

# Virginia Mammals

## Virginia Master Naturalist Training

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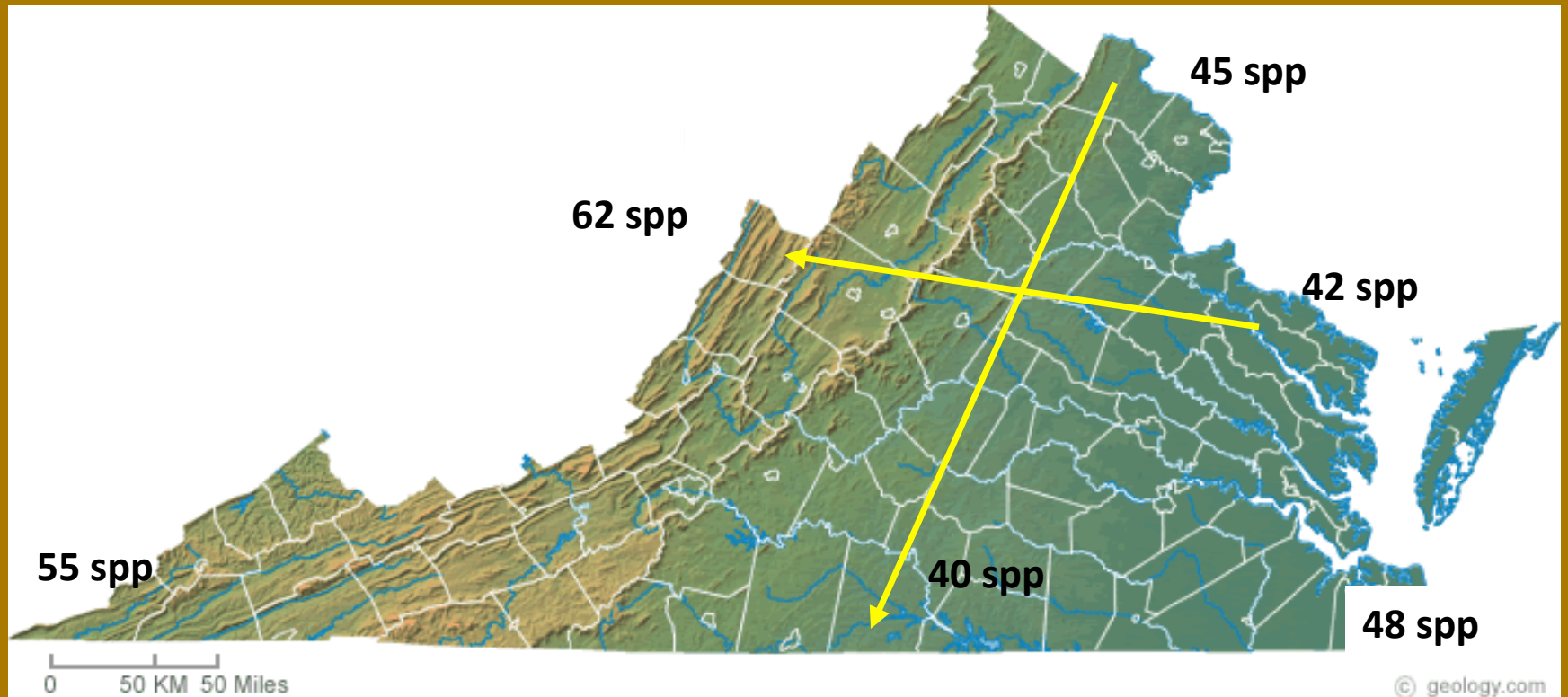
# Objectives

- Discuss diversity and distribution of mammals in VA
- Taxonomy of mammals
  - Orders/Family
- Key characteristics/Identification
- Adaptations of mammals
- Research/study techniques
- Role mammals play in VA' s ecosystem
- Threats and issues of mammals in VA



