This little field guide was born out of necessity to accommodate many of my geology students in their desire to see and experience the Front Range geology without the time constraints and conflicts of scheduled field trips. Over time it has grown into the present volume, including many favorite geologic sites and places. While there might be more spectacular examples to visit, the indicated localities in this guide were more or less selected for easy accessibility. I hope that those interested in the geology of the Colorado Front Range will find this guide helpful. Indeed, Colorado is a spectacular place to see and investigate geology and geologic features, almost like living inside a geology textbook. Experiencing geology first hand is much more exciting than reading about it, or as one of my dear geologist colleagues has expressed it: “A bad day in the field is hundred times better than a good day in the office!”

This field guide also includes probing geologic field study questions, which might be used in conjunction with assignments or simply for the perusal of one’s own interests. Many of the questions are based on skills of “observation”, a quality that should be developed. Learning how to read the blaring obvious and the subtle hints in the rock record compares to crime scene investigation. And solving geologic puzzles can be as exciting as a good murder mystery.

- Spring 2009

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**How to use this field guide:**
The guide is subdivided into time segments equivalent to day trips. Localities to be visited are indicated in RED on the maps. Each place to be visited has specific geologic questions assigned or activities to be completed. Collecting samples is possible in many areas, but is prohibited in State and National Parks and Monuments.

You may want to bring a camera for taking pictures of geologic features. Features that might be photographed in order to answer questions or to reinvestigate when back home are indicated by (D) symbol in the text.

A rock hammer, hand lens, and Ziplock® sample bags might also be advantageous. It goes without saying that a raincoat, a hat, sun screen, appropriate clothing and hiking shoes, water and a sack lunch should be a part of your field trip gear.

For those interested in further and other area field-trips, the following resources might be helpful:


Waiver of Liability for Persons using this Field Guide in behalf of an Educational Institution

Educational Institutions in the State of Colorado are covered by the Colorado Governmental Immunity Act: CRS 24-10-101. This law provides that the state and it’s institutions are immune from lawsuits for injuries suffered by private persons, except in specific situations listed in the law, where immunity is waived. Participation by persons in field trips and non-classroom activities conducted by a state funded institution of education is not one of the areas where immunity from liability is specifically waived. In other words, by law, if a person suffers an injury, as a result of participation in field trips or non-classroom activities of the educational institution, this institution is immune from fiscal liability for such injury. For this reason, persons are strongly encouraged to obtain medical insurance coverage, if they do not already have coverage, before participating in these activities. Participants are also encouraged to read the applicable statutes cited above, which are public records.

All Persons using this field guide understand that by participating in field trips and non-classroom activities, including associated activities and services arranged by their educational institution or their agents, that the person assumes all risks and will hold the educational institution and agents harmless from any and all liability, actions, causes of action, debts, claims and demands of every kind and nature whatsoever which the person now has or which may arise from or in connection with the person’s participation in activities arranged for the person by the educational institution or it’s agents. The terms hereof shall serve as a release and assumption of risk for the person’s heirs, executors and administrators and all members of his/her family.
COLORADO FRONT RANGE SELF-GUIDED GEOLOGY FIELD-TRIPS

U.R. Kackstaetter, Ph.D.

