentation

- Rain washes soil or silt into streams or wetlands
- Reduces dissolved O² & diversity
- Construction major sediment source



Conservation - pollution

- Wetlands are amazing filters, however, pollution may make them unsuitable habitat
 - Improper use of insecticides, pesticides, fertilizers & petroleum products become runoff problems
 - Bioaccumulation of chemicals in food sources
- Acid precipitation; pH decrease in breeding pools



Conservation - diseases

- Permeable skin - more susceptible to diseases
- Bacteria, viruses & fungi are all sources



– Common examples:

- Ranaviruses
- Chytrid fungus – *Batrachochytrium dendrobatidis* (*Bd*)



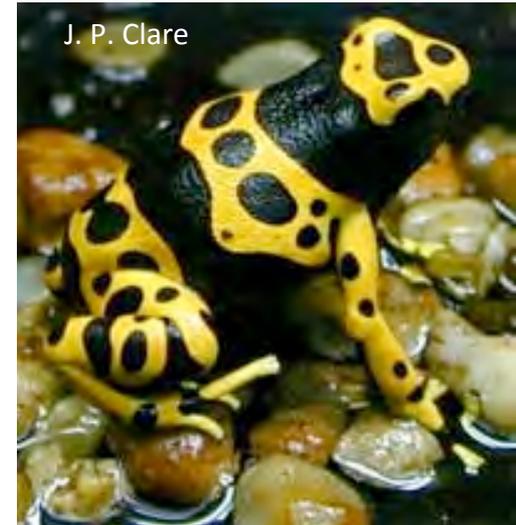
Conservation – climate change

- Changing seasonal patterns
 - Temperature & precipitation seasonal cues for breeding
 - Effects timing & success of amphibian breeding
- Increased UV-B exposure
 - Caused by reduced ozone layer
 - More sensitive to exposure due to thin, permeable skin



Conservation – pet trade

- From foreign countries to US pet trade
- High market values for rare & colorful species
- Leads to over collection stressing natural populations



Conservation – what can I do?

- Participate in citizen science research
- Join state & national conservation organizations
- Create “backyard” amphibian habitat
- Spread the word!



The North Carolina Herpetological Society

“Dedicated to Reptile and Amphibian Conservation since 1978”

- Supports research, education & conservation
- Great connection with herpetologists across state
- Grass-roots movement for designations of state “herps” (2013)



Partners in Amphibian & Reptile Conservation

- National organization promoting education, research & conservation
- [NCPARC](#) – state chapter
 - Working groups:
 - Education & Outreach
 - Policy, Regulation & Trade
 - Research, Inventory, Monitoring & Management



[Link](#)

Calling Amphibian Survey Program ([CASP](#))

- Citizen Science
- Survey frog calls on designated route 3x a year
- Training & frog call [quiz](#) required
- Provides data on distribution & relative abundance



FROG WATCH | USA™

- Citizen Science
- Similar to CASP; without specific survey routes
- Required: Join local chapter, attend frog call training
- Report data [online](#)



ASSOCIATION
OF ZOOS &
AQUARIUMS

Snapshots in Time

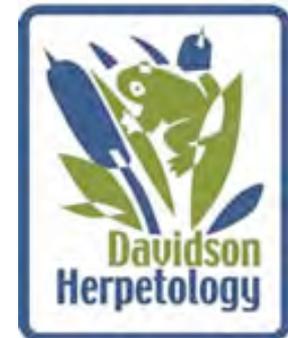


- Citizen Science
- Monitor timing of Spotted Salamander & Wood Frog breeding
- Easy! Just report observations [online](#)



Carolina Herp Atlas

- Citizen science project
- Report observations of herps in NC/SC
- Simple! Just register [online](#) & start reporting observation & location
- Helps scientists understand species occurrence



Create “Backyard” Habitat

- Create a pool or pond
- Use native plants
 - Ex. pickerel weed, duck potato
- Provide shelter/basking areas (rocks and logs)
- Limit exposure to chemicals & domestic pets



