

Mammals of Virginia



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- * Describe the diversity and distribution of mammals in Virginia
- * Describe the role of mammals in Virginia ecosystems
- * Describe the natural history and basic biology of mammals
- * Describe the adaptations of mammals and how these relate to environmental factors
- * Describe the taxonomy of mammals
- * Describe the key characteristics used to identify mammals
- * Describe threats and/or issues relating to mammals in Virginia
- * Recognize some common mammals occurring in the local ecosystems
- * Recognize rare or special species that indicate habitat qualities
- * Understand appropriate techniques and methods for studying mammals

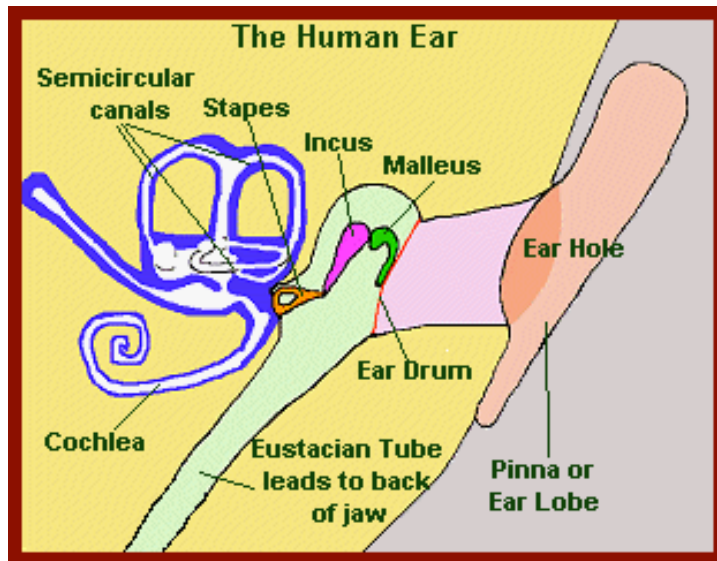
What makes a mammal?



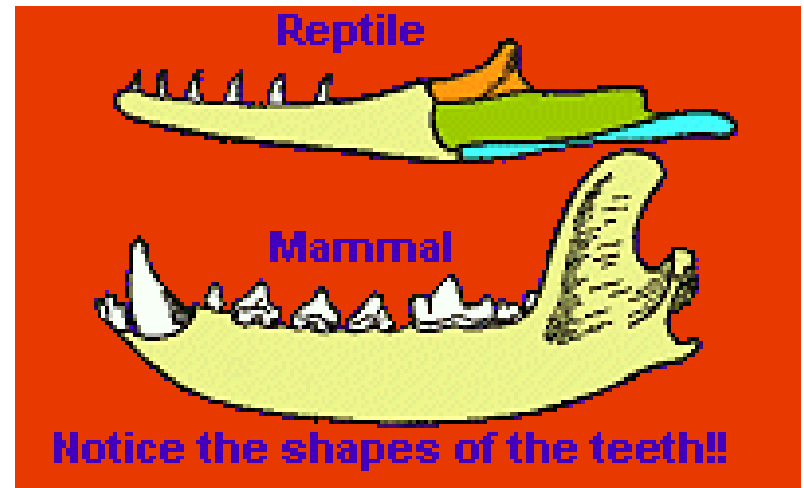
Mammary glands*

Hair (pelage)

What makes a mammal?

