

GEL1010 FIELDTRIP

FRONT RANGE STRATIGRAPHY

GEL1010 Field Trip

Part of your educational experience is to experience "geology" in the great outdoors and to gain an appreciation for this natural science in a real life setting. There are different self guided field trips available in Dr.K's publication "COLORADO FRONT RANGE SELF-GUIDED GEOLOGY FIELD TRIPS". While participation in these field trips is "ungraded", you should go on at least ONE of the field trips outlined in the publication, preferably more.

To help facilitate these field trips and give you at minimum some aid in your ROCK-MINERAL GROUP CLASS PROJECT, a class field trip that we can take all together is scheduled for the indicated date. The destination for this trip is labeled as DAY 3 in the aforementioned publication.

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Collecting specimens for GEL 1010 Project:

Remember, sample locations MUST be all different with AT LEAST ½ MILE DISTANCE (as the crow flies) between locations. You can NOT submit two or more collected samples from the same spot. Do NOT collect in National or State Parks or in County Open Spaces. You may be fined if caught. Ask permission for collecting on private land. On the side of a road or in National Forests or BLM lands it is completely o.k..

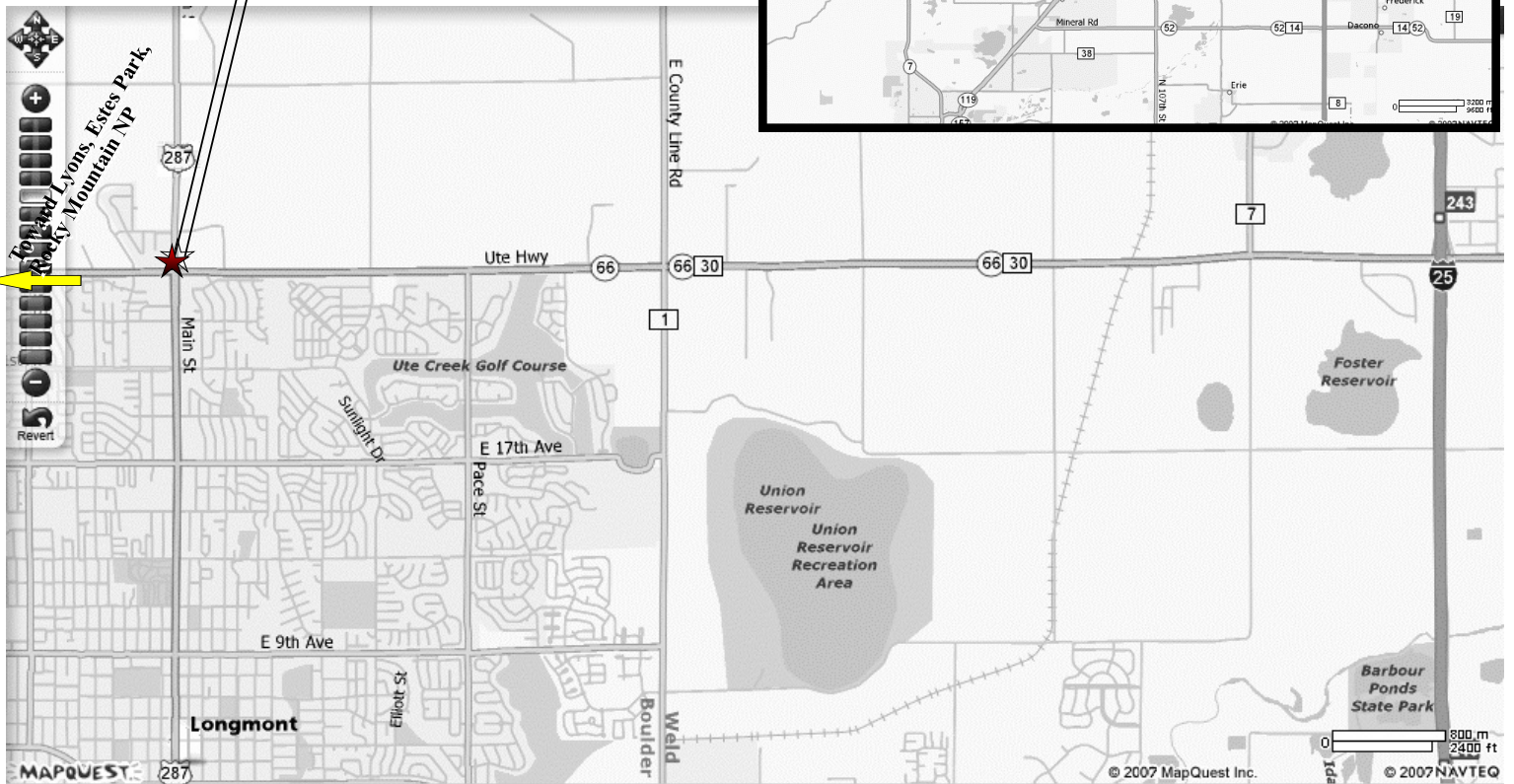
MEETING MAP

Date: See CANVAS schedule

Meeting Time: 9:30am

Dr. K's Cell Phone:
720-257-4486
(Just in case)

Super Wal-Mart
2514 Main St, Longmont, CO
(Meet at the NW Parking Lot in
Front of Garden Center)



FIELD-TRIP! Meet 09:30am (!sharp!) at the Northeast corner of the North Longmont Walmart Parking Lot (West Side) located on the NE corner of US287 (Longmont Main St.) and CO Hwy66 (Ute Hwy. into Lyons)!

What To Bring?

- ▶ THIS PACKET!!!
- ▶ Lunch, Drinking Water
- ▶ Sunscreen, Hat, Sweater, Raincoat
- ▶ Firm Shoes
- ▶ Ziplock Sample Bags & Index Cards for Notes (to be placed inside Ziplocks with sample)
- ▶ Rock-Hammer or any other **STURDY** Hammer
- ▶ Your ID kit, especially acid bottle & handlense

RULES & REGULATIONS

■ Fieldtrip Waiver

- ALL Participants must sign a Fieldtrip Waiver!
NO EXCEPTIONS!

■ Transportation

- CAR POOL! Students who use their cars and act as car pool drivers must have valid driver's licenses AND have current insurance coverage as required by Colorado law. A \$5 donation from each passenger is to be paid directly to the driver for gas expenses.

■ NO ALCOHOL/DRUGS

- The consumption of alcoholic beverages is strictly prohibited on any of Dr.K's fieldtrips. The use of illegal drugs is also prohibited.

■ NO SMOKING

- NO SMOKING at any time during the fieldtrip except INSIDE designated smoker vehicles.