Front Range Stratigraphy & Geologic Formation Overview

<table>
<thead>
<tr>
<th>Age</th>
<th>Formations</th>
<th>Thickness (feet)</th>
<th>Summary description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NON-MARINE</td>
<td>Earthquake</td>
<td>170</td>
<td></td>
</tr>
<tr>
<td>TERTIARY</td>
<td>Green Mountain</td>
<td>100</td>
<td>Boulder conglomerate with occasional thin siltstone lenses</td>
</tr>
<tr>
<td></td>
<td>Conglomerate</td>
<td></td>
<td>Ten sandy siltstone and clayey sandstone; conglomerate at base,</td>
</tr>
<tr>
<td></td>
<td>Denver</td>
<td></td>
<td>includes Table Mountain &quot;clay&quot; near the north</td>
</tr>
<tr>
<td></td>
<td>Arapahoe Fm.</td>
<td>600</td>
<td>Ten, fine- to medium-grained sandstone and silt clay, thin</td>
</tr>
<tr>
<td></td>
<td>Loromie Fm.</td>
<td>500</td>
<td>coal beds in lower part</td>
</tr>
<tr>
<td></td>
<td>Fox Hills Fm.</td>
<td>400</td>
<td>Ten, fine- to medium-grained sandstone and sandy shale</td>
</tr>
<tr>
<td></td>
<td>Pierre Fm.</td>
<td>350</td>
<td>Dark grey, silty shale and few thin, silty sandstones</td>
</tr>
<tr>
<td></td>
<td>Niobrara Fm.</td>
<td>250</td>
<td>Dark grey, very calcareous shale, Fossiliferous abundant (Smoky Hills Member)</td>
</tr>
<tr>
<td></td>
<td>Light grey, dense, fossiliferous</td>
<td></td>
<td>Light grey, dense, fossiliferous limestone (Fort Hays Member)</td>
</tr>
<tr>
<td></td>
<td>Benton Fm.</td>
<td>250</td>
<td>Brown, sandy, fossiliferous limestone</td>
</tr>
<tr>
<td></td>
<td>South Platte Fm.</td>
<td>170</td>
<td>Dark grey shale with bentonite streaks; thin limestones in middle part,</td>
</tr>
<tr>
<td></td>
<td>Dakota Group</td>
<td></td>
<td>two thin-limestone calcs in lower part</td>
</tr>
<tr>
<td></td>
<td>Lytle Fm.</td>
<td>100</td>
<td>Dark grey, brittle silty shale (Moony)</td>
</tr>
<tr>
<td></td>
<td>Morrison Fm.</td>
<td>75</td>
<td>Dark grey, fine- to medium-grained sandstone; several dark grey</td>
</tr>
<tr>
<td></td>
<td>Ralston Creek Fm.</td>
<td>350</td>
<td>shales in middle part</td>
</tr>
<tr>
<td></td>
<td>South Platte Fm.</td>
<td>250</td>
<td>Light grey, fine- to coarsely-grained, locally conglomeratic sandstone, frequent</td>
</tr>
<tr>
<td></td>
<td>Lyons Fm.</td>
<td>300</td>
<td>red and green siltstone interbeds</td>
</tr>
<tr>
<td></td>
<td>Lyons Fm.</td>
<td>150</td>
<td>Grey to greenish-grey to red shale and siltstone; thin limestones in middle part,</td>
</tr>
<tr>
<td></td>
<td>Lykins Fm.</td>
<td>100</td>
<td>lenticular sandstones in upper and lower part</td>
</tr>
<tr>
<td></td>
<td>Fountain Fm.</td>
<td>100</td>
<td>Light grey, thin and light red, silty shale, gypsiferous, sandstone at base</td>
</tr>
<tr>
<td></td>
<td>Idaho Springs Fm.</td>
<td>100</td>
<td>and locally conglomeratic</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Red siltstone with two laminated limestones in lower part</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Greyish-white, fine- to medium-grained, cross-bedded sandstone,</td>
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<td></td>
<td></td>
<td></td>
<td>conglomeratic lenses frequent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Red, fine- to coarse-grained sandstone and conglomerate; micaeous, thin,</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>lenticular red siltstones frequent throughout</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gneiss, schist, and small granitic intrusions</td>
</tr>
</tbody>
</table>

Exposed at mouth of Mt. Vernon Canyon
DAY 1 - Red Rocks, Dinosaur Ridge & Lookout Mountain Field Trip

Start: Red Rocks Park Amphitheater uppermost (highest) Parking Lot.

Geology Questions:
1. (Take Picture) What is a slump & how does it form?
2. What type of unconformity is found at Red Rocks park? How can you tell that it is an unconformity (NO, the answer is not because someone put a sign there!)
3. Which rocks (Relative ages) are missing at the great unconformity from the previous question?