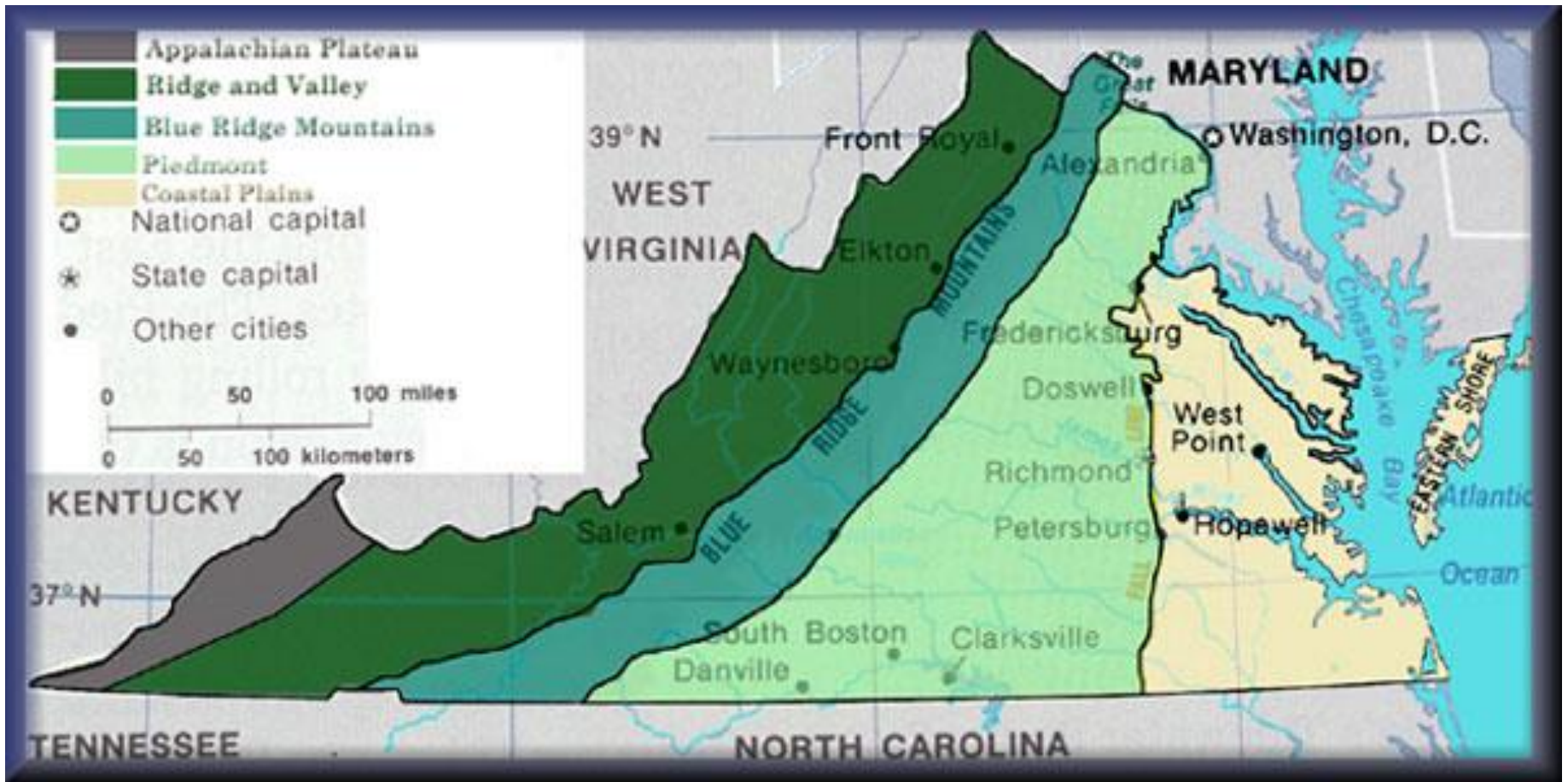


3 middle ear bones



Also:
Diaphragm
4-chambered heart

Jaw made of single bone



SW – state-wide

M – mountains

SE – southeast

Kingdom – Animalia

Phylum – Chordata

Class – Mammalia

Order – Carnivora

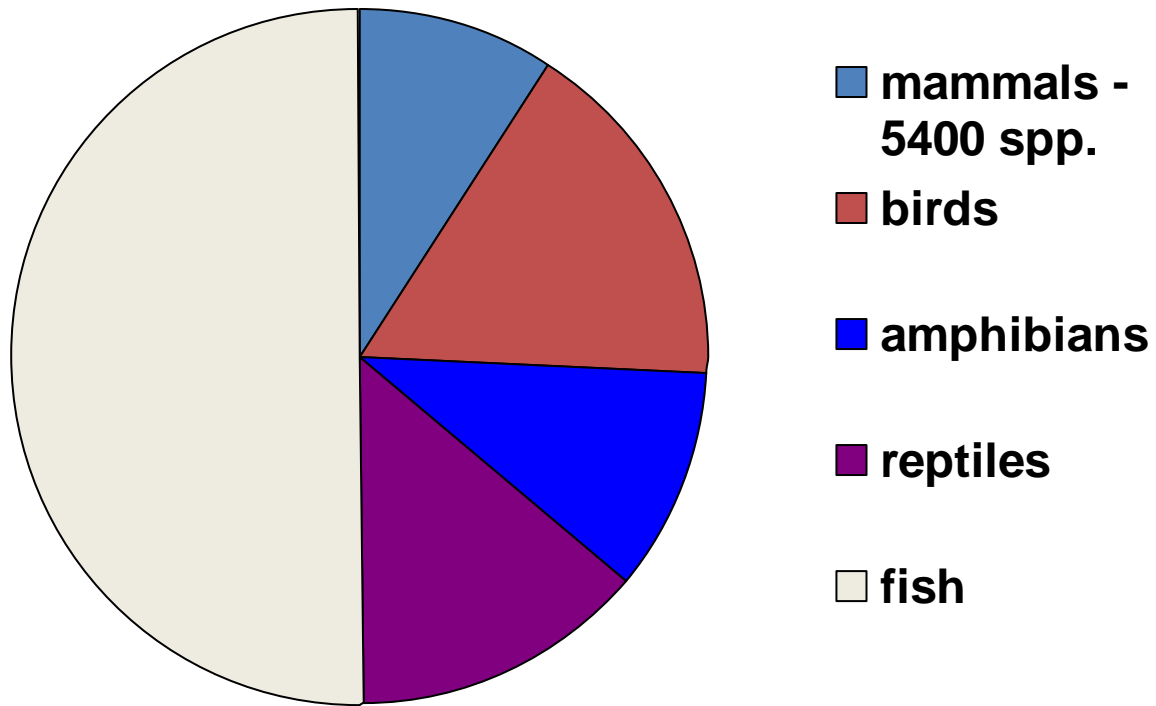
Family – Ursidae

Genus – *Ursus*

Species – *americanus*



Number of vertebrate species by Class



Class – Mammalia

Order – 19 Orders...

Species – 75 in Virginia (terrestrial)

Carnivora

(55% have statewide dist.)

Artiodactyla

Rodentia (½ total spp.)

└─── Cetacea

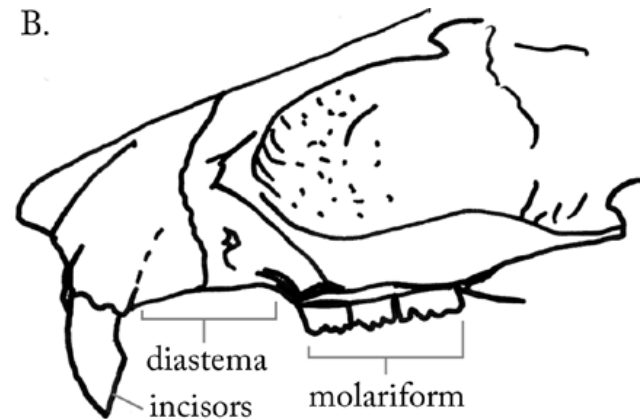
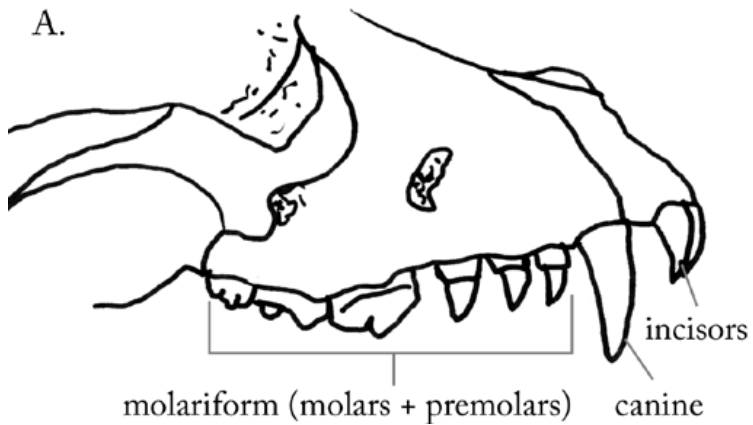
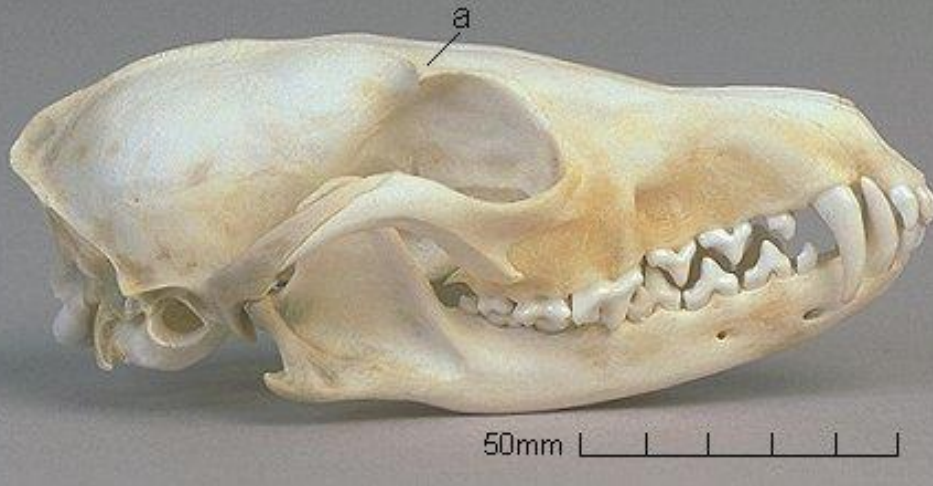
Chiroptera (1/4 total spp.)

