Biogeography

Alexey Shipunov

Minot State University

Lectures 22–24

MINOT STATE UNIVERSITY

Outline

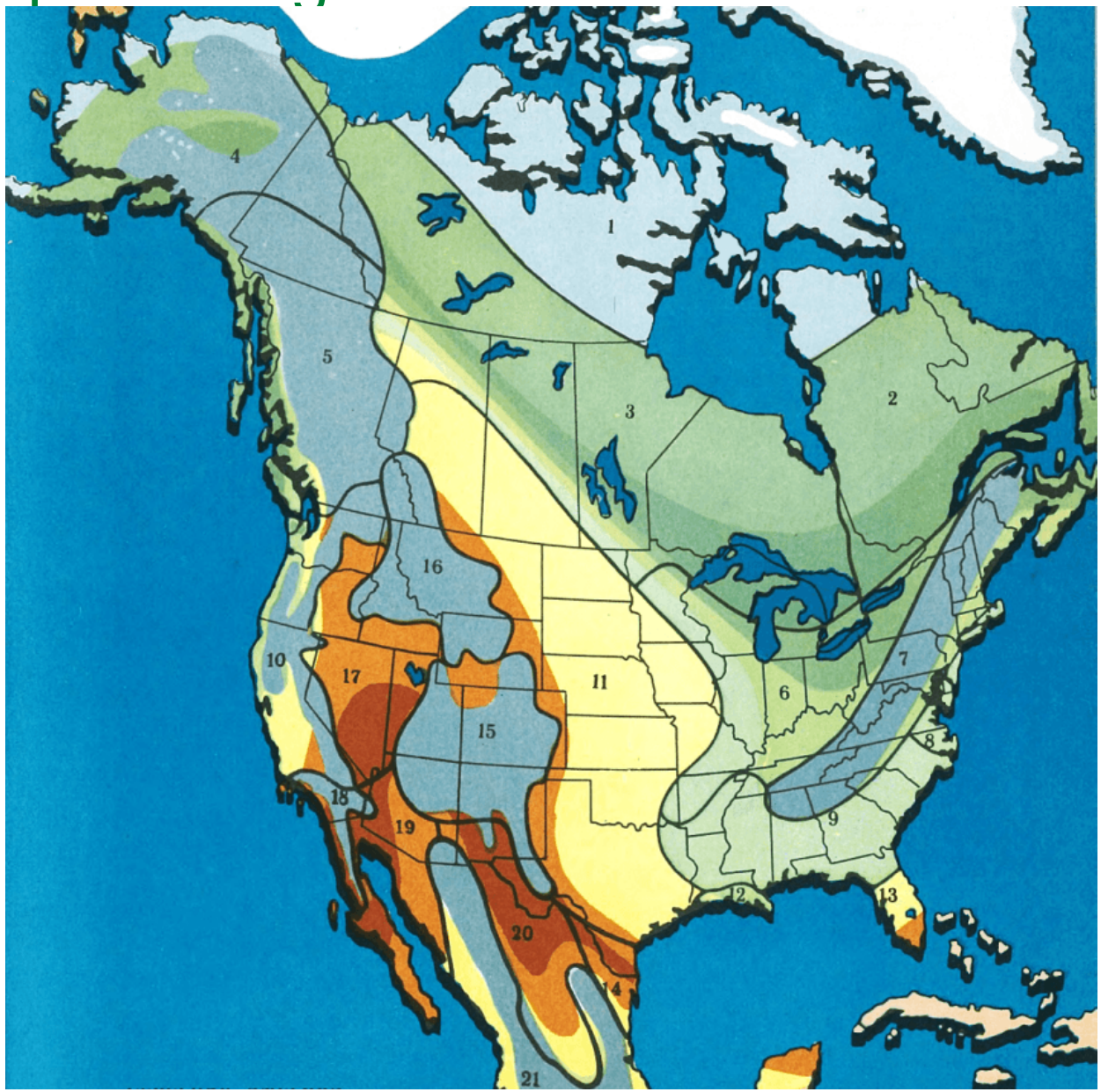
Biogeography of the World

Holarctic region I: Nearctic North America

Biogeography of the World

Holarctic region I: Nearctic North America

Biogeographical regions



North America: 21 region

1. Arctic Islands and Greenland
2. Labrador, Sr. Lawrence Valley
3. Canadian Northwest
4. Alaska
5. Yukon and British Columbia
6. Great Lakes and Central Lowlands
7. Appalachians
8. East Coast
9. Coastal Lowlands
10. Central Pacific Coast Ranges
11. Great Plains
12. Mississippi delta
13. South Florida
14. South Texas
15. South Montane region
16. North Montane region
17. Great Basin
18. Southern California
19. Sonora
20. Chihuahua
21. Mexican Sierras