Next: Drive down the road toward Dinosaur ridge to a sign pointing toward a “Geologic Interest” site. Follow the signs, park the car at the parking lot and hike the short distance to the signs and posters explaining the geology.

Geology Questions:
4. Read the signs. What is the geologic history of the area?

Next: Continue your excursion down the road toward Dinosaur Ridge Road with frequent stops. The tour continues up dinosaur ridge road. The road is closed for vehicles. Drive to the other side of Dinosaur Ridge and park at the “Friends of the Dinosaur Ridge” Parking Lot. Walk from there or pay $3.00 for the tour shuttle bus. For more info visit http://www.dinoridge.org/.

Geology Questions:
5. (Take Picture) You can see Dinosaur Bones at one of the stops in the Morrison Formation. How can you distinguish dinosaur bones from the surrounding host rocks?
6. (Take Picture) You also find “load casts” in the Morrison Formation: What are they and how are they identified?
7. (Take Picture) There are evidences that the Dakota Sandstones was deposited in shallow water! How can you tell from the clues left in the rocks?
8. What evidences are present that would tell you that the climate during the deposition of the Dakota Sandstone was tropical?

9. The Dinosaur footprints at Dinosaur Ridge are famous: (a) What type of Dinosaurs are identified from the footprints? (b) What type of animal behavior could be inferred from the footprints found at Dinosaur Ridge? (c) How can you differentiate between carnivore and herbivore footprints?

Next: Drive southward to the Morrison Elementary school, also called the Red Rocks school. Park in the school parking lot and hike up a small distance toward the Northeast or toward the whitish outcrop. Looking westward you will see a sight similar to the picture. The white outcrop being the Lyons Sandstone, the Maroon hogbacks to the West is the Fountain Fm. and the hills in the distance comprise the Idaho Springs Fm. From there drive the Morrison Road eastward to the Morrison Road cut.

Geology Questions:
10. The whitish outcrop at the Morrison elementary school shows the transition of the Fountain Fm. into the Lyons Sandstone. How are these two sandstones different?

11. Explain how the depositional environment might have changed to reflect the transition observed.

12. (Take Picture) At the Morrison Road cut, can you identify the various rock formations?

13. From the Morrison Road cut walk westward toward the Lyons Sandstone. At a parking lot you will come across the brick red Lykins Fm. Why does the Lykins form a valley instead of a hogback?

14. There are two resistant whitish or tan layers in the Lykins Fm. What is their lithology? How did they form?

Next: Drive back North to the Rooney Road cut. Get out of the car and observe the outcrop on the south side of the road, which is the Fox Hill Sandstone. The upper few feet of the road cut outcrop close to the surface show soil formation and soil horizons. Take also a look at the soils exposed on the north side of the road. The mottled soil texture looks a little bit like popcorn and is called “popcorn weathering”, indicative of high amounts of bentonite or swelling clay in the soil. Bentonite often forms from the chemical weathering of volcanic ash.

Geology Questions:
15. Take a good look at the sandstone found in the Rooney Road cut. How is this sandstone different from other sandstones observed so far?

16. Put a drop of water on a clean and dry sandstone sample. What do you observe? What does this tell you about the porosity of the Fox Hill Sandstone and the probability of the sandstone as resource material? Resource for what?

17. (Take Picture) Look at the soil horizon on the south side of the road cut while walking toward the west. Observe the plants and roots carefully. What you see is indicative of a special type of mass wasting called ...?

Next: Drive to the I-70 road cut and the indicated “Point of Geologic Interest”. Park in the PnR parking lot and walk along the road cut.
Geology Questions:
18. The point of geologic interest at the I-70 road cut reveals many colorful, different, and tilted layers. The rock formations are actually labeled. While walking along the trail, try to identify as many different sedimentary rock types as you can.
19. What causes the various colors in the rocks? Especially the greens, reds, and blacks.