NO cigarette butts out the window!

Liability Waiver

TO: Students Participating in Earth Sciences Field Trips FROM: Chairperson of Earth and Atmospheric Sciences Department
SUBJECT: Field Trip Policies and Liability Waiver FIELD TRIP: Field trips sponsored by the Department of Earth & Atmospheric Sciences

- (1) All students participating in field trips taught by the Department of Earth and Atmospheric Sciences should be aware that there is always an element of risk involved in such trips. These risks involve travel by vehicles, including commercial, state, and private vehicles, and in certain cases travel by canoes and rafts, walking as pedestrians on or near roadways, as well as strenuous hiking in mountainous terrains which are sometimes in remote areas. Instructors will use all reasonable precautions and students need to exercise prudent behavior during field trips, but even then there exists the possibility of an accident. Students need to assess their own physical abilities and not exceed their capabilities. Students must be alert and aware of possible risks and dangers during field trips.
- (2) All drivers of either private, leased, or state vehicles must have valid driver's licenses. All drivers of private vehicles must have current insurance coverage as required by Colorado law. Students should be aware of the State of Colorado liability insurance situation as follows:

Use of Personal Vehicle - Auto Liability

When an employee or student uses their personal vehicle for college business or to transport other students on authorized field trips, the student's or employee's personal automobile policy will provide the primary coverage if an accident occurs.

If the limits of the policy are not sufficient to cover the damages, the State self-insured liability coverage may be effective, but as extended coverage only. This extended coverage is in force only when the vehicle is being used for business purposes and not when in use for personal reasons.

Colorado no longer requires that medical bills that result from an accident be paid from each driver's insurance immediately regardless of fault (formerly "Personal Injury Protection"). Insurance companies now operate on the basis of legal liability for negligence, which is a more complex process especially when negligence is disputed or shared. Injured parties must now either pay the bills themselves or submit them to their own health insurance company. Companies that provide benefits under such circumstances typically require the injured party to agree that the health insurance company will be reimbursed from any judgment or settlement against a negligent driver.