Lagomorpha

Primates

Marsupialia

Comparative anatomy - skull



Comparative anatomy - skull



Carnivore:
Reduced teeth
specialized



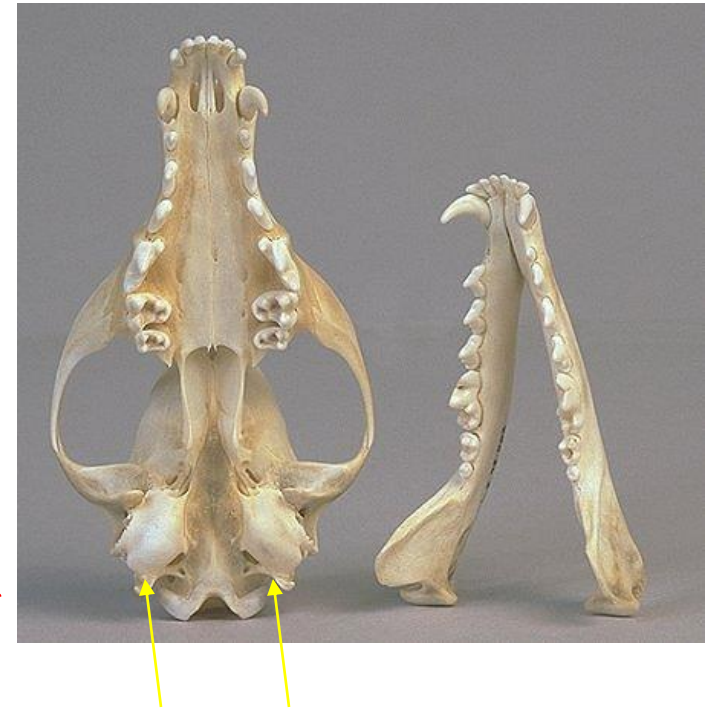
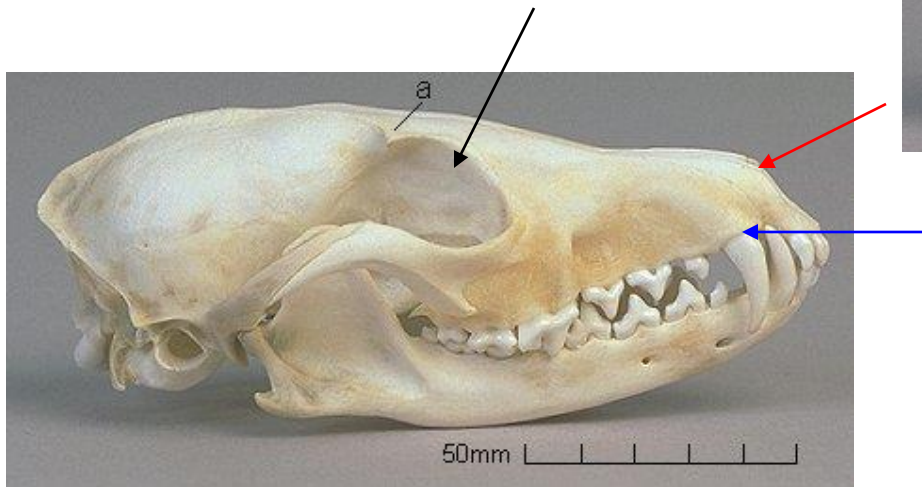
Omnivore:
Many teeth
generalized

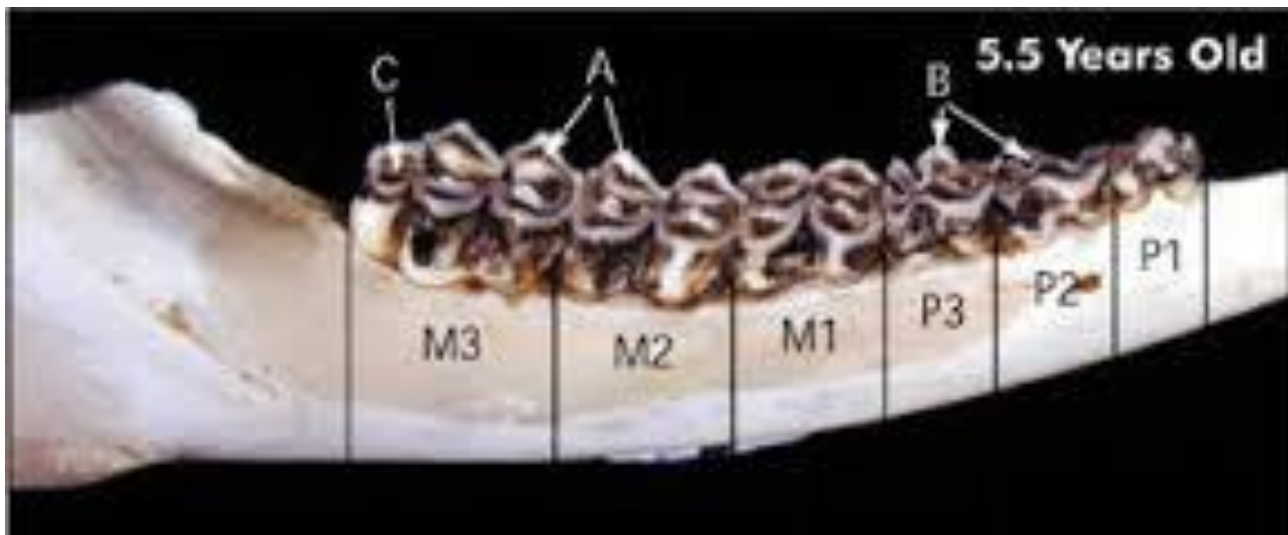


Herbivore:
Reduced teeth
specialized

Comparative anatomy - skull

- diet – look at teeth type
- hearing – auditory bullae
- smell – nasal turbinates
- vision – position of eyes, skull shape
- age – tooth eruption & wear, gum recession, sutures/ossification





Pelage

Keratin – cornified cells that comprise hair, scales, feathers, nails, horns

Cuticle – outer layer of cells on hair, cuticular pattern used for diagnostic purposes

Underfur – short, dense hair that provides insulation

Guard hairs – longer, thicker protective hair that contains pigment

Arrector pili muscles – used to raise hair for warmth or behavioral



vibrissae

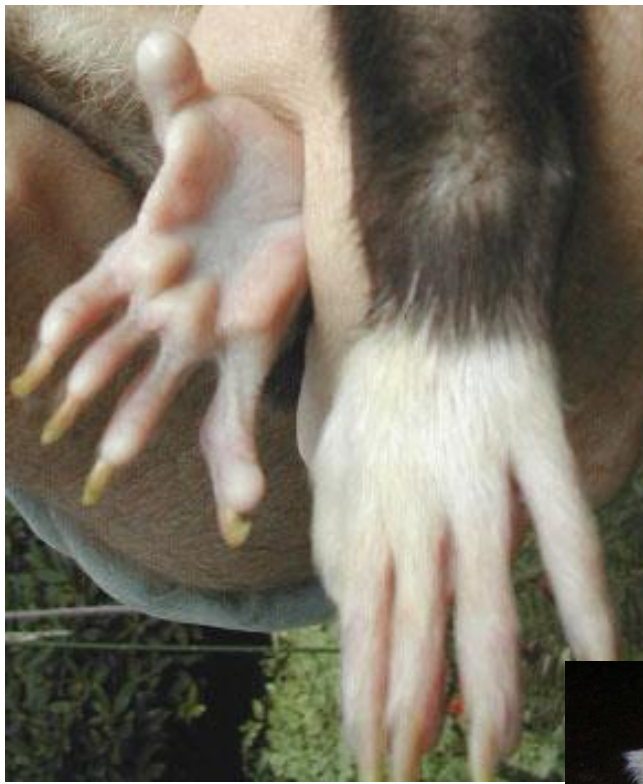


Order
Marsupialia

Opossum
Didelphis virginiana

Marsupial; 50 teeth
Statewide distribution
Omnivorous

Breed first year; two litters per year – 7-9 altricial young
12-13 days gestation
Life expectancy – 1.3 years



B. Mansell ©1998

Order Insectivora



Moles – 3 spp.