# VA Mammal Distribution

- GEOGRAPHIC DISTRIBUTION**



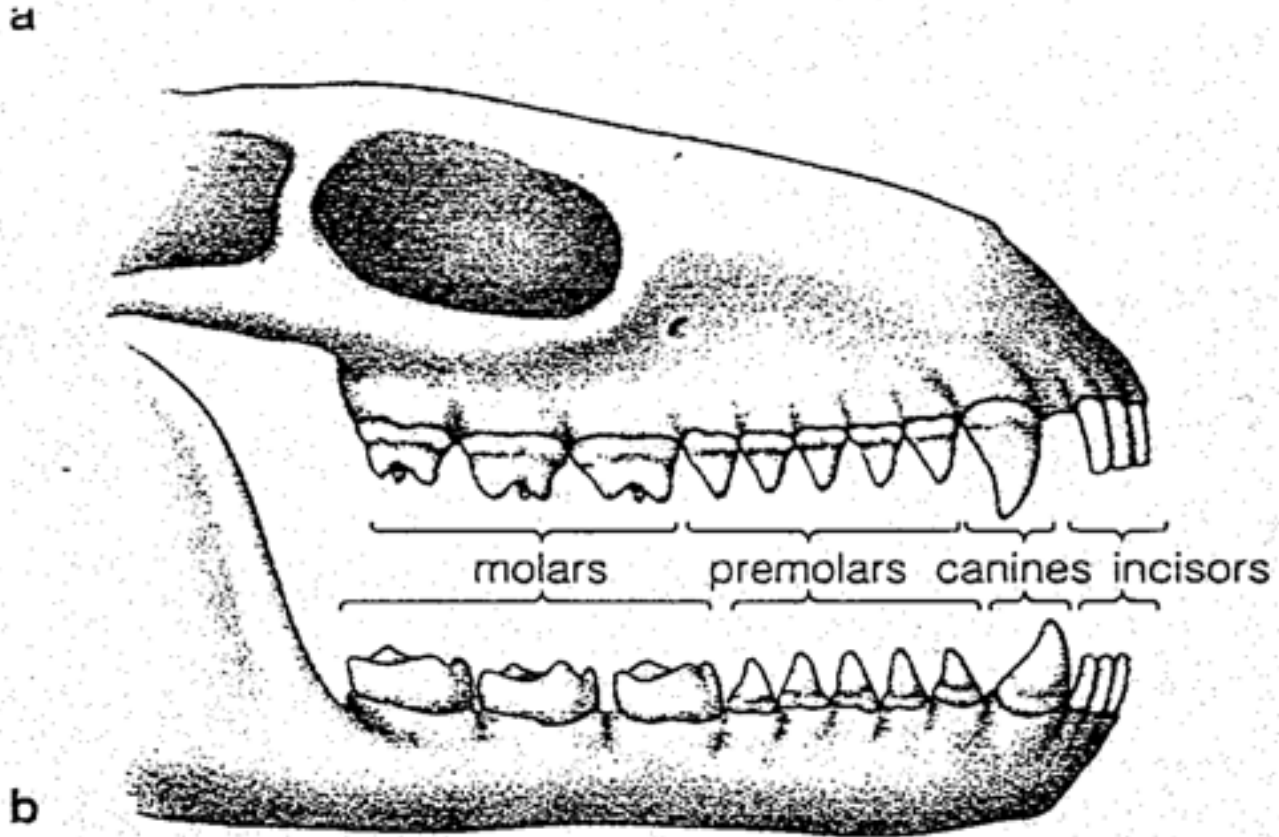
# Diversity of VA Mammals

- ~ 100 species of mammals in VA
  - 20 marine mammals: along the shore, bay and tidal rivers
- 84 species of land mammals
  - Includes extirpated: elk\*, bison, gray wolf and mountain lion
- Introduced Species:
  - Sika Deer- Assateague Island
  - Nutria-nuisance, Eastern VA
  - House mouse/Norway rat: greatest economic significance due to \$ spent annually to eradicate

# Taxonomy/Classification

- Kingdom: Animalia
- Phylum: Chordata
  - Subphylum: Vertebrata
- Class: Mammalia
- Order: 26 total
  - 7 in VA that contain ~ 75 native species
- Family: 16 land mammal families in VA
- Genus
- Species

# Mammal Skulls



# Number of Teeth – Common Mammals

- Opossum – 50
- Various mole species, pig – 44
- Bears, Canids – 42
- Raccoon – 40
- Marten, Myotis bats – 38
- Some bats, Eastern mole, Otter – 36
- Some bats, most skunks, Elk – 34
- Sorex shrews, some bats, most ungulates (deer) – 32
- Least shrew, Felis, some bats – 30
- Rabbits, hares – 28
- Gray squirrel, ground squirrels, – 22
- Fox squirrel, chipmunk, beaver, muskrat – 20
- Jumping mouse – 18
- Most mice, rats – 16



# Types of Teeth

- Incisors: front most teeth
  - Gnawing/Nipping
- Canines: behind incisors
  - Long and sharp for piercing
- Premolars/Molars: cheekteeth
  - Vary in size, # and shape depending on diet
- Tooth type correlates to diet (Herbivore, Omnivore, Carnivore)



# Rodents

- No canines
  - Gap called diastema
- Only 2 upper and 2 lower incisors
  - Many have staining on incisors
- Incisors continuously grow over lifetime
- Herbivore: flat molars for grinding or rounded molars for chewing softer vegetation

# Carnivore Skull

- 6 Incisors on top and bottom
- Molars: specialized for piercing and slicing flesh
  - Fewer than most other mammals
- Canine Family-molars are intermediate in shape between those of bobcat (carnivorous) and raccoon (omnivorous)
  - Have both piercing/slicing molars and grinding/crushing molars
- Omnivores: Unspecialized teeth for processing many different types of food

# Mammal Characteristics

- Diagnostic characteristics: unique to mammals
  - 1) 3 bones in inner ear (incus, malleus & stapes)
  - 2) Lower jaw is one bone: dentary
  - 3) Presence of hair
  - 4) Milk production for young

# Mammal Hair

- Keratin-unique feature of vertebrates
- Hair cannot change color: color is added while forming from the cuticle
  - Mammals can molt and grow new hair of a different color
  - Juveniles often have one phase/adults different or seasonal variations (white tail deer)
- 2 kinds of hair:
  - Underfur: dense, short, fine hair, provides most insulation
  - Guard Hairs: longer, thicker, contain pigment for coloration, protect underfur
    - Arrector pili can raise hair
  - Vibrissae: whiskers on face, very sensitive



# Mammal Milk

- Produced by females for nourishment of young
- 1<sup>st</sup> milk is colostrum: high in fat and contains antibodies for young
- Milk composition varies for each species (amount of fat, protein, carbohydrates, minerals and vitamins)



# Types of Young

## •Altricial

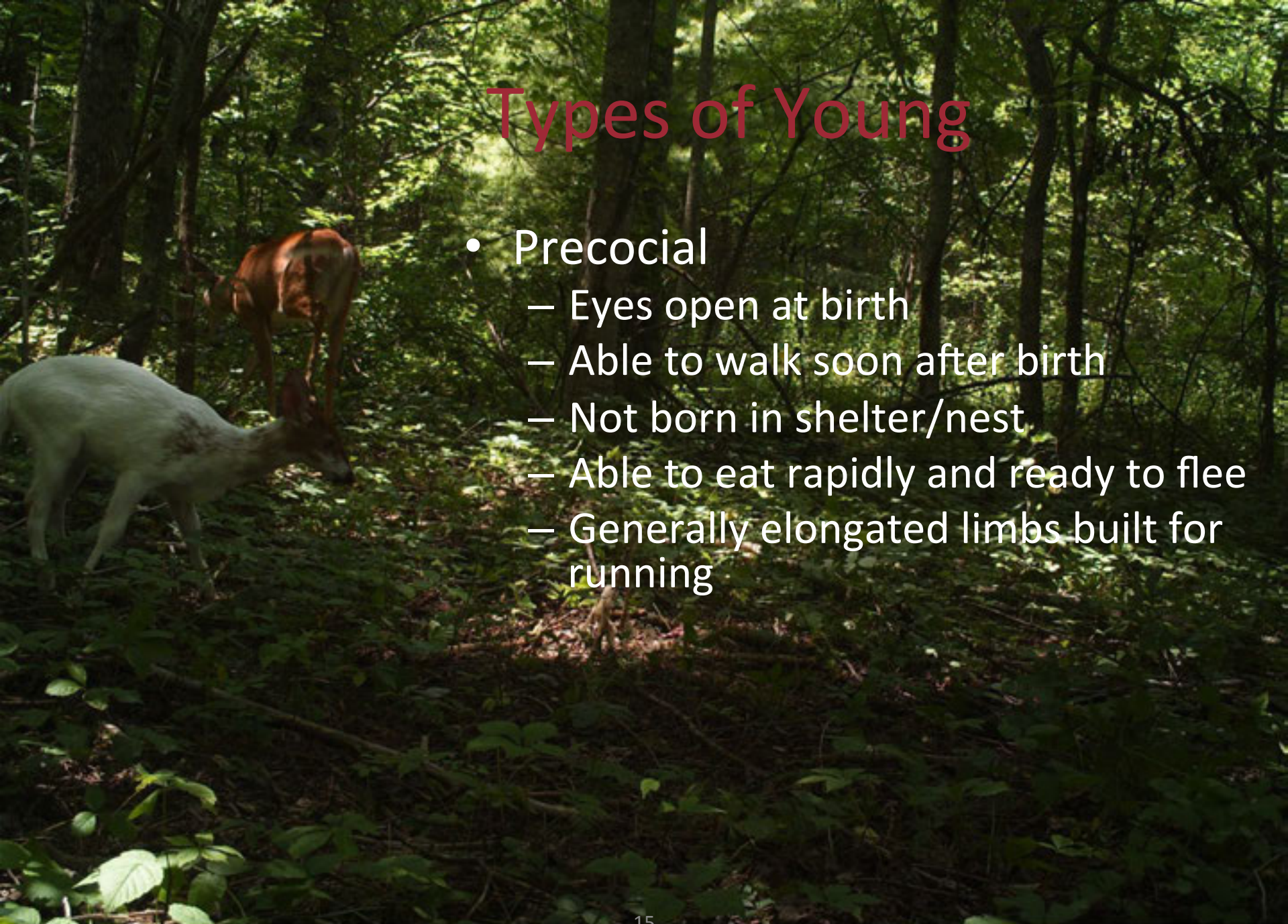
- Require more care at birth
- Eyes not open
- Cannot walk immediately after birth
- Born in nests or sheltered areas
- Length of time with parent varies by species