Next: Follow W 6th Ave toward Golden. At the 19th Street traffic light take a left (West) and follow Lookout Mountain Rd. all the way up to the top of Lookout Mountain. Look for Pegmatites in road-cuts on the way up (and down)... except the driver, of course! You may also want to stop and take pictures on the way up. Park at the Buffalo Bill Museum and Lodge Parking lot. After visiting the overlook, walk up to Buffalo Bills grave and from there westward through the woods to the parking lot road and back to the parking lot. Look carefully at some of the rocks. Eventually you will find some containing garnets. Unfortunately, these garnets are NOT gem quality.

Geology Questions:
20. Go to the Lookout Mountain overlook and read the geology posters and signs.
21. What type of rock is found on top of Lookout Mountain in Golden and how did it get there?
22. Why do we find Garnets on top of Lookout Mountain?
23. Why is Table Mountain flat?
24. What rock type do you find on top of Table Mountain and how did it get there?
25. (Take Picture) What type of fault is the Golden fault and what does it displace?
Day 2 - School of Mines Museum & Geology Trail, Golden Gate State Park

Start: The Colorado School of Mines Geology Museum is located on the corner of 13th and Maple St. in Golden, Colorado. The admission is free and the Museum is open Monday - Saturday: 9am - 4pm & Sunday: 1pm - 4pm. (Closed all CSM Holidays and Sundays during summer). Call for current schedule since it changes frequently.

Geology Questions:
26. The Colorado School of Mines Museum has an exquisite display of Minerals. Survey the great variety of specimens. What is Colorado’s State Mineral?
27. What is Colorado’s State Gem?
28. From the minerals on display, which ones can be found in the Colorado Front Range corridor?

Next: The Geologic Trail is situated about 600ft uphill just behind the Museum as indicated. A printed trail guide can be obtained free of charge at the Museum or downloaded from:
http://www.mines.edu/academic/geology/newstuff/walkingtour/geoTrail1.pdf
The brochure will answer many of your questions and includes a geologic map of the trail with information for each stop.

Geology Questions:
29. The Front Range of Colorado contains certain Rock Formations of certain geologic ages, which are associated with certain rock types. These rock types in turn reflect the ancient depositional environment or mode of deposition for igneous rocks. Complete the table below for all the Formations exhibited as samples on the geologic trail. As indicated, the youngest formation must be on the top of the table with the oldest on the bottom:
### Colorado Front Range Self-Guided Geology Field-Trips

**U.R. Kackstaetter, Ph.D.**

<table>
<thead>
<tr>
<th>Formation Name</th>
<th>Geologic Age</th>
<th>Major Rock Type(s)</th>
<th>Environment / Mode of Deposition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precambrian</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

30. According to the Colorado School of Mines geologic trail, which **igneous rocks** are found in Colorado? Where in Colorado do you find them?

31. According to the Colorado School of Mines geologic trail, which **metamorphic rocks** are found in Colorado? Where in Colorado do you find them?

32. According to the Colorado School of Mines geologic trail, which **sedimentary rocks** are found in Colorado? Where in Colorado do you find them?

33. *(Take Picture)* What is a geologic fault? Which fault is on display on the geologic trail and what did this particular fault do?
Next: After the Geologic Trail at the School of Mines drive Northward on 6th Ave straight across Hwy 58 (large intersection) toward Boulder. At the intersection the road turns into Hwy 93. Continue on 93 for about 1 mile to North Golden, where a road will turn westward toward Golden Gate State Park. Follow this road toward the Park for about 4 miles.

*Hint:* Do not necessarily enter the park, because mineral collecting in State & National Parks is prohibited.

What to look for: After about 4 miles en route to Golden Gate Park look for pegmatite veins in road-cuts. Such veins appear as thick banded intrusion of light material (usually quartz, mica and feldspar) as indicated in the picture, and sparkling muscovite mica is a dead giveaway. Find a suitable parking spot, walk over to such a vein and investigate. In pegmatitic quartz & feldspar veins you can find black hexagonal crystals of tourmaline, variety “schorl” (see picture).