Shrews – 10 spp.

Moles – 3 spp.

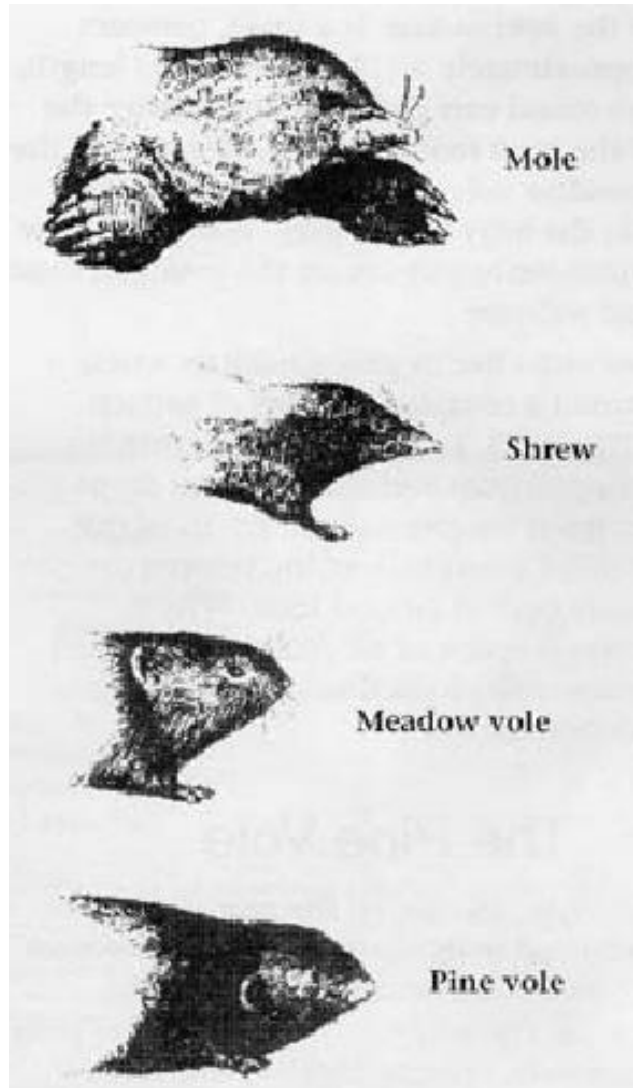


Star-nosed mole
Eastern mole
Hairy-tailed mole

Fossorial
Active day and night
Prefer moist soil

Eat earthworms and invertebrates
Up to 50% of body wt./24 hours

Mole or Vole?



Mole – meat eater

Vole – vegetarian

Shrews – 10 spp.



Water shrew



Short-tailed shrew

High metabolic rate – eat 50% of own weight in 24 hrs., 750 heart beats/min. (up to 1,200)

Mostly nocturnal

Excellent sense of smell

Venomous saliva in short-tailed shrew

Echolocation

Order Chiroptera

Bats – “winged hand”

>1000 spp. worldwide

16 spp. commonly found in Va.

3 fed. 1 state endangered spp.

Myotis – widest world range of any non-marine mammal *genus*

Elongated fingers

Flight membrane

Keeled sternum

Tragus

Echolocation

Uropatagium



Bats of Virginia

Endangered or Threatened, Concern

Big brown

Eastern big-eared
(incidental)

Tricolored Bat (SE)
(Eastern pipistrelle)

Evening

Gray (FE)

Hoary

Indiana (FE)

Little brown (SE)

Northern long-eared myotis (FT)

Northern yellow

Rafinesque's big-eared (SE)

Seminole

Silver-haired

Small-footed myotis (C)

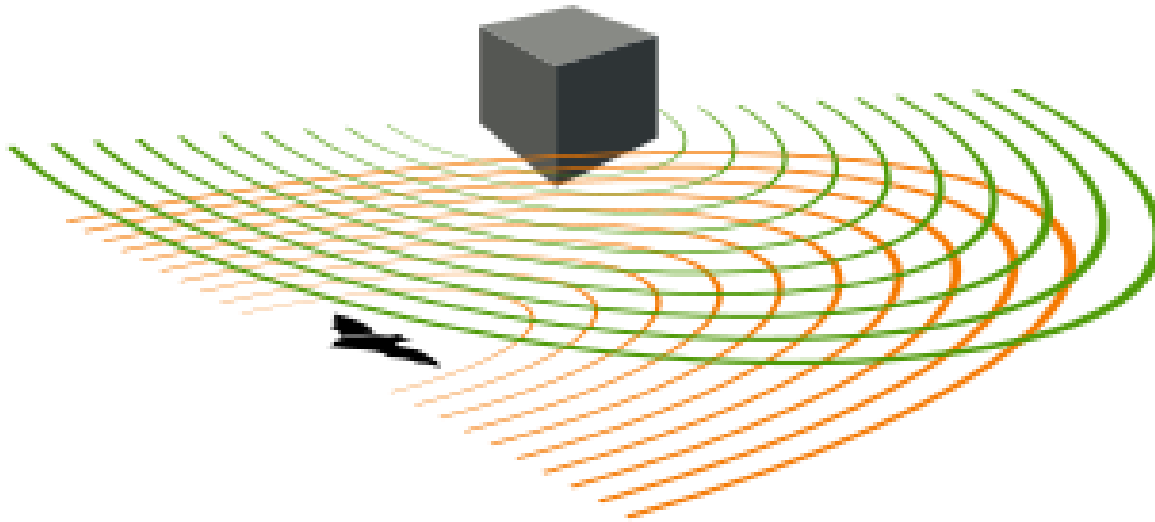
Southeastern myotis

Virginia big-eared (FE)

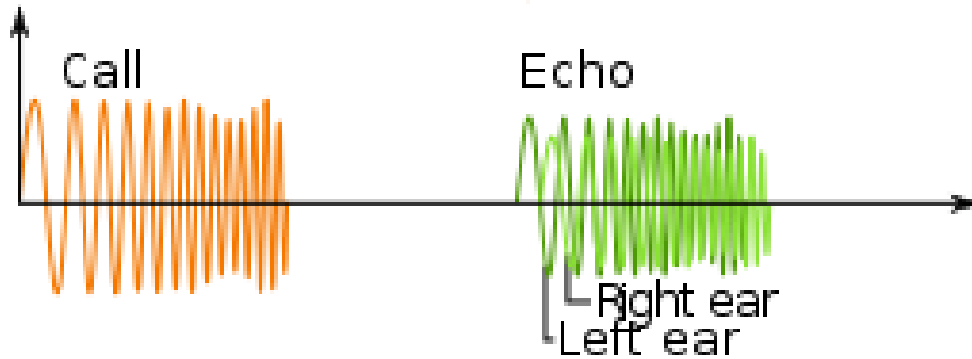
Eastern red

Brazilian free-tailed

Echolocation



- Frequency modulation FM
- Constant frequency CF
- Intensity
- Harmonic composition
- Call duration
- Pulse interval



Bats

Insectivorous

1-2 young per year – delayed fertilization

Some can live up to 30 years – usually 5-12 years

Hibernate or migrate

Population decline

Rabies



Rabies

- Infectious viral disease that affects the nervous system
 - Mammals only
 - People get rabies from the bite of an animal with rabies
 - Primarily raccoons, skunks, foxes, coyotes, bats
- Must be confirmed by a laboratory
 - 10,000s of people are successfully treated each year
 - A few people die each year in the United States

Rabies

Animals to watch out for:

- Odd behavior; aggression
- Active during the day when normally nocturnal
- Unable to move normally

Small rodents and lagomorphs are almost never found to be infected with rabies and have not been known to cause rabies among humans in U.S.