# Types of Young

- Precocial
  - Eyes open at birth
  - Able to walk soon after birth
  - Not born in shelter/nest
  - Able to eat rapidly and ready to flee
  - Generally elongated limbs built for running



# Mammal Observation

- Most species nocturnal or crepuscular
- Highly developed senses: ready to flee
- Many species fossorial





# Small Mammal Live Trapping



Sherman trap



Removing animal from trap



Toe-clipping ID  
Mark and Release



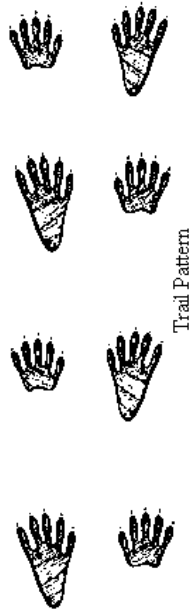


Often use trail cameras for large mammal observations/study





# Other observation skills



Tracks

Scat

# Ecological Significance

- Mammals play a large role in the food web
  - Many rodents are prey for other mammals, birds, reptiles, etc.
- White-tail Deer and Forest Ecosystems
  - Change in forest structure/stand composition over time
  - Habitat generalist species
- Beaver and Wetland Ecosystems
  - Create new wetland areas/boggy meadows
  - Can be a nuisance for landowners, but also create a declining habitat type
- Predator/Prey Dynamics

# Order Didelphimorphia

## Family Didelphidae



Virginia Opossum  
*Didelphis virginiana*





## **Characteristics**

- Only N.A. marsupial
- Greatest number of teeth = 50
- Opposable, clawless big toe on hind foot
- Hairless prehensile tail
- Paired reproductive system