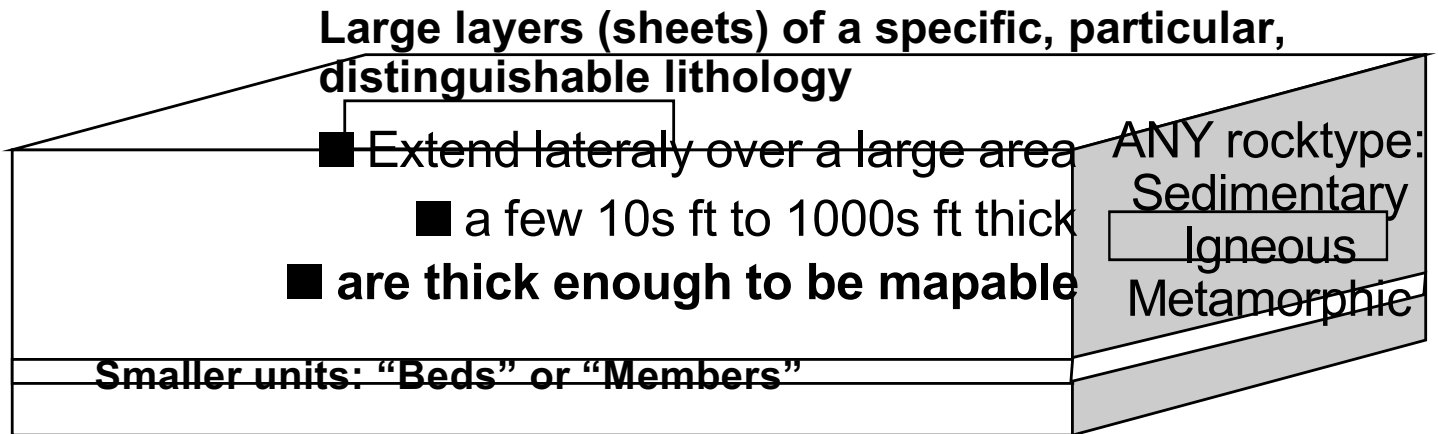
- (3) The consumption of alcoholic beverages is strictly prohibited on any field trip guided, sponsored or accompanied by Dr. U.R. Kackstaetter. The use of illegal drugs is prohibited on field trips. Because of possible fire danger, smoking is prohibited at any time during the field trip. Students found in violation of these restrictions must be prepared to be removed from the field trip according to (8) below.
- (4) No firearms or weapons of any kind are allowed on field trips.
- (5) No pets, children, family, or friends are allowed on field trips except with permission of instructor. All such persons must sign the same liability waiver.
- (6) Students with medical problems, including but not limited to asthma and allergies, **must** consult with instructor prior to participating in field trips. Such students **must** have appropriate medications with them during the field trip. In case of a medical emergency during the field trip, such students must be prepared to pay for expenses incurred for their evacuation. The purchase of Colorado game or hikers licenses may provide for emergency medical evacuation.
- (7) Carpooling students are expected to assist the driver in covering gasoline expenses.
- (8) Students who violate any local, state, or federal statutes or who violate any of the field trip policies or stipulations or who fail to conform to directives from the instructor may be immediately dismissed from the field trip. Alternate transportation for early dismissal is the financial responsibility of the dismissed student. They may also be subject to a failing grade in the course, be required to withdraw from the course, and be subject to disciplinary action by the College.

- (9) All participants **MUST SIGN** the **LIABILITY WAIVER**.

In consideration of my being permitted to participate in this activity, I, the undersigned hereby release and hold harmless: the Trustees of the Metropolitan State College of Denver, the Earth and Atmospheric Sciences Department, and respective employees, from all claims, losses, damages, or expenses because of property damage or personal or bodily injury incurred or caused by me during or in conjunction with the above mentioned activity. In filling out this form, I acknowledge that I fully understand the risk that is inherent to off-campus activities. Furthermore, I have fully read and understand the department policies and my liability and do accept the restrictions.

Terms to Know

GEOLOGIC FORMATIONS are...



■ Formation

- Groupings of similar sequential lithologies often of same or closely related geologic age. These larger sedimentary sequences are called formations and may range in thickness from 10's ft to 1000's ft.

■ Stratigraphy

- understanding the geometrical relationships between formations
- Vertically: relation/change with formations above or below;
- Horizontally: relation/change of same formation over a large area).
- Meaning in terms of depositional environment.