Silver-haired bat



Little brown bat



Red bat



Big brown bat



Big eared bat

Yellow bat
Evening bat
Small-footed myotis



Gray myotis

Red bat – *Lasiurus borealis*



Roost in trees

4 mammae

migratory

Mate during fall – delayed fertilization

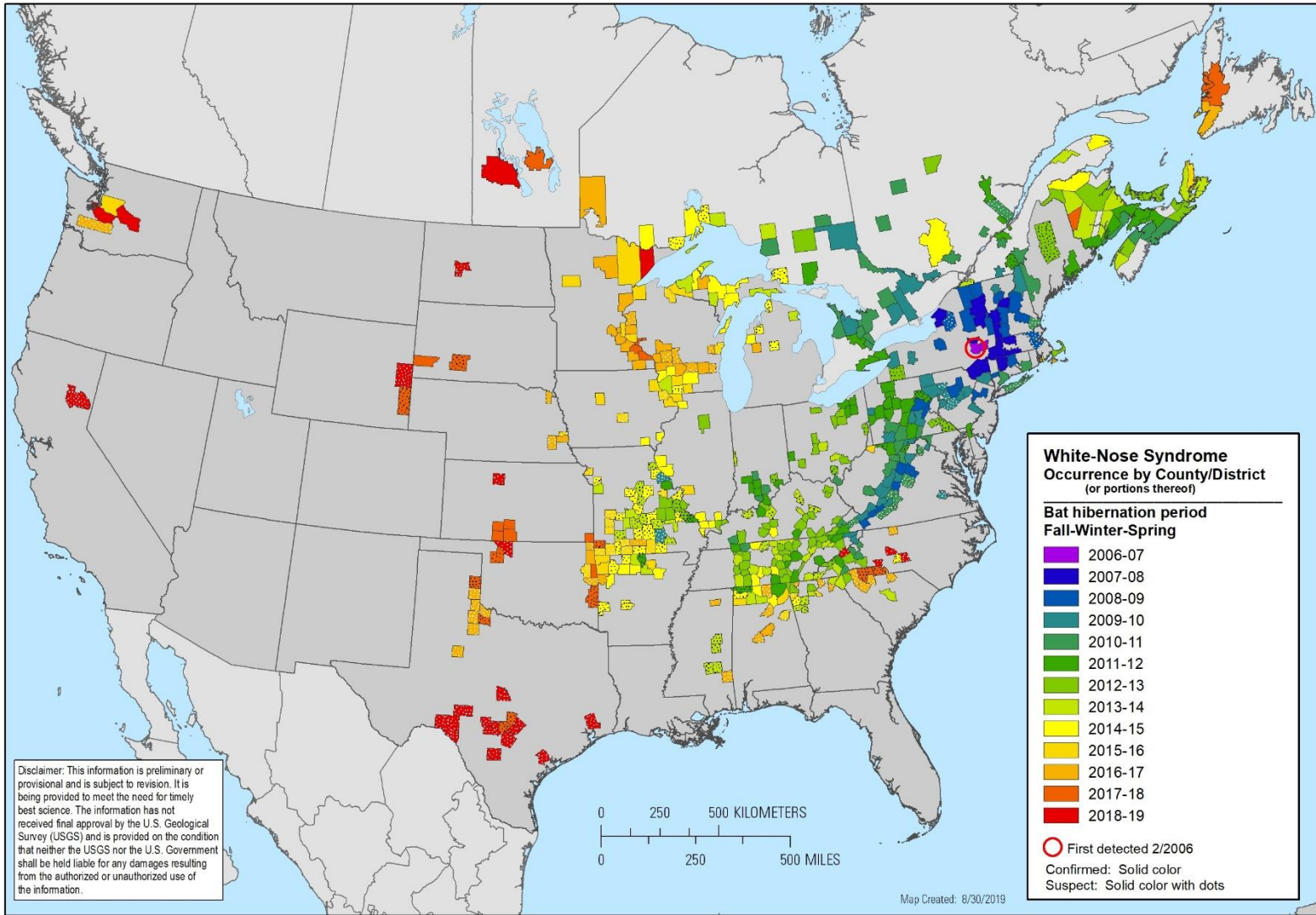
3-4 young



White Nosed Syndrome



<https://www.sciencebase.gov/gisviewer/wns/>



Citation: White-nose syndrome occurrence map - by year (2019). Data Last Updated: 8/30/2019. Available at: <https://www.whitenosesyndrome.org/static-page/wns-spread-maps>.

VA Species of Concern

- Little Brown Bat
- Big Brown Bat
- Smallfooted myotis
- Indiana myotis
- Gray myotis
- Virginia big-eared bat
- Northern big-eared bat



Order Lagomorpha

Rabbits, hares, and pikas

Dentition – 2/1,0/0,3/2,3/3=28

Skull fenestration

Crepuscular or nocturnal



Marsh rabbit – SE Virginia

Eastern cottontail – Statewide distribution

Appalachian cottontail – mountains

Snowshoe hare – Highland County



Marsh rabbit



Appalachian cottontail



Eastern cottontail



Snowshoe hare

Order Rodentia

4 chisel-like incisors that grow continuously

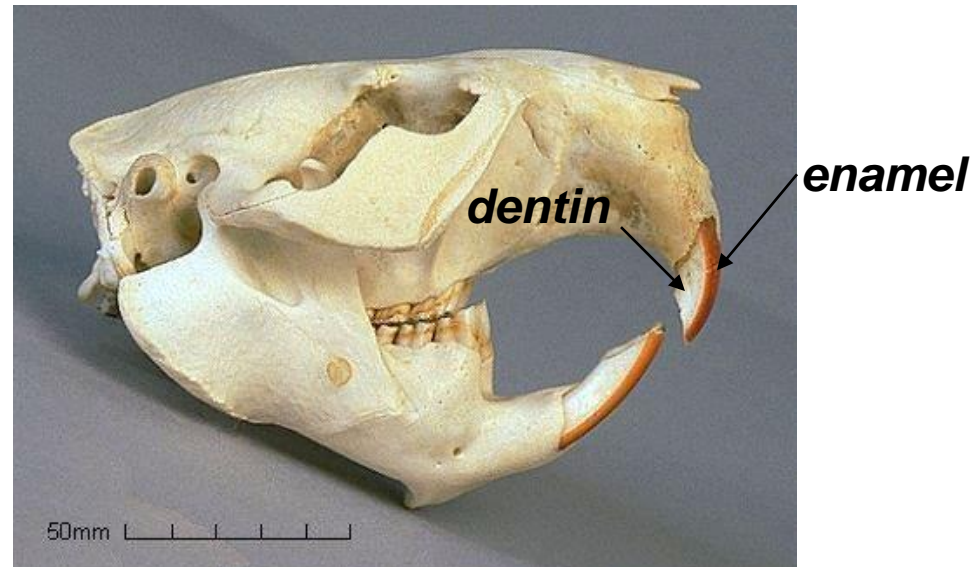
Terrestrial, arboreal, fossorial, semi-aquatic, gliding

Nocturnal and diurnal

Most are active throughout the year

Comprise 40% of mammals in world

31 spp. in Virginia



Family Sciuridae

Chipmunks (1), squirrels (5), and woodchucks (1)



Eastern chipmunk

Solitary, diurnal

Dig burrows

Active mostly on ground

Hibernate

Eat seeds, grains, berries

Opportunistic meat eater

**(insects, snails, birds, bird eggs,
mice, salamanders, etc.)**

Woodchuck

Statewide distribution

Prefer edges of woodlands

Diurnal

Eat herbaceous plants

True hibernators – reduced temperature,
heart rate, respirations, breathing

Can climb



Southern flying squirrel

Nocturnal

Statewide distribution

Glide 20-30 ft.