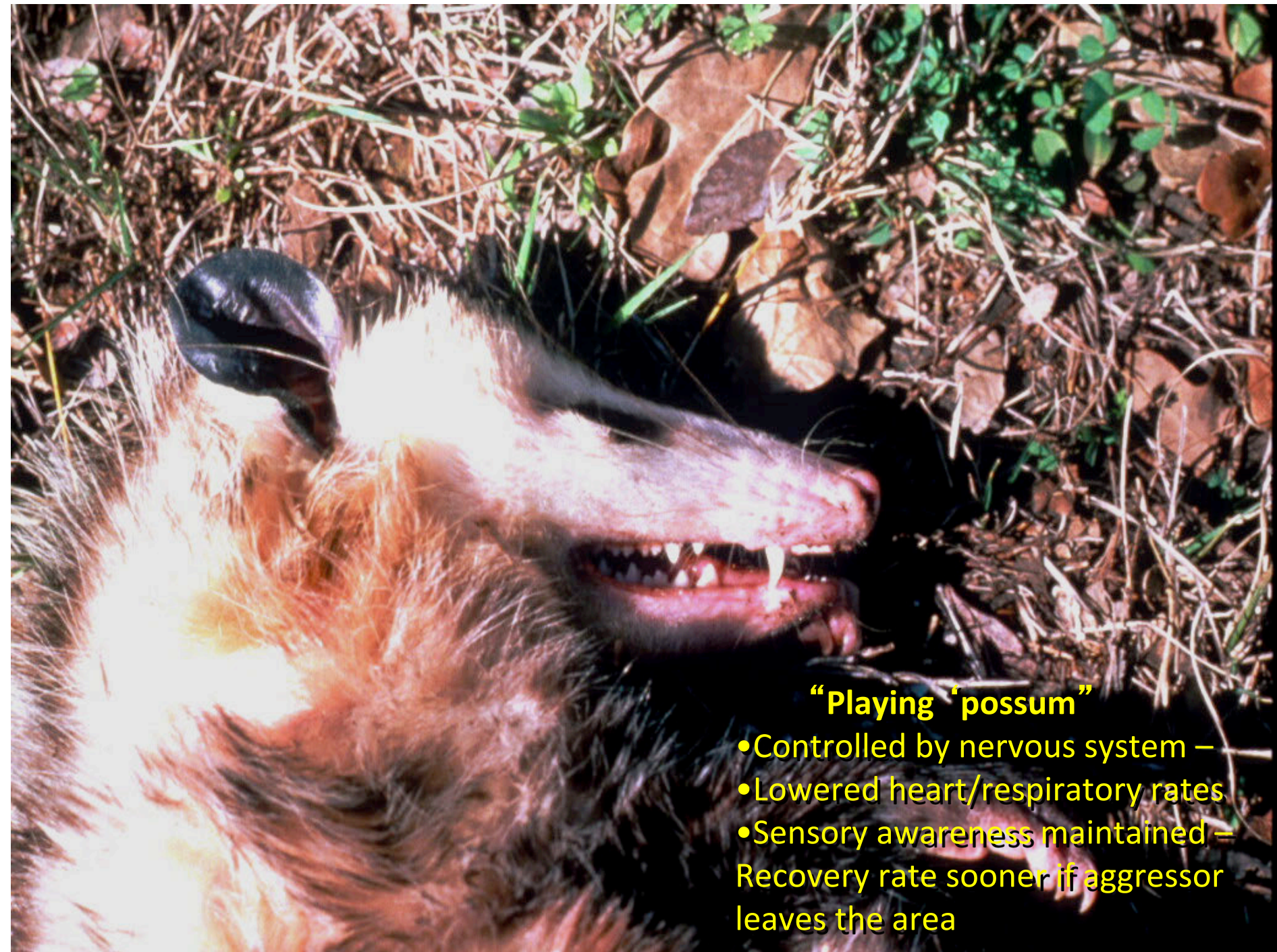
## **Habitat**

- Prefers low, damp, wooded areas
- Omnivore, but prefers animals

## **Reproduction**

- Breeding season – late Jan to midsummer
- Young in pouch 2 months; stay with mother addl. 3-4 weeks





### **“Playing ‘possum”**

- Controlled by nervous system –
  - Lowered heart/respiratory rates
  - Sensory awareness maintained –
- Recovery rate sooner if aggressor leaves the area



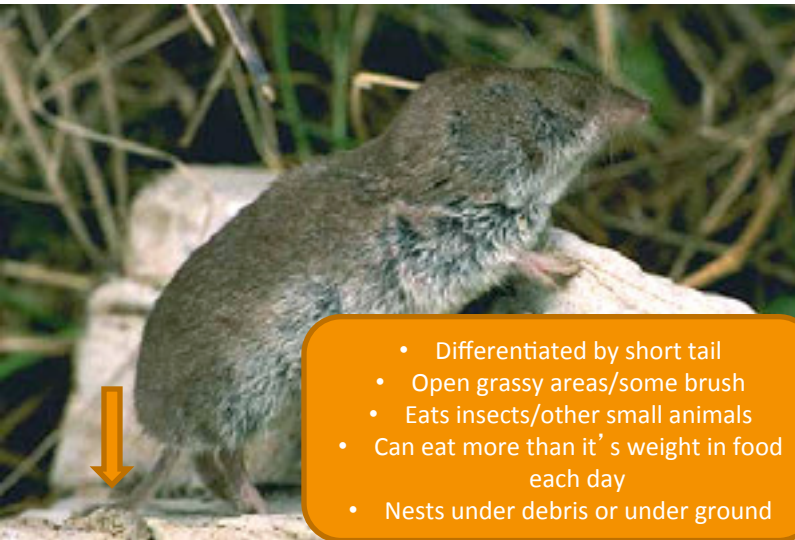
# Order Insectivora – Shrews and Moles

## Characteristics

- Most primitive placental mammals
  - 5 toes on each foot
  - Teeth not well differentiated
  - Primitive brain; broad, flat braincase
- Primarily fossorial
  - Small eyes, ears
  - Dense, velvet-like pelage
  - Elongated, movable snout
- Predominantly insectivorous or carnivorous



# Family Soricidae - Shrews



- Differentiated by short tail
- Open grassy areas/some brush
- Eats insects/other small animals
- Can eat more than it's weight in food each day
- Nests under debris or under ground

Least Shrew- *Cryptotis parva*

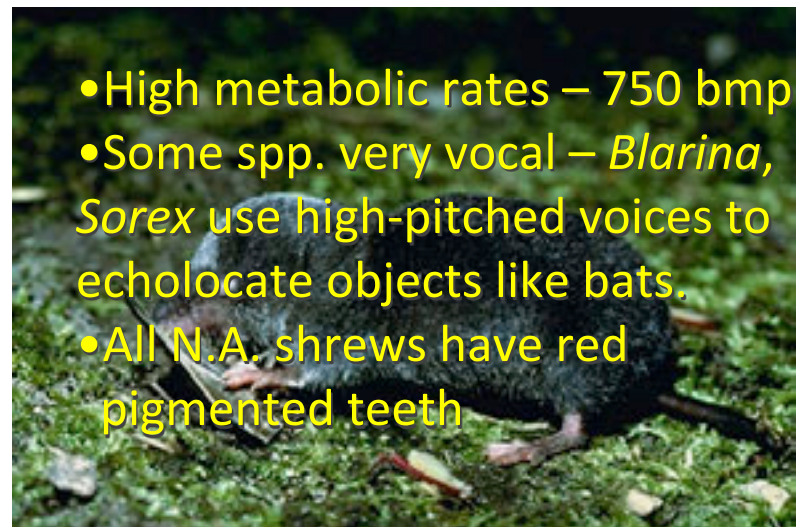


Southeastern Shrew- *Sorex longirostris*



Smallest mammal in N.A. 2-4 g!

Pygmy Shrew – *Sorex hoyi*



- High metabolic rates – 750 bmp
- Some spp. very vocal – *Blarina*, *Sorex* use high-pitched voices to echolocate objects like bats.
- All N.A. shrews have red pigmented teeth

Short-tailed Shrew – *Blarina brevicauda*



# Family Talpidae - Moles



Eastern Mole – *Scalopus aquaticus*



Hairy-tailed Mole – *Parascalops breweri*

- Well-adapted for digging in loose, friable soils
- Tiny eyes covered by skin, no external ears
- Vibrissae on snout, head, surrounding palms aid in detecting food – primarily earthworms and insects
- These species have two levels of tunnels
  - Surface tunnels for feeding
  - Lower level (20-60 cm) for living quarters



# Order Chiroptera – Bats

## Characteristics

- Only mammals capable of true flight
  - Elongated fingers
  - Keeled sternum
  - Flight membranes connect body with wings, legs and tail
  - Knees directed outward, backward
  - Thumb projects forward from front bend of wing terminating in sharp hooked claw
  - Echolocation



# Order Chiroptera – Bats

## Family Vespertilionidae – Evening Bats

### Characteristics



- Unique fleshy outgrowth of ear canal, tragus, projects upward in front of pinna
- Emit ultrasonic calls – 25-75 kHz- hear reflected echoes to navigate, locate food, primarily insects
- Tail and wing membranes used to capture and restrain prey