*Hint:* You may also try some side roads for better veins and larger crystals

Geology Questions:
34. *(Take Picture)* What is a pegmatite? How does it form?
35. Which minerals are commonly found in the pegmatites of Golden Gate Canyon?
36. What type of Rock is predominantly found in the vicinity of Golden Gate Canyon and how did it get there?
37. How do you use a rock hammer? (This is not a humorous or trick question. It has to do with personal safety)
Next: Return to Highway 93 and drive northward to the Leyden turn off or W 82nd Ave. You will see a rock formation almost standing straight up as shown in the picture. Park the car on the side of the road, get our and investigate.

Geology Questions:
38. Which stratigraphic formation is present at this locality?
39. Which two economic rocks / minerals were mined in the locality of the Leyden turn-off?
Day 3 - Jamestown, Lyons, Carter Lake, Devil’s Backbone

Start: Follow US36 from Boulder northward toward Lyons. About 2.5 miles north of Boulder take the Neva Rd turn-off to the right (East). After 100 yards the paved road turns sharp right with a dirt road going straight. Take the dirt road and stop uphill just before the stop sign. You are at the Pierre Fm and Niobrara Fm stop. Get out of the car and investigate.

Geology Questions:
40. Walk southward down the dirt road to some black shale outcrop. This is the Pierre shale. Brake off a fresh piece of black shale and smell it. What do you smell?
41. What causes the black color of the shale?
42. (Take Picture) What is the Pierre Shale, how & where was it deposited, and how thick is it here in Colorado?
43. If you observe the black outcropping closely you will find some inch thick tan or yellow layers parallel to the shale bedding. What are those?
44. Walk back north to the stop sign and cross US36 (BE CAREFUL... This is a high traffic road!). Go about 100ft north to a white outcrop. What rocktype do you observe?
45. If you look carefully at the rock you might be able to find some large Inoceramus clam fossils. What does the size and shell thickness of those fossils tell you about the ancient depositional environment?

Next: Return to the car and continue northwards on US36 to the Jamestown turn off to the west into Lefthand Canyon Rd at the famous Greenbrier Inn Restaurant. Mark your odometer at this point and add 4.5 miles. There will be a significant stop at that point, but first continue on Lefthand
Canyon road to Buckingham Park; we will make a short-stop there. AT Buckingham Park walk northward on Lefthand Canyon Rd for about 200 yards to a stand of Cottonwood trees. Cross the road going east and climb about 50 yards up the slope.

Geology Questions:
46. What rock types do you observe? Which Formation can you identify? What do those rocks tell you about the depositional environment?

Next: Remember your odometer point?? Continue driving Lefthand Canyon Rd westward to this odometer point. You should now be at a large pegmatitic bright white vein appearing in the road-cut to your right. (see picture above). Park at a safe place and investigate.

Geology Questions:
47. (Take Picture) You may want to take some pictures of this large, attractive pegmatite and it's huge mineral crystals. Identify the minerals present. Sketch freehand or mark on your photograph the distribution of those minerals Then explain what might have caused this dispersion. (Note: Bowen’s Reaction Series might be helpful)

Next: Continue on toward Jamestown. Within a mile or two before you enter the town, sericitic alteration of the rocks becomes evident.

Mineral laden hydrothermal fluids percolated through cracks & crevasses in the rock, often leaving their valuable mineral load behind. In the process, the host rock was decomposed into yellow or orange, very lose material (see previous picture). Old miners were always on the look-out for these discolorations and used them as a guide to place their mining shafts. Stop at a safe place at one of those altered, lemon colored rocks and investigate.

Geology Questions:
48. What minerals do you observe in the areas of alteration? (Note: You may want to use a hand lens)  

49. Take a rock hammer and strike some of the rocks. Then smell them. What do they smell like and what does this particular smell tell you?