Cavity nesters

Will share nest

78% mast*, fungi, buds, lichens

22% insects and other invertebrates



Northern flying squirrel

Larger than southern

Gray belly (vs. white)

Limited to spruce-fir forests

Endangered species

* Hard and soft fruits and nuts

Eastern gray squirrel

Diurnal, do not hibernate

Diet – mast, buds, fungi

Squirrels vs. oaks, caching

Statewide distribution



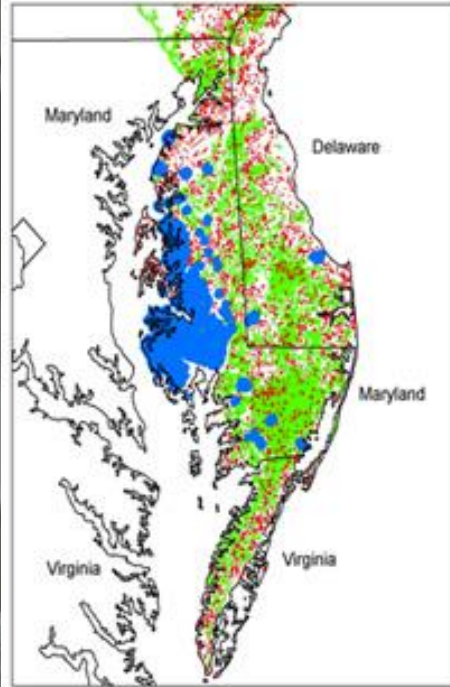
Fox squirrel

Diurnal, do not hibernate

Found throughout state

Delmarva – delisted 11/15

Larger than gray



- = known DFS populations
- = large forest patches
- = small forest patches

Delmarva Fox Squirrel

Red squirrel

Smaller than gray or fox

Western and northern Va.

Typically in conifers or mixed

Eat mast, berries, fungi (poisonous)

Large caches



Family Castoridae

Beavers

Largest rodent in N. America
Statewide distribution

Monogamous, mate for life

Live 10-12 years

Chiefly nocturnal

Dams, lodges & canals

Young stay in colony up to 2 yrs.



Trapping/historical populations
Breathing
Nose and ears close under water

Family Muridae

Rats and Mice – 17 spp.



Peromyscus sp.



Deer mouse
Mountains/No. Virginia



House mouse



White-footed mouse
Statewide distribution



Wood rat

- mountainous areas
- hairy tail
- middens

RATS!



Norway rat



Black rat

Voles – 4 spp.



Meadow vole



Woodland vole



Rock vole*



So. Red-backed vole

Muskrat or Nutria?



Muskrat – vertically flattened tail
Native species
Breed year-round, 3-5/litter
Trapped for fur
Throughout Virginia



Nutria – round tail
Non-native species
Found mostly in SE Va.

Porcupine



Extirpated in Virginia

Order Carnivora

- **Canidae – dogs, foxes**
- **Ursidae – bears**
- **Procyonidae – raccoons**
- **Mustelidae – weasels, mink**
- **Mephitidae – skunks**
- **Felidae – cats**

Family Canidae



Red fox

Vulpes vulpes

<http://www.mammalogy.org/articles/origin-recently-established-red-fox-populations-united-states-translocations-or-natural-ran>

Statewide distribution

Prefers open habitat, fields, hedgerows, farmland mixed with forest

Lives ~4 years

Mostly nocturnal

Eat mostly rodents, rabbits, misc. small mammals, but also plant material

Family Canidae



Gray fox

Urocyon cinereoargenteus

Statewide distribution

Prefers brushy deciduous forest

Can climb trees

More nocturnal than red fox

**Eat mostly small mammals but also plant material
(more than red fox)**

Family Canidae



Coyote
Canis latrans

- Statewide distribution – *non-native* to Virginia**
- Prefers open woodlands, forest edges, fields, brushy areas**
- Mostly nocturnal**
- Can be a problem for livestock producers**
- Eat mostly rodents and rabbits**
- Live 6-8 years**



Family Ursidae



Black bear

Ursus americanus

Live 12-15 years

~200-400 pounds

1-2 cubs/2yrs

Mature at 3 yrs.

Delayed implantation

Found in mountain region, some Piedmont, and Great Dismal Swamp

Well-defined home range

Prefers wooded areas and lowland swamp

Mostly nocturnal and solitary

Not true hibernators

Omnivorous, diet varies with seasonal food availability



Hibernation



Woodchuck- true hibernation

Metabolism – reduced to 10-30%

Respirations – 1 per 5-6 minutes

**Heart rate – 3-4 per minute
normal – 80-95 per minute**

**Temperature – as low as 38° F
normal – 95°-102°F**

During “true” hibernation temperature is typically reduced to within ~2°F ambient

Black bear- false hibernation

Metabolism – reduced to 50-60%

Respirations – 2-4 per minute

**Heart rate – 8-19 per minute
normal – 40-50 per minute**

Temperature – reduced by 12-14°F

Family Procyonidae



Raccoon
Procyon lotor

Statewide distribution

Prefers forests near water, stream and lake banks

Nocturnal, partially arboreal

Omnivorous

Live 10-12 years (3)



Family Mustelidae

Least weasel
Mustela nivalis

Found in mountain region
Virginia's smallest carnivore
Hearing range at <1Khz – 61Khz
No delayed implantation

Primarily nocturnal
Eats mice, shrews, voles, insects
High metabolism; relentless predators, bite prey at base of neck & hold on; will store excess food
Live 3-5 years; females mate at 3-4 mos.