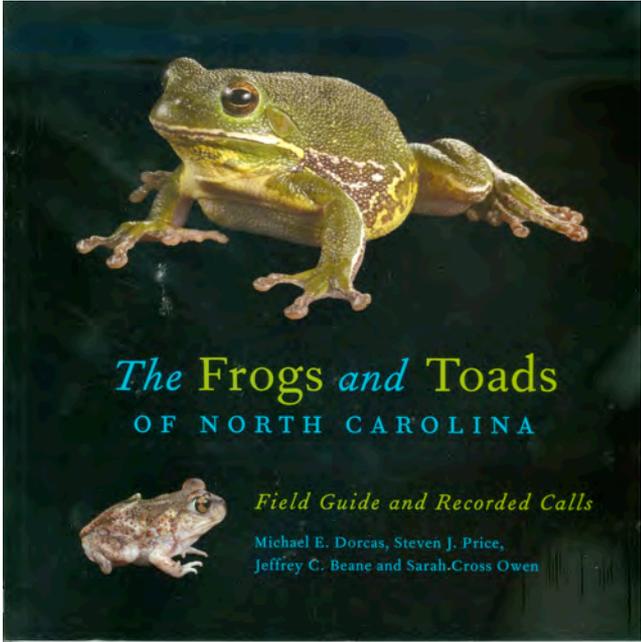
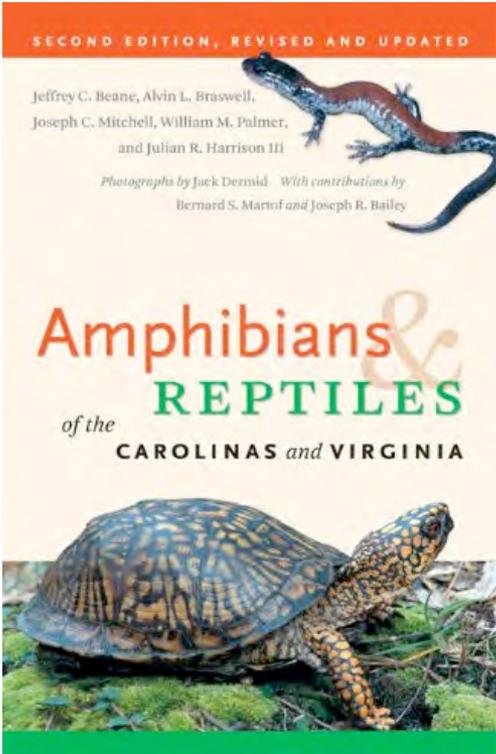
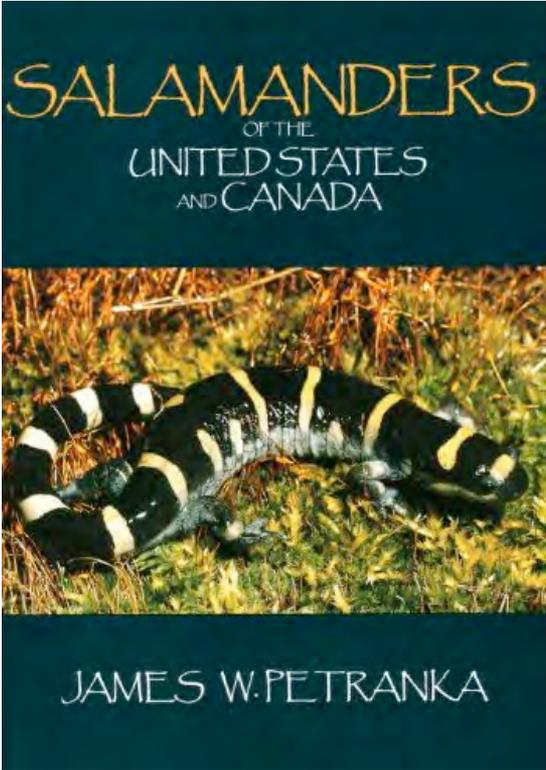
- Mosquitoes are food for amphibians
 - Use wildlife safe “mosquito dunks”, contains *Bt-israelensis*