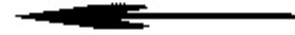
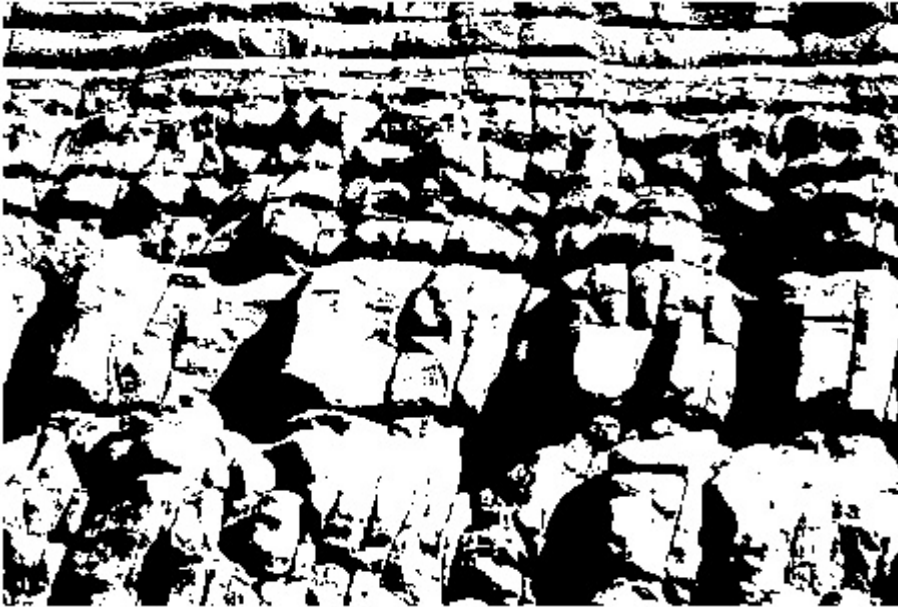
■ Unconformity

- a surface separating two units of rock; represents a period of time in which deposition stopped and erosion occurred. Rocks immediately above the unconformity are usually considerably younger than rocks below