MINOT STATE UNIVERSITY

Regions 6, 7 and 8: eastern states

- Eastern USA forests are much closer to Neogene than most of Eurasian forests: much richer and also contain the dominant level (tulip tree, *Liriodendron*; sweet gum, *Liquidambar*; black tupelo, *Nyssa* (a bit smaller)) which disappeared in Europe
- Striking diversity of autumn colors
- Hot spots of animal diversity in Appalachians (crayfish, salamanders, tree frogs, butterflies and many others)
- Appalachians are “destroyed” mountains, consequently they have many caves and rich underground life
- One piece of Appalachians is going west to Great Plains: Ozark plateau
- Many Neotropical elements (opossum, tanager birds, troupials like red-winged blackbird, hummingbirds and others)
- China/Japan — East coast disjunctions for many plant genera (like *Magnolia* or *Trillium*, shrubby blueberry *Vaccinium*, the latter occurrs also in westernmost Europe and Caucasus) and even species
- Swampy/sandy Atlantic shore hosts unusual things: swamp false cypress (*Chamaecyparis*) forests; and nesting places for living fossil **horseshoe crab** (*Limulus polyphemus*), marine invertebrate closest to extinct trilobites

MINOT STATE UNIVERSITY

Red-winged blackbird, *Agelaius phoeniceus*

Regions 9 and 12: Southern “pine belt”

- The “African” piece embedded in North American continental plate (**Piedmont** and coastal planes) consists of extremely hard minerals so it is almost impossible to make a proper river bed here. As a result, rivers becoming swamps, mostly swamp pine forests with *Pinus palustris* as a dominant species.
- These warm, shallow swamps on poor soils have many unusual plant and animal species: Venus fly-trap (*Dionaea*), Spanish moss (*Tillandsia*), bald cypress (*Taxodium*) with azaleas (*Rhododendron* spp.), water tortoises, alligators and many species of rodents.
- Again, even more elements are Neotropical like Xyris (yellow-eyed grass; with South American canter of distribution on the Guiana shield).