Next: Continue on through Jamestown on James Canyon Dr. About a mile West of town you will encounter the old mines and mine tailings (at remediation stage) of the Burlington Mine. The material is usually whitish tan to yellow. Park at CR87 or Ballard Rd. which turns to the right or northward. (This is about 9.5 miles after the Greenbrier.)

- WARNING: Mines are private property. Do NOT walk into a mine or on mine property without permission. Permission can be
obtained. Inquire in Jamestown. -

The sides of the main roads are public and sufficient for investigation and collecting. Walk back along the North side of the road to Jamestown (among the trees to the side of the road.) If you look closely at some of the mine tailing rocks along roads you can find purplish fluorite and even some golden pyrite. These are easiest to obtain when cracking some of the larger rocks with a rock hammer. You may also investigate the rubble between the trees on the south side of the road.

Geology Questions:
50. The fluorite in Jamestown was actually mined. What was it used for?
51. The presence of pyrite in mining areas presents a problem. Even though the mineral is worthless, it creates one of Colorado’s environmental problems when mixed into the tailings or exposed to air. What is that problem and how is it created?
52. The creeks and rivers around Jamestown are used for amateur gold panning adventures. If you have a pan, you may try your luck. How does gold panning work? Which specific attributes does the river material need to display in order to be panned successfully and most likely yield the desired treasure?
53. How does the gold get into the river?
54. After investigating some of the hydrothermal alterations near Jamestown, which mineral(s) did you find in them? How did those minerals get there?

Next: We are down in Jamestown. Follow the road back to US36 and head toward the city of Lyons where a lot of mining activity takes place (There are several quarries in the area). Find out what is being mined and the uses of the mined material. Afterwards follow Hwy66 westward through Lyons and turn southward on Hwy 7 or the St Vrain Dr toward Allenspark. After about 3.5 miles beyond the downtown T-intersection you will see a mining / quarrying operation to the South. Interestingly enough, andesite is mined here, a very unusual rock type for the Colorado Rockies.

Geology Questions:
55. What is being mined in and around Lyons (other than the andesite) and what is it used for?
56. What is the geologic time period for this reddish material mined in Lyons and what was the depositional environment? How can you tell?
57. Leaving Lyons on Hwy 7 you will encounter the andesite mines. Unfortunately these quarries are actively mined and are across the St Vrain River on the other side of the road. Binoculars or a telephoto lens would be advantageous at this point. How did we get andesite get to this part of Colorado?
58. With a telephoto lens or some binoculars find columnar jointing in the andesite! Interpret how columnar joints form!

Next: Continue your trip back through Lyons to the Carter Lake recreational area as indicated on the map in green (For just driving through you will probably not need a day use permit. Ask at the entry station). Go to the North shore of the lake as indicated by the arrow on the map, make a short stop and investigate.

Geology Questions:
59. So far all sedimentary rock units you have observed were dipping toward the East. Why?
60. Here at carter Lake on the North shore these units dip toward the West. Looking across carter Lake to the West you will see the rock units dipping to the East again. What is the geologic structure you are parked on?

Next: Continue Northward from Carter Lake as indicated until you reach US34. Here you take a right and go eastward toward Loveland. You will also drive past an area known as “devils backbone”, where a rugged rock formation is literally sticking straight up out of the ground. “Devils Backbone State Park” is on Hwy 34, about 1 mile West from the Loveland City Limits. The turn-off comes without much warning and the signs are rather small, so pay close attention. Park at the parking lot, lock the car and bring some water. Follow the 1 mile hiking trail to the “Gap” overlook.

Geology Questions:
61. Take a close look at the rocks comprising “Devil’s Backbone”. What is their lithology? Which Formation?
62. What is the “devil’s backbone” and how did it from?
63. “Devil’s Backbone” is a geologic puzzle. Looking eastward from the “gap” you will see a ridge on the horizon. This ridge, which tilts eastward is the same rock formation as “Devil’s Backbone”. If you look westward you
will see a valley and after the valley another hogback tilting again eastward. This hogback is again the exact same rock formation as the lithologies of “Devil’s Backbone”. As you can observe, “Devil’s Backbone” is not very thick were you are standing. How then are these three separate rock outcroppings connected? Try to solve this famous geologic puzzle.