Underlying Principles

Law of Original Horizontality

Sedimentary strata is usually deposited in nearly horizontal layers

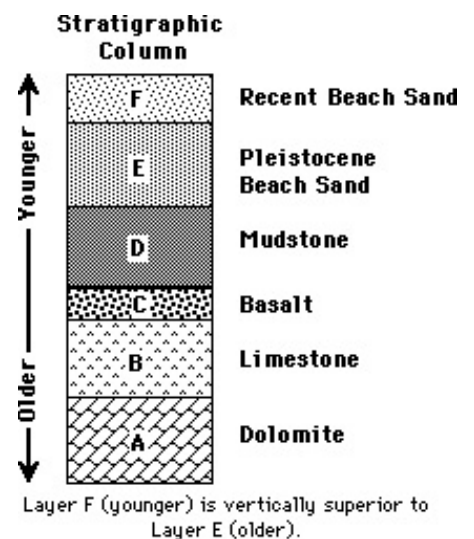


Horizontal Layers of Sedimentary Rock

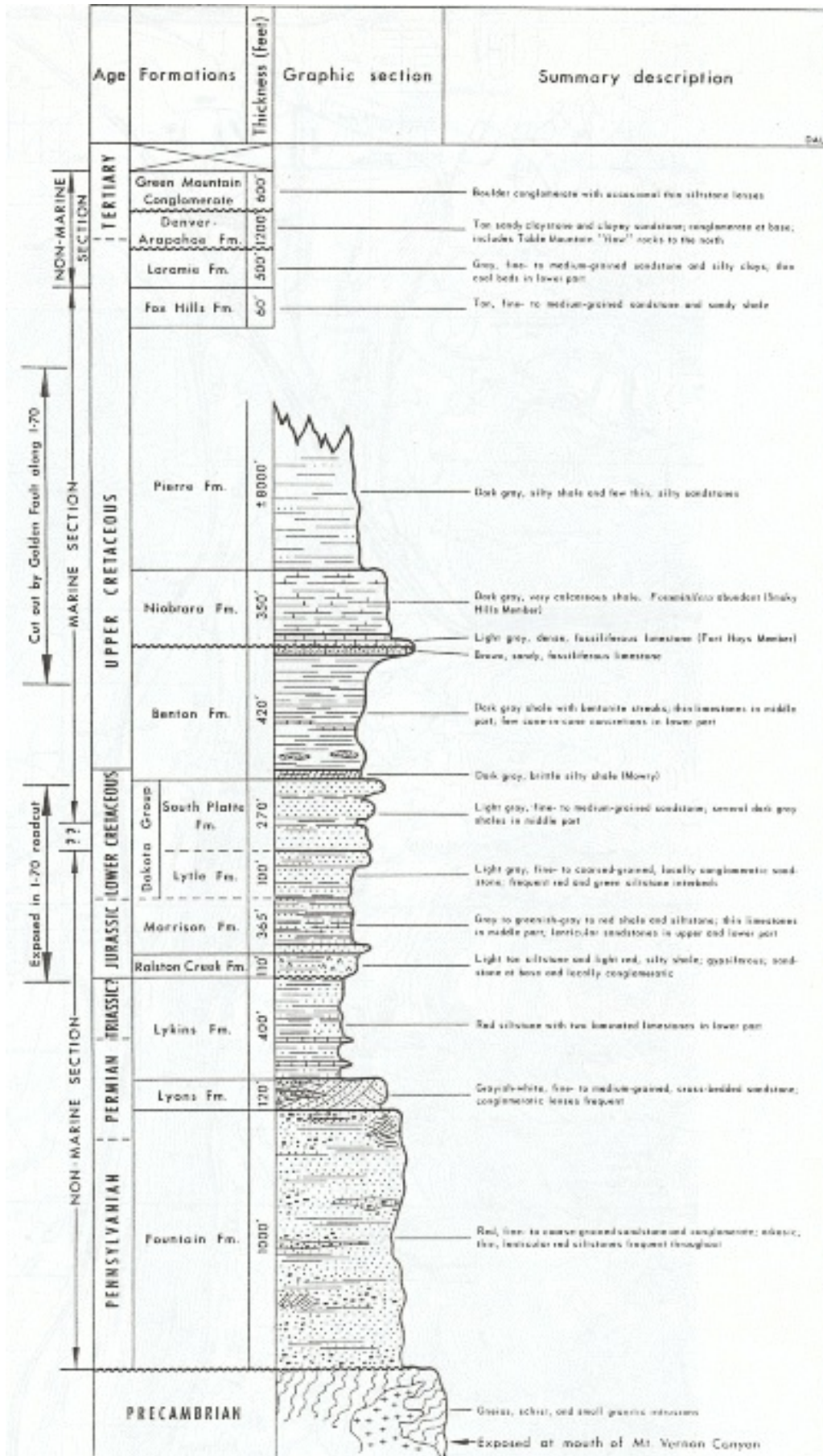


Law of Superposition

In undeformed stratigraphic sequences, the oldest strata will be at the bottom of the sequence.



Front Range Stratigraphy



How old?

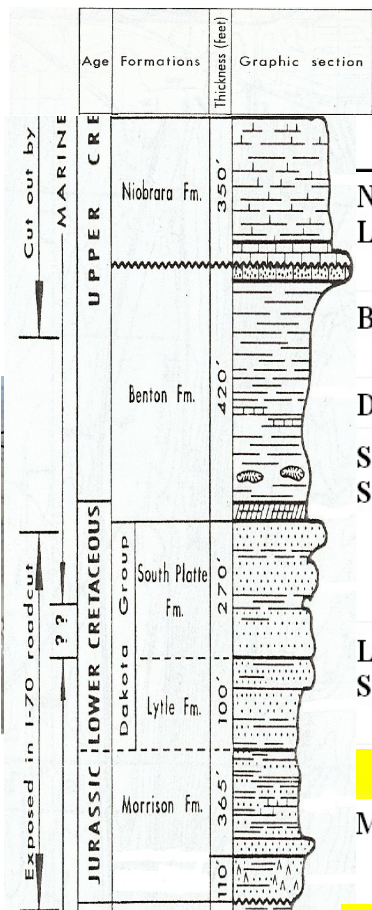
INTERVALS OF TIME		MILLIONS OF YEARS AGO	FORMATION	THICKNESS (FEET)	DESCRIPTION	WEATHERING CHARACTERISTICS
ERA	PERIOD					
CENOZOIC	QUATERNARY	2	NOT NAMED	0-25	GRAVEL, SAND, SILT	LOOSE
	TERTIARY					
MESOZOIC	CRETACEOUS	70	LARAMIE, FOX HILLS, PIERRE, NIOBRARA, BENTON, DAKOTA	10,400	GRAY TO TAN SHALES, SANDSTONES, LIMESTONES, FOSSILS	SANDSTONES STAND ON RIDGES, SHALE FORMS SLOPES
	JURASSIC	135	MORRISON	300	SHALE TO SANDSTONE	FORMS SLOPES
	TRIASSIC	180	ENTRADA	30	CROSS-BEDDED SANDSTONE	ONE . . . RESISTANT
		225	LYKINS	675	RED SHALE, SILTSTONE SANDSTONE	SOFT. VALLEYS AND SLOPES
PALEOZOIC	PERMIAN	270	LYONS	220	PINK SANDSTONE	HARD RIDGES
	PENNSYLVANIAN		FOUNTAIN	800	RED SANDSTONES AND CONGLOMERATE	LOCALLY HARD RIDGES
	MISSISSIPPIAN	305				
	DEVONIAN	350				
	SILURIAN	400				
	ORDOVICIAN	420				
		500				
CAMBRIAN	600					
PRECAMBRIAN		1700	IDAHO SPRINGS FM, BOULDER CREEK GR.	UNKNOWN	METAMORPHIC & IGNEOUS ROCKS	CRYSTALLINE, HARD