Yellow-eyed grass, *Xyris*

Region 13: South Florida

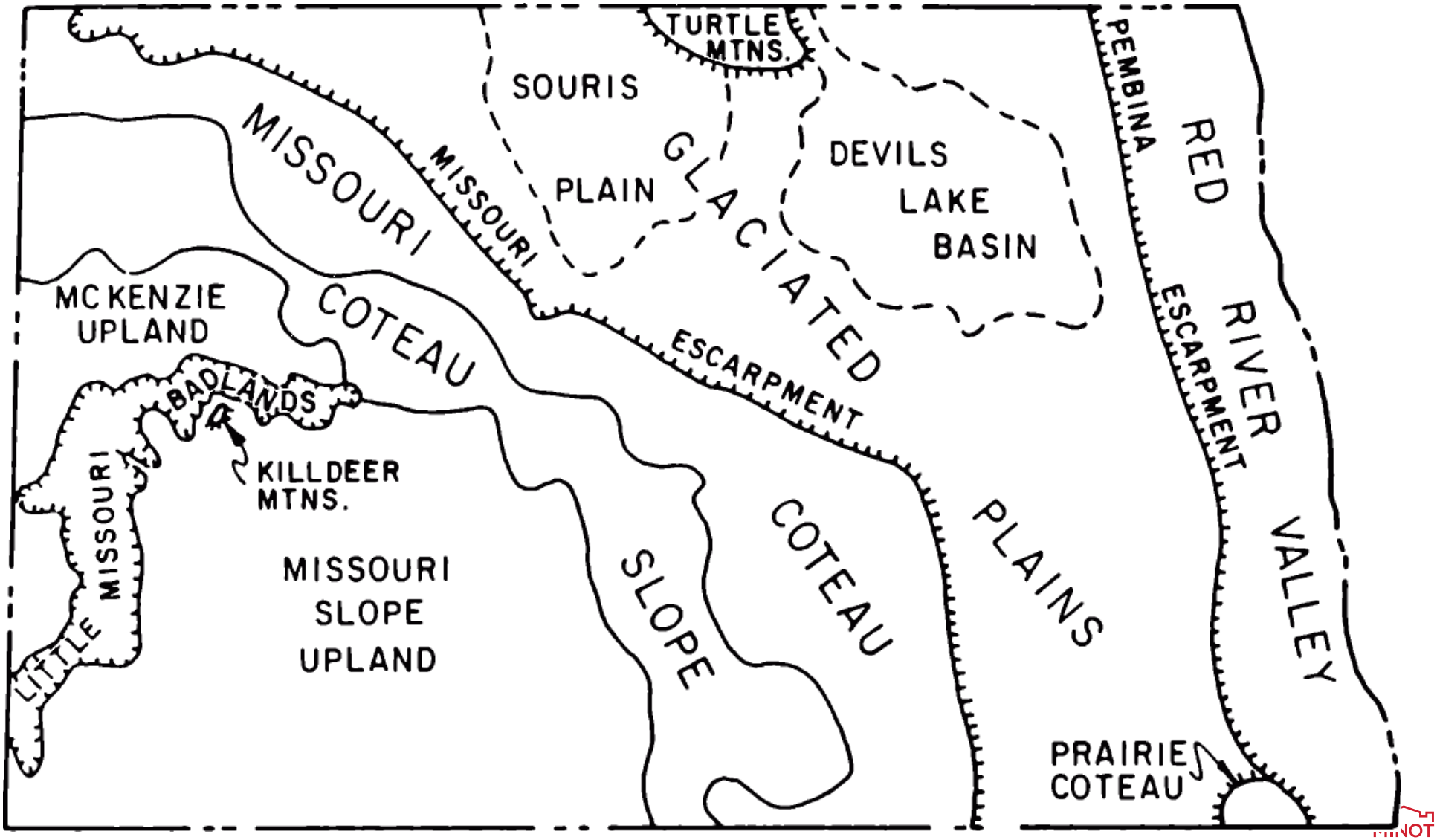
- Everything from lake Okeechobee to the south is a part of Neotropics
- Lowland of different origin: basement is a part of Antilles microcontinent together with Cuba, Hispaniola and Puerto-Rico, plus materials washed out of Appalachians
- Humid region rich of wetlands like Everglades rich of Araceae family representatives and mangrove forests of black (*Avicennia germinans*), white (*Laguncularia racemosa*) and red (*Rhizophora mangle*) mangroves. All these mangroves have seeds germinated on the mother plant.
- Hammocks are “islands” in the “sea” of wetlands, usually covered with threes and shrubs, mostly of tropical origin (Guanica dry forest is similar to well-developed Florida hammock)
- Rich freshwater animal life: flamingos, alligators, freshwater fish from Poeciliidae family (like mosquito larvae-eating *Gambusia*) and many others.
- Florida coast is one of few places supporting big population of sea cows: manatees