- Colonial
  - Erratic flight-feeds on insects
  - Hibernate in caves or other protected spot
  - Roosts: Caves, tunnels, hollow trees, buildings
    - Leave roost at dusk, return at dawn



PGC Photo/Joe Kosack

## Little Brown Myotis

*Myotis lucifugus*

Most common bat in VA  
caves

Maternity colonies in  
manmade structures



### Myotis Group:

- Largest/most widely distributed group
- All relatively small
- All some shade of brown
- Difficult to differentiate/identify

Northern Myotis  
*Myotis septentrionalis*



Silver-haired Bat  
*Lasionycteris noctivagans*  
Family: Vespertilionidae

- Distinguished by dark pelage tipped with silver
- Slow, erratic flight early evening above trees that border water
- Hibernate in VA – seen Sept-May
- Most often roosts in tree hollows, crevices
- Solitary



## Eastern Pipistrelle

*Pipistrellus subflavus*

Family: Vespertilionidae

- Smallest bat in eastern U.S.
- Light reddish-brown with long guard hairs
- Hibernate in unspecialized caves
- Early evening flier – strong, erratic
- Feeds at treetop level or along water edge
- May form long-term social bonds







Big Brown Bat - *Eptesicus fuscus*  
Family: Vespertilionidae



- Distinguished by large size, short, broad, rounded ears, uniform color.
- Prefers to hibernate in manmade structures
- Females in large maternity colonies in summer
- Strong flight, interrupted by sudden, frequent changes in direction over cultivated fields surrounded by trees





Eastern Red Bat  
*Lasiurus borealis*  
Family: Vespertilionidae

- Roost in trees, most commonly in deciduous forests
- During day, they hang by one foot-look similar to a dead leaf
- Overwinter in southern half of U.S.
- Can be seen flying in VA every month of year
- Strong fliers, often seen foraging around city lights
- Prefer moths







Hoary Bat  
*Lasiurus cinereus*  
Family: Vespertilionidae





- Distinct silver frosted pelage
- Solitary tree rooster, prefers conifers
- Long-distance migrant
- Last bat to appear in evening; strong, rapid fliers active throughout the night
- Feed primarily on moths and larger insects





Evening Bat - *Nycticeius humeralis*  
Family: Vespertilionidae

- Small version of big brown – little studied
- Found only at lower elevations, not in mountains in southern U.S.
- Maternity colonies in buildings, hollow trees
- Foraging starts at dusk, slow steady flight

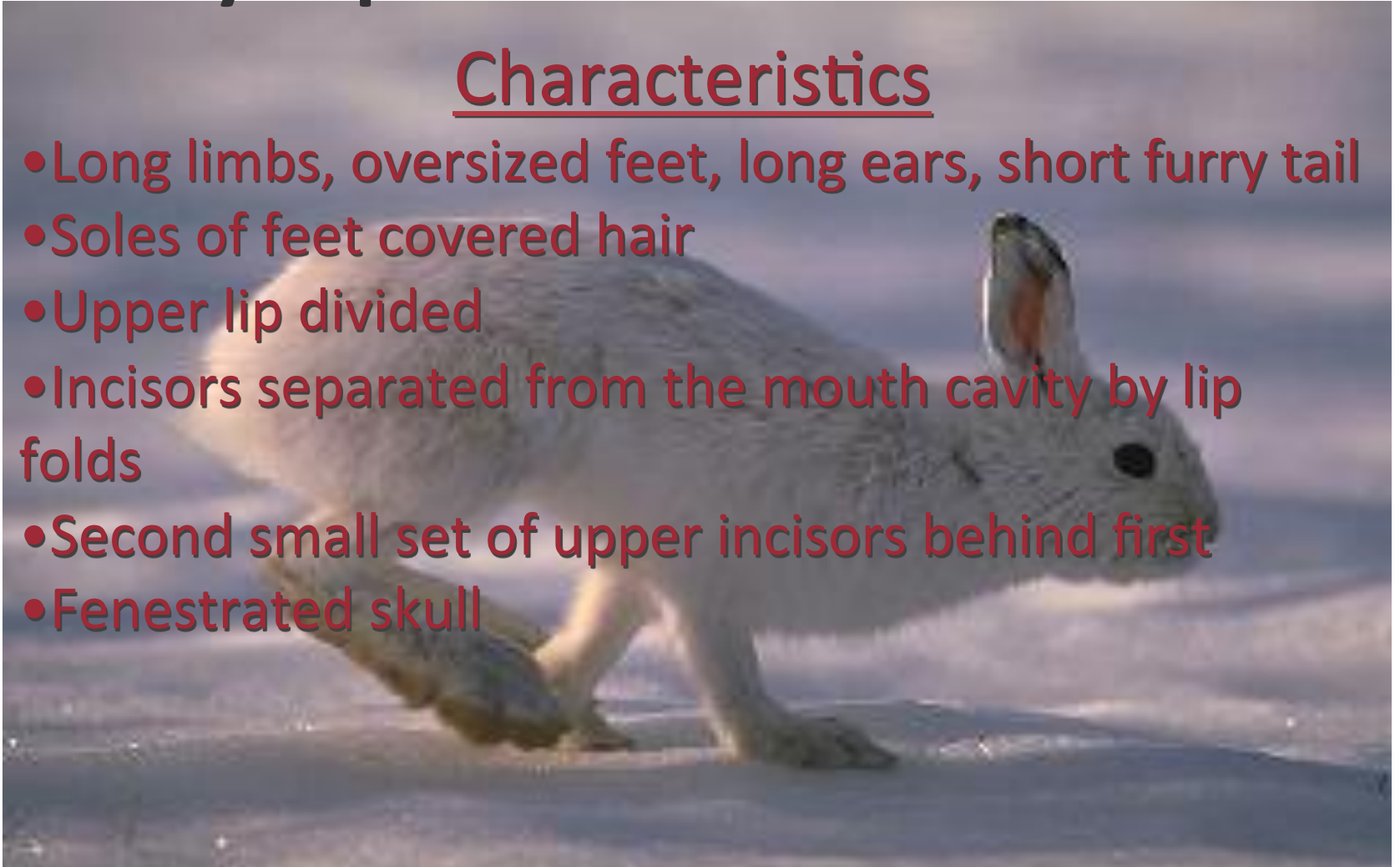


# Order Lagomorpha

## Family Leporidae– Rabbits & Hares

### Characteristics

- Long limbs, oversized feet, long ears, short furry tail
- Soles of feet covered hair
- Upper lip divided
- Incisors separated from the mouth cavity by lip folds
- Second small set of upper incisors behind first
- Fenestrated skull