APPROXIMATE AGE OF THE EARTH = 4.6 BILLION YEARS

Geologic and Stratigraphic Column for the Boulder Area (Based on Runnells, 1976)

Front Range Stratigraphy

Detail



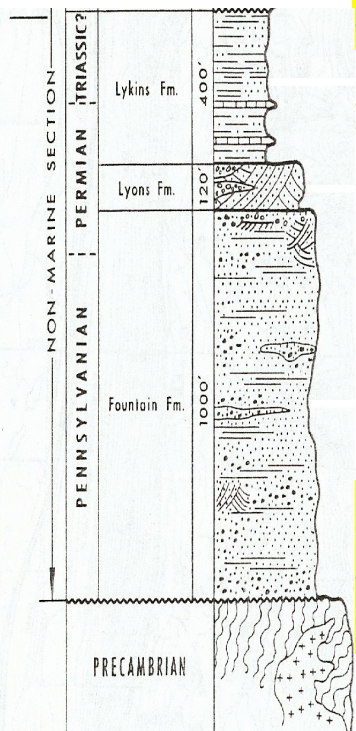
Formation Name	Principal Rock Type(s)	Depositional Environment	Geologic Age & History
Niobrara Limestone	Marine Limestone (somewhat resistant)	Marine	~ 85 mya Mid to late Cretaceous Clam Fossils
Benton Shale	Marine Platy Shale (erodes)	Marine	~ 85 mya Mid to late Cretaceous
DAKOTA GROUP:		Forms prominent Hogbacks	
South Platte Sandstone	Quartz Sandstones (resistant)	Transitional: Deltas, Tidal Flats, Beaches	110 - 85 mya Early to mid Cretaceous 106 my old volcanic porcelinite layer, many trace fossils, dino footprints, ripple marks
Lyle Sandstone	Quartz Sandstones (fairly resistant)	Coastal Plain (W) to coastal Flood plain (E)	135 - 110 mya Early Cretaceous Eastward tilting; braided streams