Region 11: Great Plains

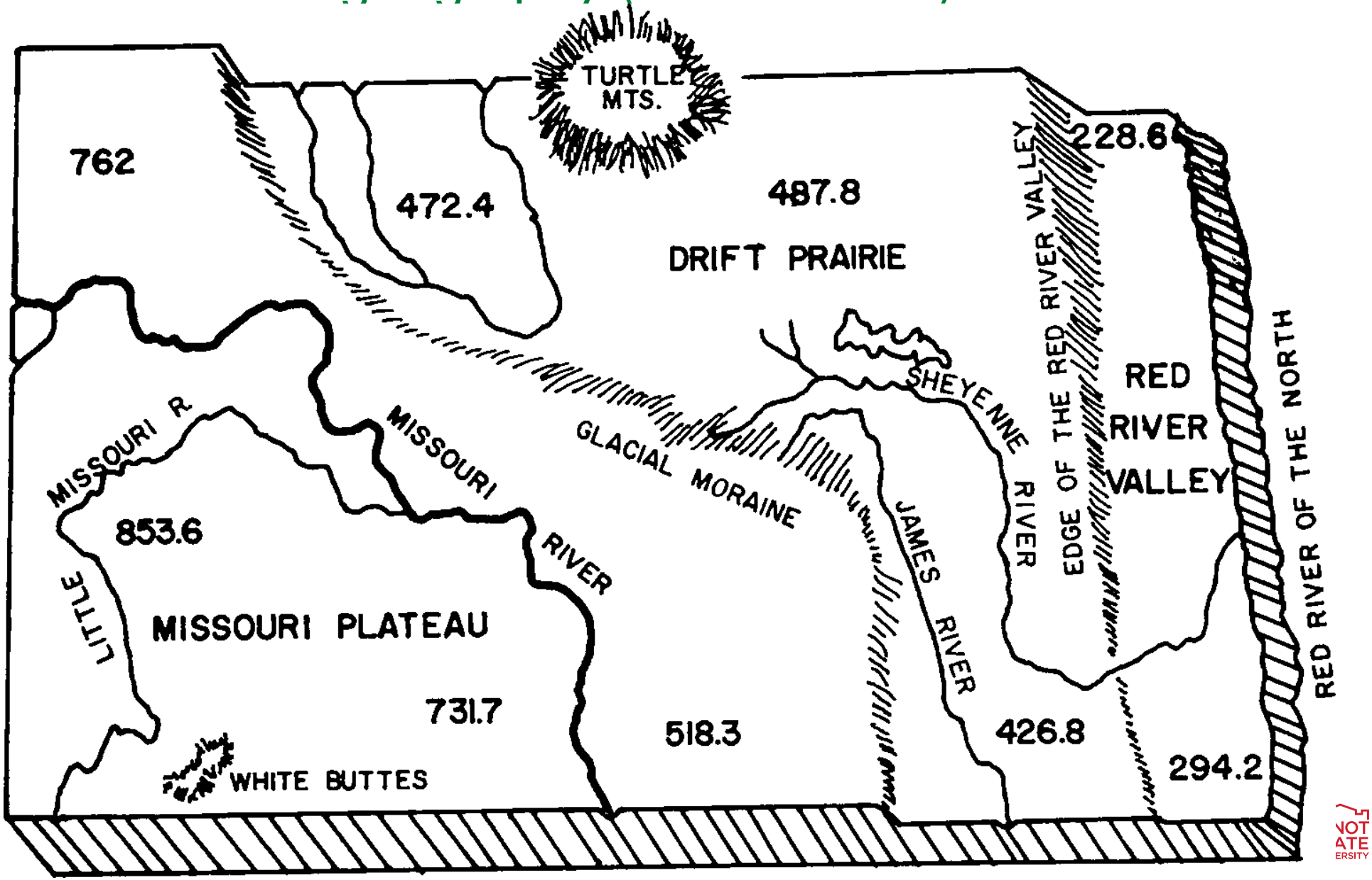
- From southeast of Alberta to Edwards Plateau in Texas. The eastern border is determining mostly by precipitation whereas western border are Rocky Mountains.
- Most important landmarks: Badlands, Nebraska sandhills, Llano Estacado (Texas uplands). Black Hills is an unique formation (continental plate uplift) having many western elements in flora and fauna. The prairie itself is mostly combination of grasslands, hills and forested coulees. Oak savanna is also frequent (in North Dakota, nearby Towner and in the Ransom county).
- Historically supported with hoofed animals, mostly bisons (*Bison bison*) and pronghorns (*Antilocapra americana*, unique North American antelope), now with agriculture.
- Rich life of rodents: prairie dogs, gophers, many species of mice and others.
- Aster family (Compositae) and grass family (Gramineae) are dominants. Typically split into tall-grass (eastern, humid) and short-grass (western, dry) prairies. Rich flora of Compositae and presence of multiple shrubs (like snowberries, *Symphoricarpos*) are typical to American grasslands.
- In North Dakota, we have: continental divide, the region of numerous prairie potholes (result of delayed melting of ice), extremely flat Devils Lake region (not even a lake but flooded plane), the second self-drainage basin in North America, wide Red River valley (remaining of Great Lake Agassiz), and “glacier garbage” Turtle Mountains.