Appalachian Cottontail –  
*Sylvilagus obscurus*

- Slightly smaller, shorter ears, more black on back than Eastern
- Cooler, higher, thicker wooded cover than Eastern
- Sparse over range, outcompeted by Eastern in more open habitat

Eastern Cottontail –  
*Sylvilagus floridanus*

- \* Most common, widespread lagomorph in N.A.
- \* Prefers edge habitat
- \* Broad vegetarian diet in summer/twigs and bark in winter
- \* Cuttings at sharp 45-degree angle
- \* Several litters/year



# Order Rodentia - Rodents

## Characteristics

- Chisel-like incisors specialized for gnawing
  - 4 incisors only – grow continuously
  - Enamel on anterior surface only, dentine on back
- Diastema (gap) separates premolars from incisors
- Most successful, widely distributed order – constitute approximately 40% of named species worldwide



# Family Sciuridae – Squirrels, Chipmunks, Woodchucks

## Characteristics

- Large eyes, well-haired tails
- Active during day except flying squirrels
- Set of unique skull features
  - Small infraorbital canal
  - Prominent postorbital processes
  - Two premolars develop in upper jaw
  - Prominent auditory bullae
  - Four toes on front feet, five on hind feet







Woodchuck/Groundhog  
(*Marmota monax*)

- Many fossorial adaptations
- Crepuscular, most of day in burrow
- Digs own burrows – 1.8 m deep, 7.5-9 m long
- Burrows important for many other spp.
- Hibernates (Oct.-Feb.)
- Primary food – herbaceous plants
- Can cause agriculture damage



Eastern Chipmunk –  
*Tamias striatus*

- Large internal cheek pouches
- Hibernates but doesn't store fat
- Digs own burrows - >9 m long
- Deciduous forests, brushy habitat
- Primary food – seeds/nuts but also inverts, small verts, eggs



- \* Largest tree squirrel in N.A.
- \* Prefer open, mature hardwoods or pine forests
- \* Less adept climbers than gray squirrel
- \* Feeds on variety of nuts, fungi, bird eggs, seeds and cambium beneath tree bark

Eastern Fox Squirrel - *Sciurus niger*







Eastern Gray Squirrel –  
*Sciurus carolinensis*



- Distinguished from fox squirrel by silvery-gray vs. tawny underparts and tail
- White/off-white eye ring
- Inhabits dense hardwood-mixed forests, river bottoms
- Excellent climbers
- Spends most of its time in or near trees
- Important game species



Red Squirrel –  
*Tamiasciurus hudsonicus*



- High elevation mountains, prefers conifers but also in mixed stands
- Vocal – often act as forest sentinels when intruder present
- Often has favorite “feeding stump” where pinecone and nut husks are piled



## Southern Flying Squirrel - *Glaucomys volans*



- Nocturnal
- Loose fold of furred skin connects front and hind limbs from wrist to ankles
- Cartilaginous spurlike supports at wrists help extend skin folds
- Fur is dense, soft, fine, glossy

## Northern Flying Squirrel *Glaucomys sabrinus*

- Larger size
- Pure white belly fur
- VA endangered species



# Family Castoridae (Beaver)



American Beaver – *Castor canadensis*



- Largest N.A. rodent – up to 40 kg
- Many adaptations to semiaquatic lifestyle
- Trapping led to extirpation in VA in 1911; reintroduced in ' 30s
- Important modifiers of forest ecosystem – tree cutting; dam building
- Monogamous – mate for life; live in family groups



# Family Muridae – Rats, Mice & Voles



## Characteristics

- Largest family of mammals in the world
- Rats and Mice have large eyes, ears, long tails
- Voles have small eyes, ears, short tails
- Occupy wide diversity of habitats
- Diverse food habits – many omnivorous
- Generally high reproductive rates – important link in food web – bulk of diet of many predators



Allegheny woodrat – *Neotoma magister*



White-footed Mouse - *Peromyscus leucopus*



Golden Mouse – *Ochrotomys nutalli*

- Allegheny woodrat inhabits cliffs, bluffs of river valleys, wooded bottomlands, swamps and caves. Known for collecting odd items.
- White-footed mouse inhabits mixed or hardwood upland forests, brushland.
- Golden mouse inhabits lowland heavily-forested floodplains. Semiaboreal.



## Subfamily Arvicolinae – Voles, Lemmings



Pine Vole – *Microtus pinetorum*

- Moist woodlands, but also orchards, fields, gardens
- Semifossorial
- Diet: Roots, tubers, bark, fruits, seeds
- Economic damage



Red-backed vole – *Clethrionomys gapperi*

- Reddish-brown dorsal stripe
- Cool, damp forests
- Diet: Green veg., bark, fungi, seeds, nuts, inverts



Southern bog lemming – *Synaptomys cooperi*

- Broad, grooved incisors
- Prefer wet sites, but also in upland
- Diet: mosses, grasses, fungi,





Muskrat - *Ondatra zibethicus*

- Paired musk glands used to mark territory
- Partially webbed feet, laterally compressed tail, water-shedding fur
- Feeds predominantly on aquatic veg.
- America's most popular furbearer

## Family Zapodidae



Meadow Jumping Mouse - *Zapus hudsonius*

- Greatly elongated hind limbs
- Long sparsely-haired bicolored tail
- Prefer wet meadows, forest glades
- Movement series of short hops but capable of 1 m leaps
- Grass seeds majority of diet
- Hibernates over winter

## Non-natives



House Mouse - *Mus musculus*



Norway Rat – *Rattus norvegicus*



# Order Carnivora - Carnivores

## Characteristics

- Strong, conical, recurved canines
- Carnassial premolars-molars for shearing, cutting
- Skull with complete zygomatic arch





# Family Ursidae - Bears

## Characteristics

- Largest land carnivores
- Small eyes, ears, short tails
- Carnassial teeth not developed
- Plantigrade locomotion
- Winter dormancy