**NOTE:** If you take Dr.K’s GEL1010-Physical Geology Class at Metro State, pay special attention to the Geology at Devil’s Backbone. This Geologic Puzzle will be ON THE LAST EXAM. It will be imperative that you complete LAB Exercise 15 - Dipping Geologic Structures, p.110-113 in your Laboratory e-Manual in conjunction with your observation at Devil’s Backbone.

Next: Drive US34 west from “Devil’s Backbone State Park” past the mouth of Big Thompson Canyon to Viestenz-Smith Mountain Park (about 4 miles after the “Dam Store” at the Canyon mouth). The Park contains remnants and memorial plaques detailing the story of the greatest natural catastrophe in Colorado’s history, the “1976 Big Thompson Flood”. Park at the recreational area, investigate the flood story. If you have time, take the 1 mile hike from the park to the Overlook.

Geology Questions:
64. What caused the historic 1976 flood and why was it so devastating?
65. What safety measures are in place to avoid as many human casualties as possible, should such a flood reoccur?
66. What rocktypes and formation(s) are you encountering on the Overlook hike?
Day 4 - US 287 Morrison Fm road-cut and Owl Canyon

Start: From Ft. Collins take US287 northward as indicated on the map. North of LaPorte, the highway will go through an elongated bend right after the Highway 14 (Poudre Canyon Hwy) turn off at Ted’s Place. You will see the massive road cut exposed to the east consisting of the Dinosaur fossil bearing Morrison Formation. Stop at the end of the bend and hike up this road cut (coming from the North) as indicated on the map.

Geology Questions:

67. (Take Picture) At the Morrison Formation you will find sandstone lenses. These sandstone lenses are sandbars in ancient river channels where dinosaur carcasses were often washed together. Within these sandstones, one often finds fragments of dinosaur remains or bones. Go look for such bone pieces (You may have to search a little... bone fragments are present, but are not too common). When you think you have identified a dinosaur bone, take a picture, indicate the bone on it! Explain how you can distinguish such a dinosaur relic from the surrounding rock.

- Warning: It is illegal in Colorado to remove dinosaur artifacts. Keep to taking pictures. -

Next: Continue northward on US287 for about 6 miles. The road will be absolutely straight and follow a North - South trending Valley between two massive hogbacks, the Dakota Group on your right and the Ingleside Formation on your left. At the Owl Canyon turn off, US287 will jog west right through an impressive road cut (as indicated on the map). Park right after the cut and investigate the exposed Ingleside Limestone. You will find cavities brimming with calcite crystals. These crystals weather out of the rock and often litter the roadside of 287.

Geology Questions:

68. What was the depositional environment of the Ingleside formation?
69. How do the calcite crystals in the Ingleside Fm form?

Next: Go back on US287 for about ½ mile and turn left into the Owl Canyon Rd. In the weathered valleys of the brick red Lykins Fm many gypsum varieties can be founds, from alabaster to satin spar to selenite. The area is completely under private ownership and access is severely limited. Permission to collect must be obtained. However, on the sides of the roads within the DOT property and easements, some small chunks are occasionally found. A neat discovery are calcite pseudomorphs after aragonite, which are hexagonal in shape and can be the size of a silver dollar.

Geology Questions:
70. How did those gypsum deposits form? What do they tell about the environment of deposition and possible prehistoric climates?

Next: If time permits, follow US287 northward toward the Wyoming-Colorado border to the small community of Virginia Dale. You are entering the Virginia Dale ring-dike complex, about 9 miles or so across, straddling the State boundary. On the southern end diorite and quartz monzonite can be found. The outermost area consists of biotite and hornblende containing granite. At the side of US287 igneous rocks of granitic and monzogranitic composition can be found. The area is often referenced as the Virginia Dale Ring Dike complex.

Geology Question:
71. What is the difference between the igneous rocks mentioned?