Tilting - coarser material is eroded & transported East

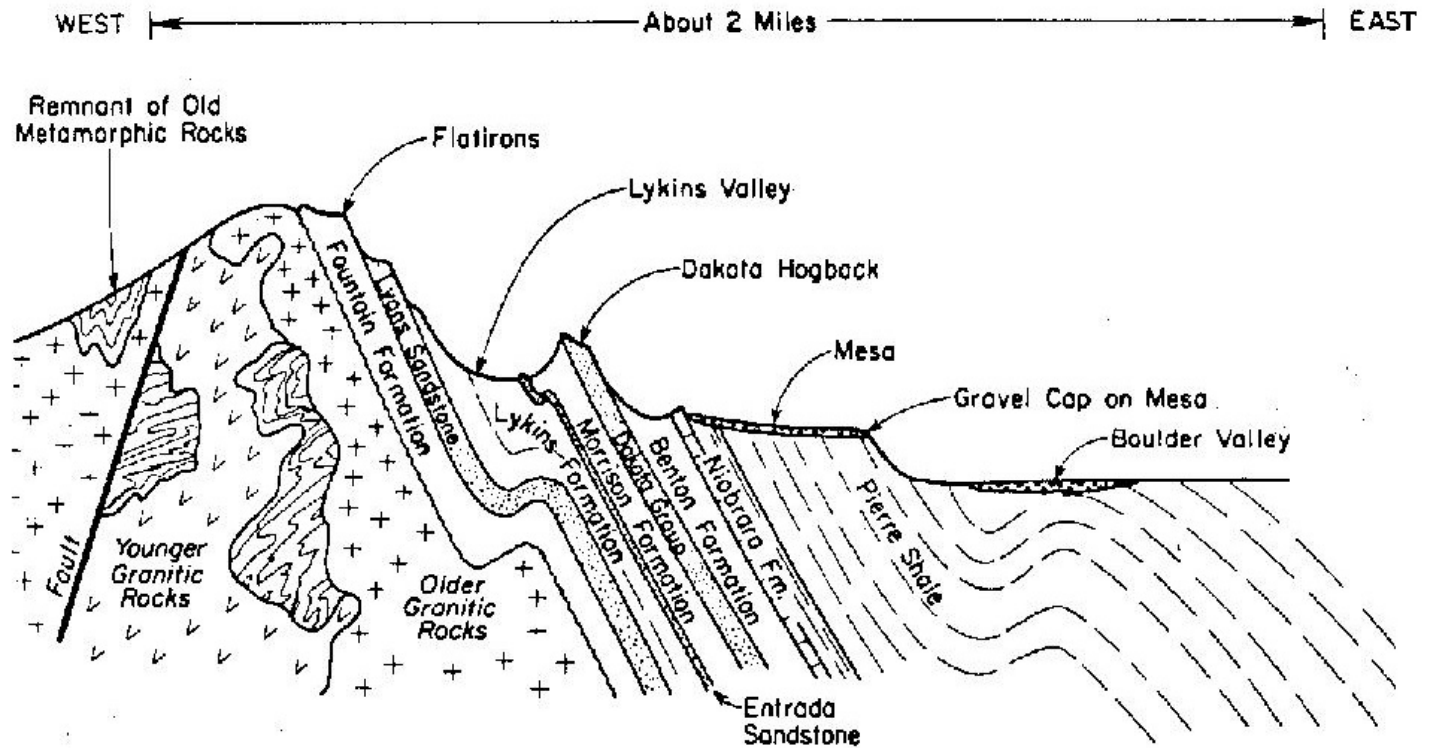
Morrison Shale	Greenish-gray shales, (erodes); some Ss & fresh water LS	Coastal (?) Flood Plains	150 - 135 mya Late Jurassic Dino Fossils. Tropical Climate
Disconformity	<i>Missing: Triassic (part), Jurassic (part), TOTAL: 50 my</i>		
Lykins Mudstone	Red Mudstones (erodes)	Costal Flood Plain	250 - 210 mya Late Permian - Early Triassic Meandering Streams, 2 marine LS beds
Lyons Sandstone	Quartz Sandstones (resistant)	Eolian Dunes, Costal Plains, Braided Streams	270 - 250 mya Middle Permian Quartz cemented flagstone
Fountain Arkose	Arkosic Sandstones (resistant)	Alluvial Fans	290 - 270 mya Pennsylvanian - Early Permian Eroding Ancestral Rockies

Ancestral Rockies & Uncompahgre uplift

Non-Conformity	<i>Missing: Precambrian (part), Cambrian, Ordovician, Silurian, Devonian, Mississippian, Pennsylvanian (part) TOTAL: 1,395 my</i>		
Idaho Springs Formation	Gneisses & Schists	Metamorphic Rx (No Depositional Environment)	1.7 bya Precambrian Plate collision



Overview "What lies below"