Long-tailed weasel
Mustela frenata

Statewide distribution
Delayed implantation
Will attack larger prey (squirrels, rabbits, snakes)

Family Mustelidae



Mink

Mustela vison

Statewide distribution

Prefers forested stream, river and lake banks

Excellent swimmers/divers

Nocturnal/crepuscular

Eat mice, muskrat, rabbits, frogs, fish, crayfish; can hear ultrasound within range emitted by rodent prey

Live 3-5 years; delayed implantation

Family Mustelidae



River otter

Lontra canadensis



Statewide distribution (sp. of special concern)
Found in swamps, ponds, streams, rivers and lakes
Active day and night; learn to swim
Eat fish, frogs, crayfish, salamanders, turtles
Live 8-9 years

Family Mephitidae



Striped skunk
Mephitis mephitis

Statewide distribution

Highly variable stripe pattern

Mostly nocturnal

Prefer brushy and sparsely wooded habitat

Omnivorous; dig for insects and grubs

Predation by owls

Live 5-6 years

Family Mephitidae



Spotted skunk
Spilogale putoris

Found in mountain forests

Smaller than striped skunk

Nocturnal; can climb trees

Omnivorous

2-butene-1-thiol, 3-methyl-1-butanethiol, and 2-phenylethanethiol

Live 8-9 years

Family Felidae



Bobcat

Lynx rufus

Statewide distribution

Mostly occur in rugged, sparsely populated habitat; prefer second growth forest interspersed with clearings

Chiefly nocturnal; solitary

Diet consists mostly of rabbits and rodents

Live 6-8 years

Family Felidae



Mountain lion

Puma concolor

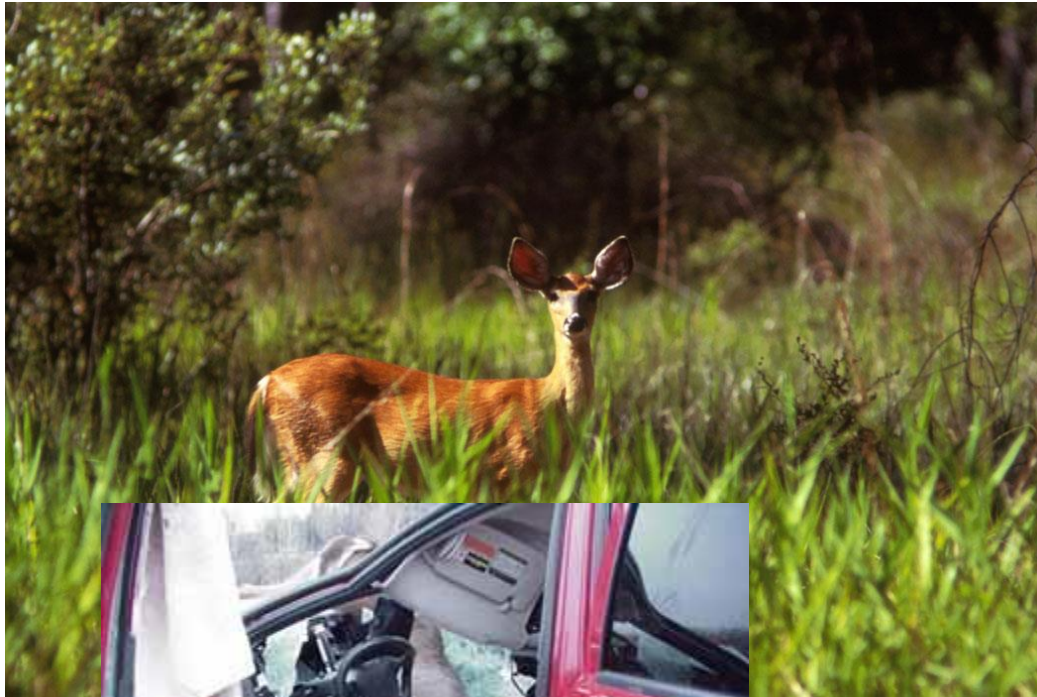
Historically had the widest range of any mammal sp. in North America; extirpated throughout most of the east.

Numerous recent “sightings” in Va., but those remain unconfirmed.

<https://dwr.virginia.gov/wildlife/information/eastern-cougar-puma/>

Order Artiodactyla

Family Cervidae



White-tailed deer
Odocoileus virginianus

Crepuscular
Forest habitat with open areas

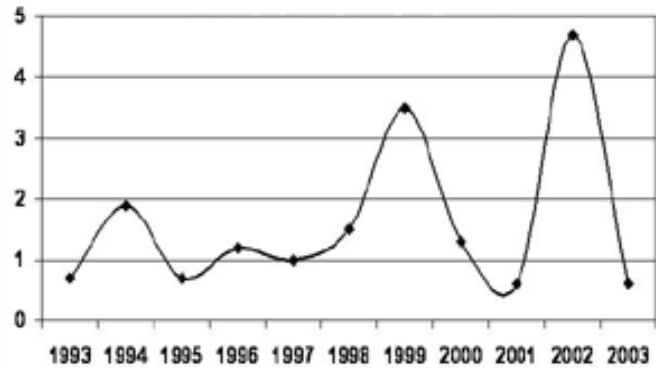
Leaping ability
Regionally/seasonally variable diet

Antlers not horns
Usually 2 young born, precocial young
Live ~10 years



- Hemorrhagic Disease

Percent Deer Exhibiting Splitting/Sloughing Hooves



Estimated annual prevalence of HD in Virginia east of the Blue Ridge based on the Department's sloughing/splitting hoof biological kill data.



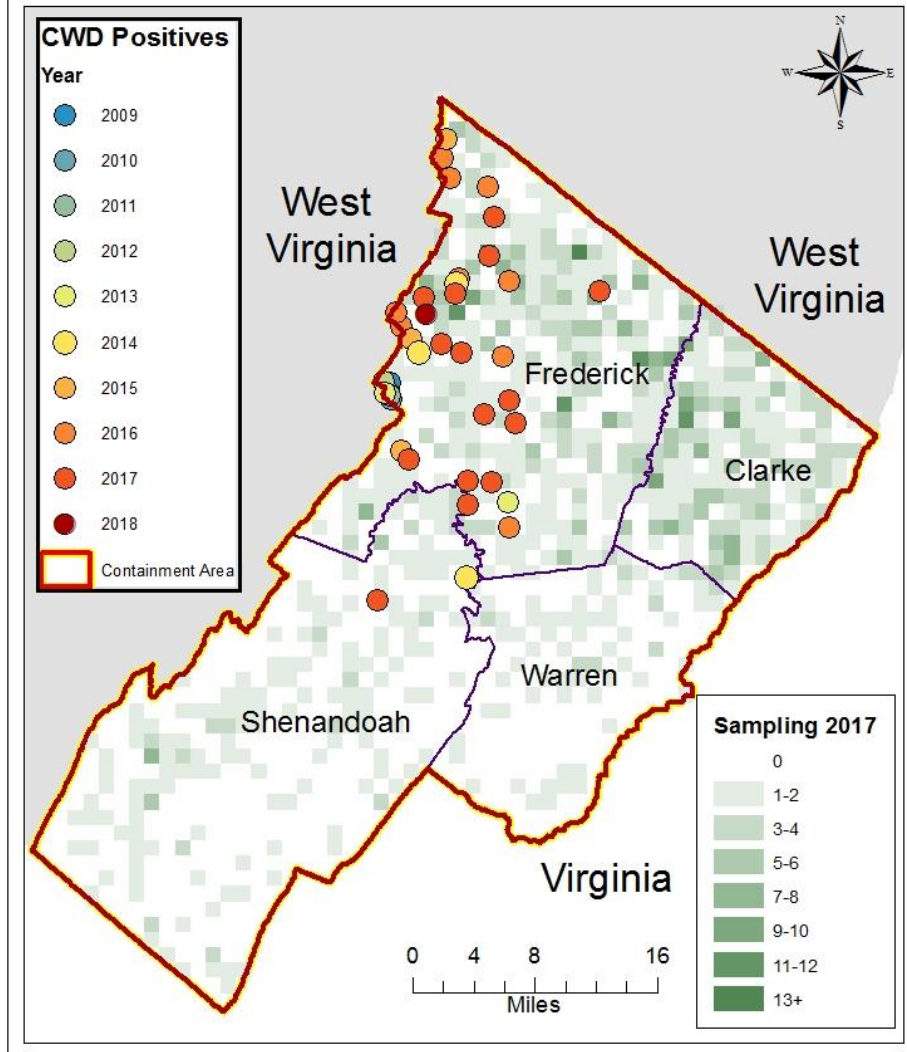
Sloughing or splitting hooves on two or more feet of a deer taken during the fall hunting season are typical of chronic HD. Photo used courtesy of the Southeastern Cooperative Wildlife Disease Study.