MINOT STATE UNIVERSITY

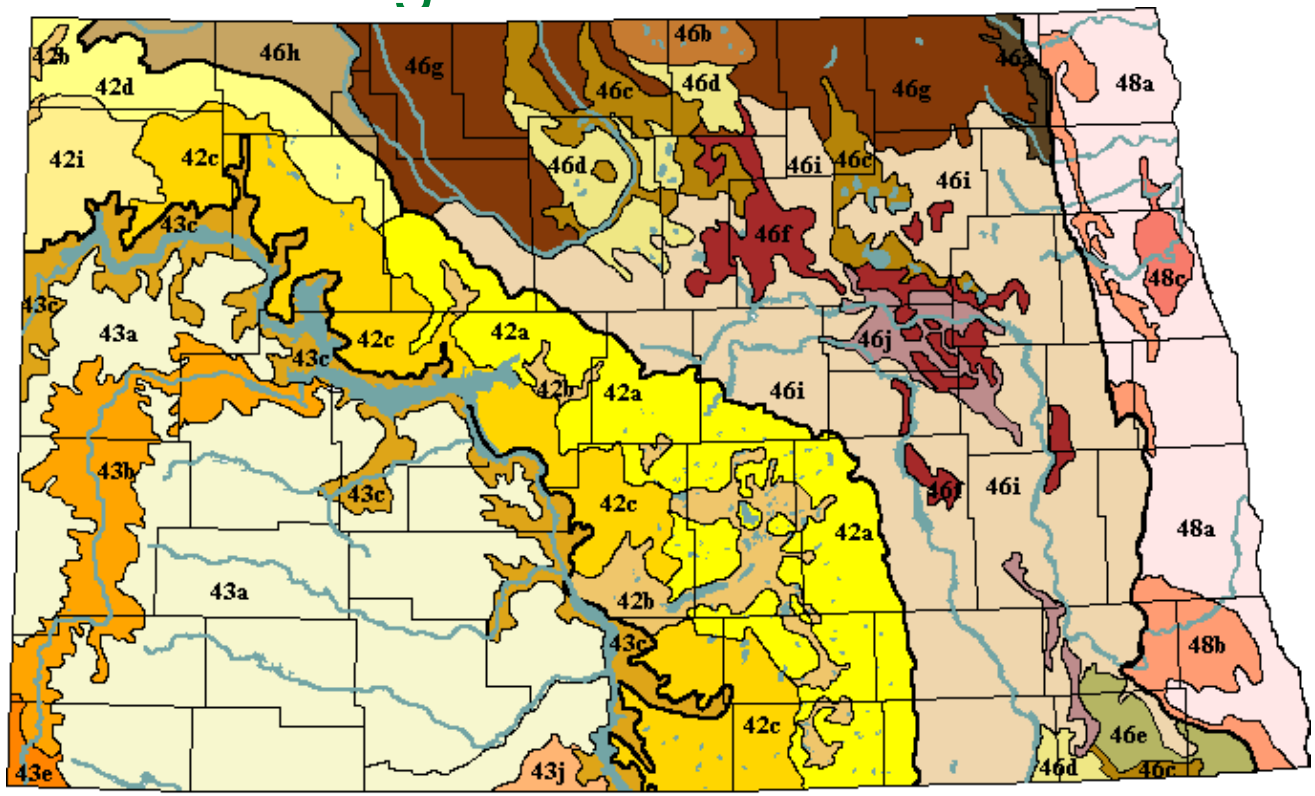
North Dakota geography



North Dakota geography (anothe view)



North Dakota ecoregions



42 Northwestern Glaciated Plains
- 42a Missouri Coteau
- 42b Collapsed Glacial Outwash
- 42c Missouri Coteau Slope
- 42d Northern Missouri Coteau
- 42i Glaciated Dark Brown Prairie

43 Northwestern Great Plains
- 43a Missouri Plateau
- 43b Little Missouri Badlands
- 43c River Breaks
- 43e Sagebrush Steppe
- 43j Moreau Prairie

46 Northern Glaciated Plains
- 46a Pembina Escarpment
- 46b Turtle Mountains
- 46c Glacial Lake Basins
- 46d Glacial Lake Deltas
- 46e Tewaukon Dead Ice Moraine
- 46f End Moraine Complex
- 46g Northern Black Prairie
- 46h Northern Dark Brown Prairie
- 46i Drift Plains
- 46j Glacial Outwash