CROSS-SECTION of the BOULDER AREA

Terms to Research

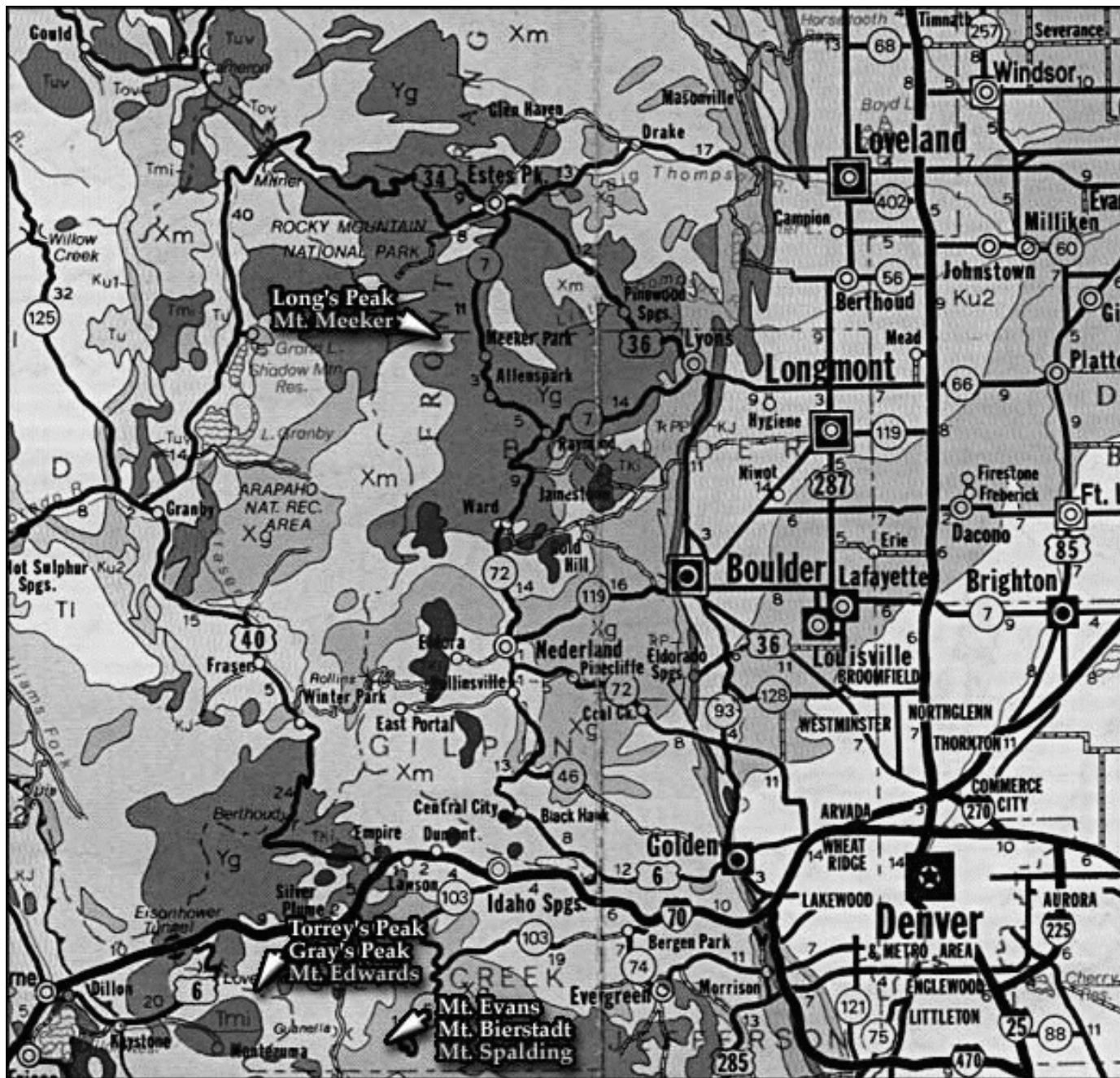
What is a fault?

What is a xenolith?

What is a pegmatite?

In an undisturbed sequence of a stack of rock formations,
where are the oldest rocks?
...where are the youngest rocks?

Geologic Map



Quaternary, Tertiary and Late Cretaceous Igneous Rocks

- Qv** Quaternary: Less than 2 million years ago
- Tuv** Pliocene-Miocene: 2 to 24 million years ago
- Tov** Oligocene: 24 to 37 million years ago
- Tui** Upper Tertiary: Less than 20 million years ago
- Tmi** Middle Tertiary: 20 to 40 million years ago
- Tla** Laramide: 40 to 72 million years ago

Sedimentary Rocks

- QT** Quaternary-Tertiary: Less than 4 million years ago
- Tu** Upper Tertiary: 4 to 37 million years ago
- TI** Lower Tertiary: 37 to 72 million years ago
- Ku1** Upper Cretaceous: 72 to 95 million years ago

- Ku2** Upper Cretaceous: 95 to 115 million years ago
- Kl** Lower Cretaceous: 115 to 144 million years ago
- J** Jurassic: 144 to 208 million years ago
- T** Triassic: 208 to 245 million years ago
- PP** Permian-Pennsylvanian: 245 to 320 million years ago
- MDOG** Mississippian, Devonian, Ordovician, Cambrian: 320 to 570 million years ago

Cambrian & Precambrian Igneous and Metamorphic Rocks

- Ei** Cambrian: 510 to 570 million years ago
- Yp** Precambrian: 950 to 1,400 million years ago
- Xm** Precambrian: 1,700 to 1,800 million years ago
- Yg** Granitic: 1,000 to 1,400 million years ago
- Xg** Granitic: 1,700+ million years ago