- Chronic Wasting Disease (CWD)



2002-2012 7,000 samples in VA
5 cases all in Frederick County

Virginia CWD Positive Deer 2009 - 2018



As of February 2018 there have been 38 confirmed cases of CWD in VA.

Antlers or horns?



Antlers:

- shed annually
- solid bone
- larger each year
- males only*
- velvet



Horns:

- not shed
- bony base
- keratinized sheath
- on both sexes*

Order Artiodactyla

Family Cervidae



Extirpated in Virginia?

Elk

Cervus elaphus

<https://blog.wildlife.virginia.gov/2016/09/a-growing-elk-herd-in-virginia/>

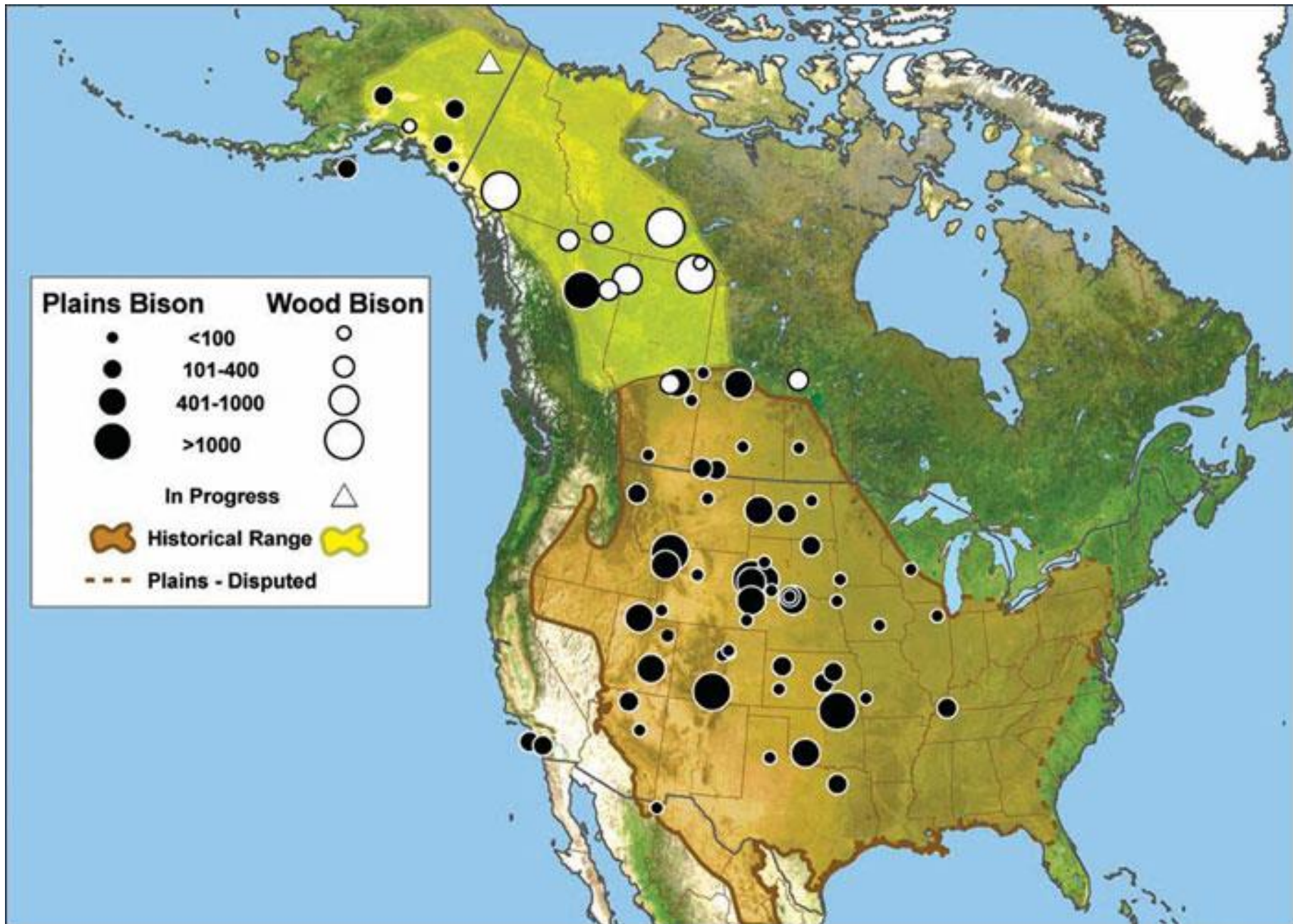
Order Artiodactyla

Family Bovidae



Plains bison
Bison bison bison

Don't do this!
Way too close!



American water shrew	<i>Sorex palustris</i>	SE
Carolina northern flying squirrel	<i>Glaucomys sabrinus coloratus</i>	FE SE
Delmarva Peninsula fox squirrel	<i>Sciurus niger cinereus</i>	FE SE
Dismal Swamp southeastern shrew	<i>Sorex longirostris fisheri</i>	ST
Eastern puma (=cougar)	<i>Puma (=Felis) concolor cougar</i>	FE SE
Gray bat	<i>Myotis grisescens</i>	FE SE
Gray wolf	<i>Canis lupus</i>	FE SE
Indiana bat	<i>Myotis sodalis</i>	FE SE
Rafinesque's eastern big-eared bat	<i>Corynorhinus rafinesquii macrotis</i>	SE
Rock vole	<i>Microtus chrotorrhinus</i>	SE
Snowshoe hare	<i>Lepus americanus</i>	SE
Virginia big-eared bat	<i>Corynorhinus (=Plecotus) townsendii virginianus</i>	FE SE
Virginia northern flying squirrel	<i>Glaucomys sabrinus fuscus</i>	FE SE

FE= federally endangered, ST= State threatened, SE= State endangered

MARINE MAMMALS

Blue whale	<i>Balaenoptera musculus</i>	FE	SE
Finback whale	<i>Balaenoptera physalus</i>	FE	SE
Humpback whale	<i>Megaptera novaeangliae</i>	FE	SE
North Atlantic Right whale	<i>Eubalaena glacialis</i>	FE	SE
Sei whale	<i>Balaenoptera borealis</i>	FE	SE
Sperm whale	<i>Physeter catodon</i> (= <i>macrocephalus</i>)	FE	SE
West Indian manatee	<i>Trichechus manatus</i>	FE	SE



Limited range – habitat loss



Limited range – habitat loss



Limited range - disturbance



Limited range – habitat loss



Limited range – habitat loss



Limited range - disturbance



6 species

Human disturbance



Limited range – habitat loss

Good Resources

The Mammals of Virginia, D. W. Linzey

Animal Skulls – A Guide to North American Species, M. Elbroch

Mammals – Peterson Field Guide, W. H. Burt and R. P. Grossheider

Mammal Tracks and Scat, L. Levine and M. Mitchell

Animal Tracks – Peterson Field Guide, O. J. Murie