Black Bear - *Ursus americanus*

- Anterior 3 molars often absent or rudimentary; large last molar
- VA distribution is expanding-Piedmont
- Habitat: Heavily wooded forest, lowland swamps
- Diet: Omnivorous, changes seasonally – mast, fruits, leaves, insects, eggs, small vertebrates



# Family Procyonidae – Raccoon Family

## Characteristics

- Moderately long, bushy, ringed tails
- Plantigrade locomotion
- Premolars, molars for crushing, not shearing
- Partially arboreal



Raccoon - *Procyon lotor*

- Long toes, forepaws well adapted for grasping, manipulating objects
- Distribution: S. Canada-Panama
- Habitat: Moist timbered areas, riparian habitat, swamps
- Diet: Omnivorous, availability-based – fruits, berries, shellfish, crustaceans, fish, snails, reptiles, rodents







### Gray Fox - *Urocyon cinereoargenteus*

- Grizzled, salt and pepper fur
- Feet, backs of ears rusty-yellow
- Black-tipped tail
- Prefer deciduous forest, heavily wooded swamps, adept climber
- Diet: Omnivorous, heavy mouser, but also more fruit than red fox



## Family Canidae

### Red Fox – *Vulpes vulpes*

- Sharp, elongate muzzle
- Front of feet, backs of ears black
- White-tipped tail
- Broken habitat, farmland, sparse woods, marshes, streams
- Omnivorous, diet governed by food availability



Coyote – *Canis latrans* (lycaon?)

- Not native to Virginia, here since 1960s
- Larger than Western coyotes, evidence of wolf genes in many Eastern animals
- Prefer open woodlands, brushy areas, but adapt to urban, suburban habitats
- Diet: primarily rodents, rabbits, but also carrion, fruit, deer, livestock, pets





# Family Mustelidae – Weasel Family

## Characteristics

- Short limbs
- Paired scent glands
- Flattened brain case; shortened rostrum
- Three pairs of incisors
- Delayed embryo implantation common





Least Weasel – *Mustela nivalis*

- Medium-sized weasel - 45 cm long
  - Fur brown above, cream below
  - Distrib: S. Canada – N. Bolivia
  - Edge habitat near water, farmland
  - Delayed implantation – 9 months!
- Diet: mainly small mammals, but also birds, snakes, insects

- World's smallest carnivore
- 20 cm long – 45 grams ave. wgt
- Circumpolar distribution
- Old fields, forest edges
- Semifossorial – rodent runways
- Induced ovulation
- Diet: small mammals, especially *Microtus*, also shrews, insects

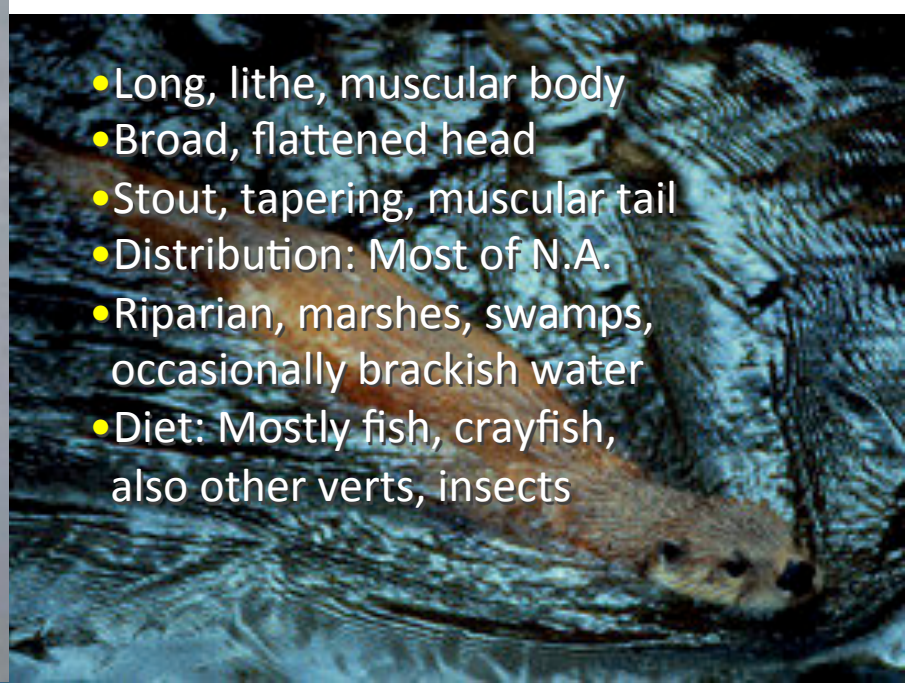


Long-tailed Weasel – *Mustela frenata*





Mink - *Mustela vison*



- Long, lithe, muscular body
- Broad, flattened head
- Stout, tapering, muscular tail
- Distribution: Most of N.A.
- Riparian, marshes, swamps, occasionally brackish water
- Diet: Mostly fish, crayfish, also other verts, insects

River Otter (*Lontra canadensis*)

- Uniform dark brown pelage
- Distribution: Most of N.A..
- Wooded aquatic habitat preferred
- Range widely for food
- Dig burrows or use that of others
- Wide range of food – mice, muskrats, birds, fish, crayfish







Spotted Skunk – *Spilogale putorius*

- Smaller of 2 VA skunks
- 6 broken white lines over back
- Tail black with broad white tip
- Distribution: U.S. south into Central America
- Habitat: rock piles, cliffs in mountain forests, sparse woods
- More active, agile, alert vs striped
- Omnivorous-prefers insects

Striped Skunk - *Mephitis mephitis*

- Long, coarse, oily pelage
- Broad white V over back
- Relatively small head, eyes, ears
- Distribution: Canada south to N. Mexico
- Open, brushy habitat, farmland
- Diet: Omnivorous – small mammals, many insects, grubs





# Family Felidae – Cat Family

## Characteristics

- Most advanced carnivores – shortened skull, large canines, highly developed carnassials, only one upper and lower molar
- Recurved horny projections on tongue
- Retractable claws
- Vertically contracting pupils
- Acute senses of sight, smell, hearing



Bobcat – *Lynx rufus*

- Back of ears black with central white spot
- Broad face set off by ruff
- Distribution: S. Canada to Mexico
- Habitat: Second growth deciduous forests, river bottom swamps
- Diet: Rabbits, rodents, deer?
- Induced ovulation