State Amphibians

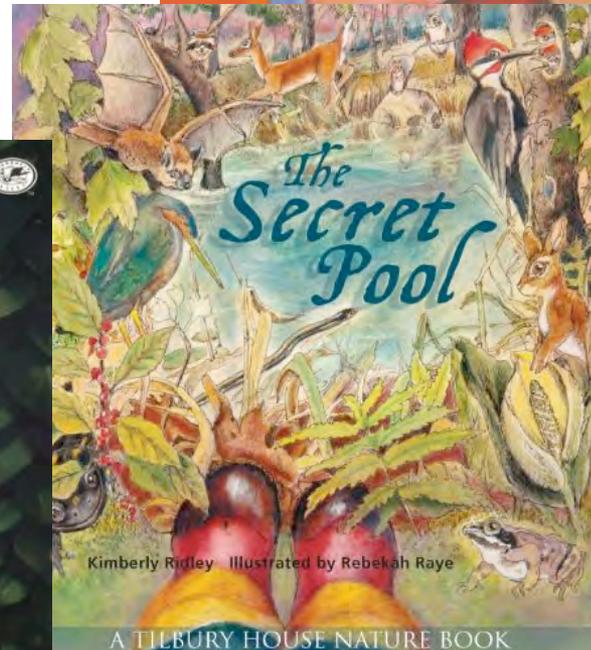
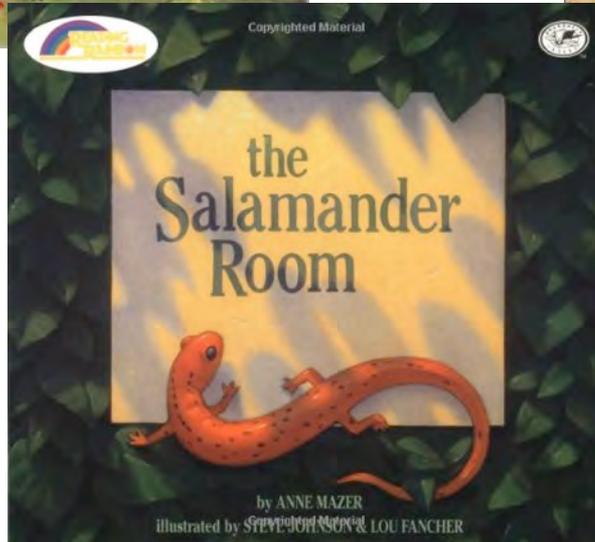
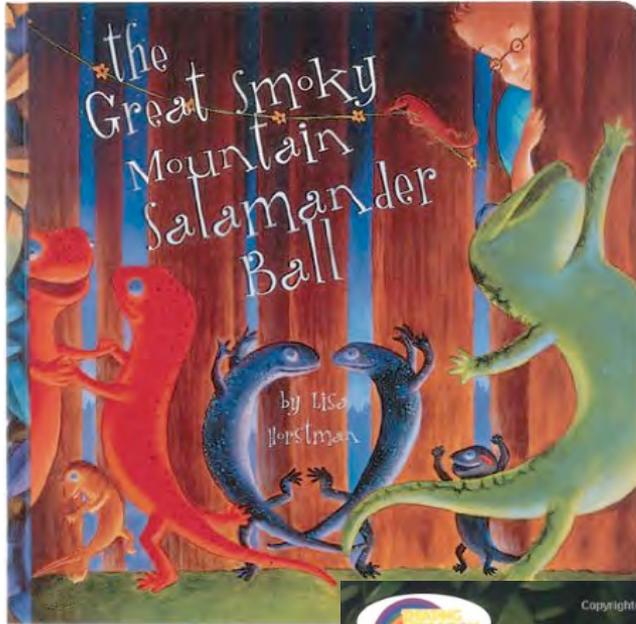
- Marbled Salamander
 - Common through most of NC
 - Return to vernal pools in late fall (Nov.)
- Pine Barrens Treefrog
 - Significantly rare (NHP)
 - Sandhills pine forests