48 Lake Agassiz Plain
- 48a Glacial Lake Agassiz Basin
- 48b Sand Deltas and Beach Ridges
- 48c Saline Area

MINOT STATE UNIVERSITY

Region 14: South Texas

- Parkland: green savanna with cactus, mesquite (*Prosopis*) and acacia (*Acacia*) domination. Similar to African savannas.
- Sea coast supports rich birds life; this is the wintering place for many northern birds.
- Many native species have Neotropical connections (like nine-banded armadillo, *Dasypus novemcinctus* which now is moving to the north again)

Regions 10 and 18: California

- Unique region with similarities to Mediterranean ans South Africa (The Cape)
- Hot, dry summers and more or less humid winters; almost no precipitation in July–October.
- Cascade mountain range will make Oregon coastline more humid but this effect disappears in "core" California.
- Multiple endemics, including several plant families and many genera (for example, cobra lily, *Darlingtonia*, redwoods, *Sequoia* and *Sequoiadendron*, *Washingtonia* palm)
- The center of several species "explosions", e.g., for oaks (*Quercus*) and manzanita (*Arctospaphylos*)
- Animals: many endemic primitive species like mountain "beaver" *Aplodontia rufa* and shrew mole *Neurotrichus gibbsii*
- The southern part (Baja California) is almost Neotropical.

Mountain “beaver” *Aplodontia rufa*

Shrew mole *Neurotrichus gibbsii*

Regions 19, 20 and 21: southern deserts

- Sonora to the west, Chihuahua to the east and Mexican Sierras between
- Closest analogs are Spanish and north African deserts
- High temperatures, precipitation increases on higher altitudes. As a consequence, desert in valleys and forest on the mountains
- Plants are mostly succulents from Cactaceae (like saguaro *Carnegiea gigantea*, barrel cactus (*Ferocactus*) and Arizona queen of the night *Peniocereus greggii*),and several smaller families (most important are agaves and yuccas from Asparagaceae, and ocotillos from Fouquieriacae). In eastern deserts, cacti are partly replaced with *Acacia* and *Parkinsonia* (Palo Verde) legume trees.
- Many desert animals are cactus-specific like bats, elf owl or cactus wren. Famous roadrunners (*Geococcyx*) and Antelope Jack (*Lepus alleni*) are among fastest living things (20 and 44 mph, respectively).
- Specific groups are gila monster (together with beaded lizard), Helodermatidae; *Phrynosoma* horned lizard; and rattlesnakes, *Crotalus* which are able for thermoreception.
- Mexican Sierras have many Neotropical groups like jaguars (*Panthera onca*), cacomistles (*Bassariscus*) and coati (*Nasua*).

MINOT STATE UNIVERSITY

Arizona queen of the night *Peniocereus greggii*)

Regions 15, 16 and 17: Rocky Mountains and Great Basin

- Great Basin is the one of two closed basins in North America, the bottom of two great dried lakes, **Lake Lahontan** (Nevada) and **Lake Bonneville** (Utah).
- Great Basin has very low precipitation: this is the true desert. Mountain ranges are more humid, especially the northern part where *Pinus ponderosa* is dominating but there are no broadleaf trees dominated (the only exception are aspen *Populus tremuloides* forests). Another widespread ecosystem is the sagebrush (*Artemisia tridentata* mostly) semi-desert.
- Only few endemic species; plants and animals typically came from surrounding regions. Northern mountain range has several species exhibiting the "Seattle/North Idaho" disjunction. However, Yellowstone and Mono Lake support an amazing diversity of extremophile prokaryotes (like *Aquifex* which is the source of PCR DNA polymerase).
- Most interesting plant and animal species: puma (cougar, *Puma concolor*), sage grouse (*Centrocercus urophasianus*), spiny lizards (*Scleroporus*, same family as horny lizard), tailed frog (*Ascaphus montanus*) and bristlecone pines (*Pinus aristata* and *Pinus longaeva*, the latter is the oldest living thing, 5,000 years old).

For Further Reading


I. Sanderson.
The Continent We Live On.
1961.
Mode of access: http://www.biodiversitylibrary.org/item/71734#page/7/mode/1up


A. Shipunov.
Biogeography [Electronic resource].
2014—onwards.
Mode of access: http://ashipunov.info/shipunov/school/biol_330


A. Shipunov.
Introduction to Biogegraphy and Tropical Biology [Electronic resource].
2017—onwards.
Mode of access: http://ashipunov.info/shipunov/school/biol_330/intr_biogeogr_trop_biol/intr_biogeogr_trop_biol.pdf

MINOT STATE UNIVERSITY