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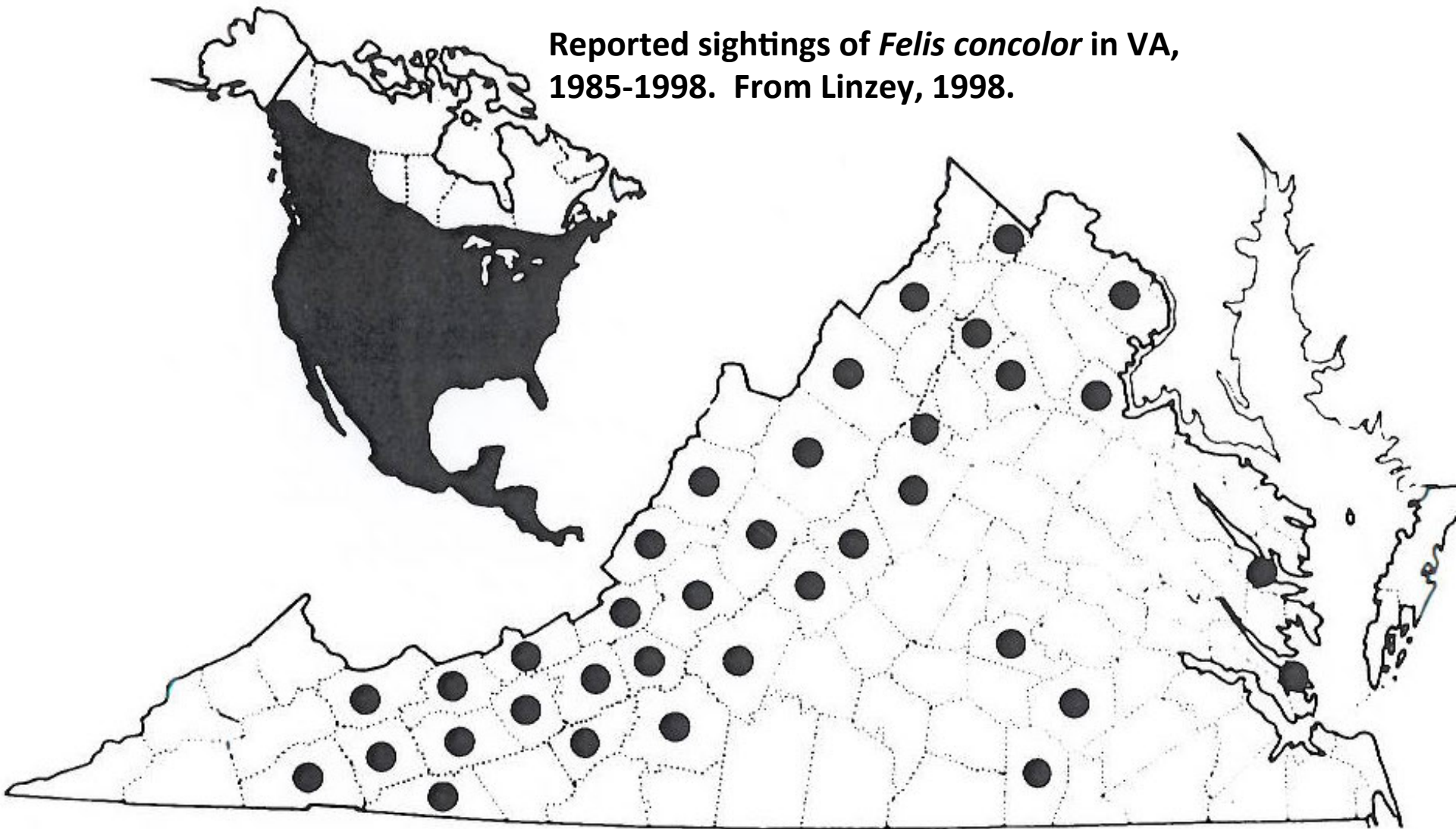




Mountain Lion - *Felis concolor*



Reported sightings of *Felis concolor* in VA,  
1985-1998. From Linzey, 1998.



- Between 1979-1994, 279 reports received, 124 of which considered of merit to investigate – no tracks, hair, scat positively IDed as *F. concolor*
- To date, no verifiable sighting of a wild Mountain Lion in VA



# Order Artiodactyla – Even-toed Ungulates

## Family Cervidae – Deer Family

### Order Characteristics

- Axis of foot passes between 3<sup>rd</sup>-4<sup>th</sup> digits
- Upper incisors reduced or absent; canines usually reduced or lost
- Stomach with up to 4 chambers

### Family Characteristics

- Antlers
- Glands on face, legs, feet
- Most widely hunted game species





### White-tailed Deer - *Odocoileus virginianus*

- White fur on underside/edges of tail – held aloft as warning sign
- Family group includes doe, yearling does, fawns of the year
- Bucks solitary in fall, congregate in spring and summer.
- Habitat: Secondary forest alternating with thickets, glades, meadows
- Food: Seasonally variable – leaves, twigs, fungi, briars, grasses, fruit...





- Urban/Suburban deer the new problem
- Overpopulation requires new management programs
- Overpopulation reducing overall habitat/species diversity
- Overpopulation may lead to serious outbreaks of CWD and HD

# Threats/Issues to VA' s Mammals

- Invasive/Non-native species
  - Feral Hogs
    - Destroy habitat for native wildlife and compete for food space
    - Destroy wetlands (sensitive habitat)
    - Spread disease (to domestic swine)





# Threats/Issues Cont.

- Disease Issues:  
Whitetail Deer
  - Chronic Wasting Disease
  - Hemorrhagic Disease

## Many Mammals

- Rabies
- Distemper
- Mange



# Threats/Issues Cont.

- Habitat Loss/Degradation
  - More urban wildlife issues
    - Fox dens in suburbs
    - Car/Wildlife Collisions (VA is in top 5 states for deer/car collision probability)
    - Deer
  - Central VA: more bear nuisance issues
    - Trash, Bird feeders, cattle feed/barns, grills, houses
  - National Forest Habitat Issues



# Additional Resources

- [www.dgif.virginia.gov](http://www.dgif.virginia.gov)
  - Wildlife Species Plans
  - Habitat Information
- [www.vafwis.com](http://www.vafwis.com)
  - Species Profiles/Distribution
- VA Museum of Natural History
  - Evolution/History of Mammals



Any Questions?