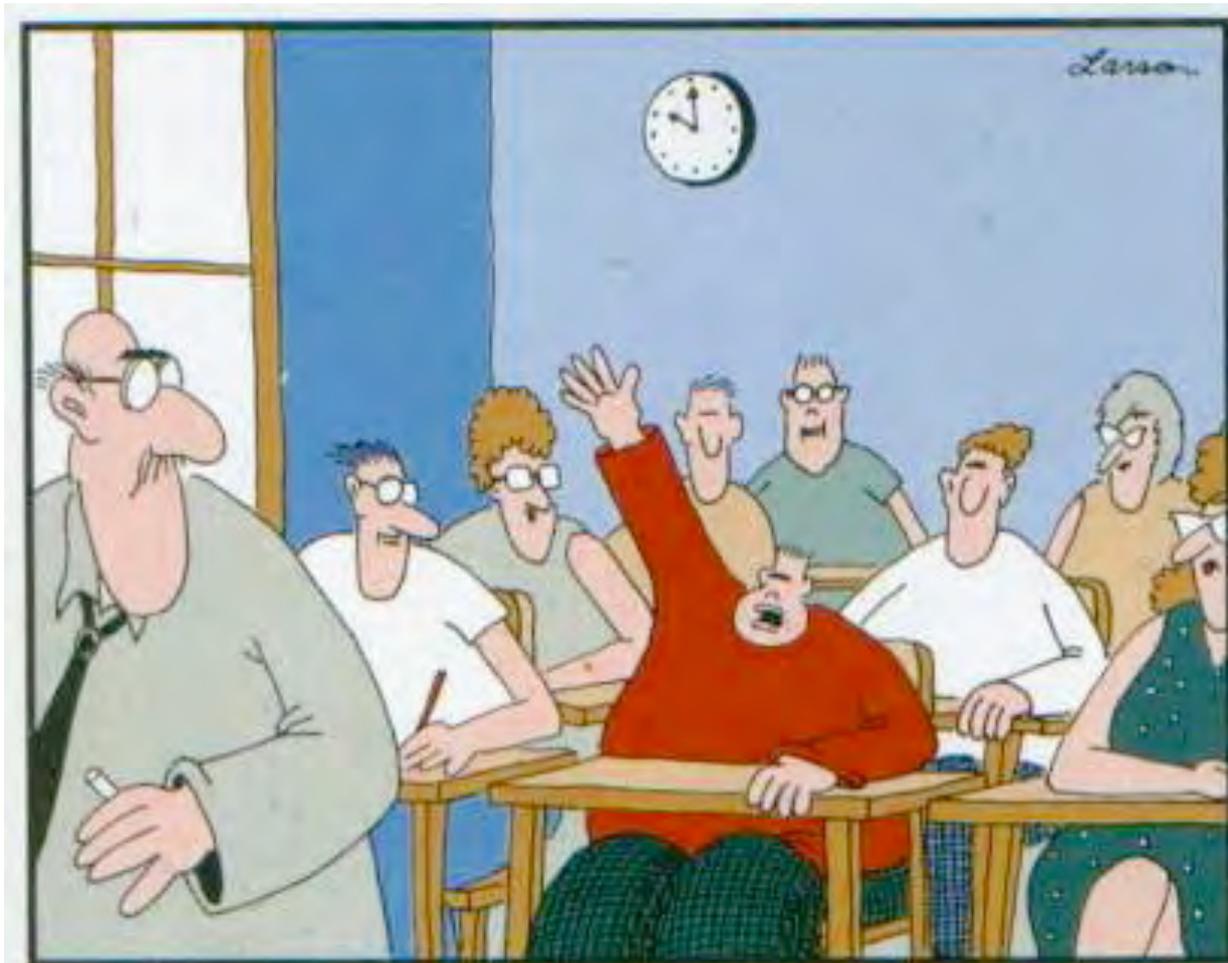
Resources



Resources for kids



Now go get outside!!!



**"Mr. Osborne, may I be excused?
My brain is full."**