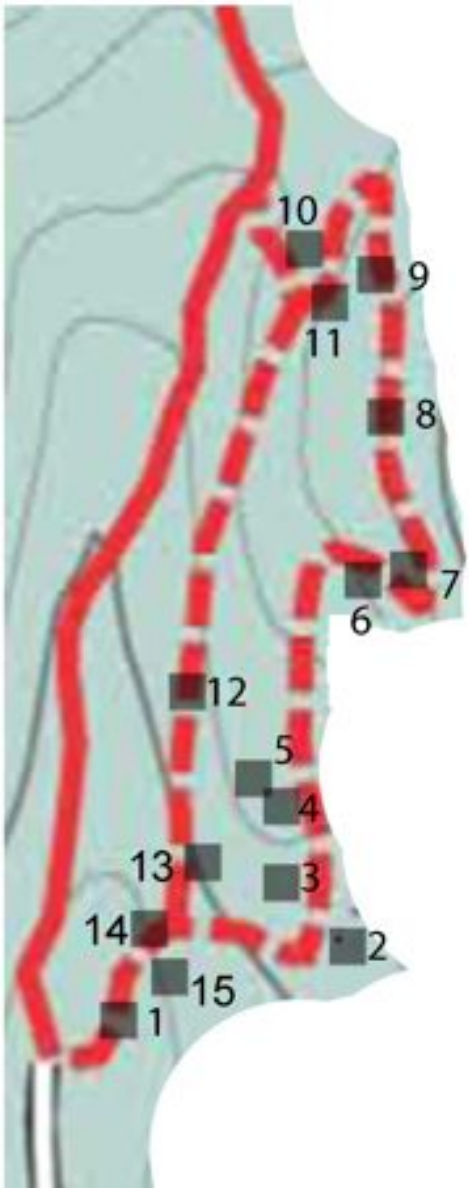
BACKGROUND: LICHEN LOOP TRAIL AT HEIL VALLEY RANCH



POSSIBLE STOPS

1. Abert's squirrel activity
2. Stromatolites to right of trail
3. Limestone rocks
4. Stromatolite rock on the west side of the trail, just below the fallen tree
5. Windblown trees
6. Geology sign; good view of the Over land Fire burn
7. Threeleaf sumac and wax currant shrubs
8. Bench with conglomerates from the Dakota Ridge and good stopping/snack area
9. Sign and sample of forest management
10. Bulldog rock
11. Sandstone from across the valley stabilizing large rock
12. Two areas of Abert's squirrel activity
13. Limestone kiln
14. Historical marker of this area
15. Mountain lion warning

Violet stories

Flower: two upper and two lateral petals act as flags to attract insects; bottom petal serves as a landing strip; dark lines help direct insect into the center of the flower; as insect wiggles its way into the center, pollen grains from the partly hidden anthers overhead fall on its back → larger insects can't get in and eat the pollen

Also have cleistogamous flowers which appear lower on the stem and never bloom but are fertile and → seeds; may be an adaptation to early blooming and chancy pollination

Myrmecochory: ants attracted to small protuberances (elaiosomes) on seed that have oils, maybe sugars; ants carry seed to nests, eat the oil and discard the hard-shelled seed; well-protected and nourished inside the ant nest. Elaiosomes play a similar role to fruits, which also attract animals to the seeds of a plant.

Common mullein ***Verbascum thapsus***

Family: Figwort or Scrophulariaceae

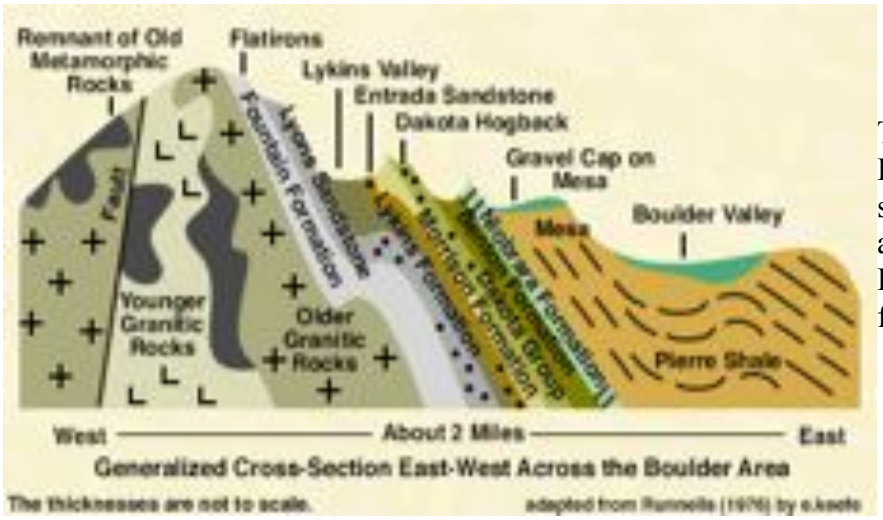
Not yet in flower

* Biennial – leaves first year, then tall seed stalk; noxious weed
* Native of Eurasia; brought to US by early settlers; spread rapidly
* Used since ancient times: dipped in fat → torch for processions
* Treat lung diseases
* Steeped seeds used to treat swelling, joint pain
* Leaves rubbed on painful joints
* Tea for coughs, colds, as a tonic (strain to remove hairs)
* Seeds thrown in water to intoxicate fish → easier to catch
* Used leaves as a wrapper to prevent fruits from rotting
* Flowers used to dye hair blond
* Plant's ashes → soap that would restore gray hair to original color
* Leaves used as blankets in dollhouses
* Hummingbirds use down from leaves in nest
* Birds eat seeds
* Used to be a garden plant
* Hairs protect it from insects, sun

Information from Jack Sanders The Secrets of Wildflowers

GEOLOGY

Based on Raymond Bridge's book, The Geology of Boulder County



The Lichen Loop trail is in the Lykins Valley. Looking east, one sees the Dakota Hogback rising above. To the west are forested Lyons sandstone and Fountain formation.

http://bcn.boulder.co.us/basin/watershed/geology/crosssec.html

Gray rock along road below picnic area	Igneous intrusion; ~62 million years old (Paleocene) → younger than surrounding sedimentaries; same as Valmont Dike; dacite with large crystals in a finer matrix = porphyritic rock with phenocrysts; has biotite, quartz and plagioclase (feldspar) Sill because rock forced its way between layers in the Lykins rather than across (dike)

Trail is in the red Lykins formation from the Permian and Triassic. Weak, soft rock → valleys

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	70				
MESOZOIC	CRETACEOUS		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
		180	ENTRADA	30	CROSS-BEDDED SANDSTONE	RESISTANT
	TRIASSIC	225	LYKINS	675	RED SHALE, SILTSTONE, SANDSTONE	SOFT, VALLEYS AND SLOPES
PALEOZOIC	PERMIAN	270	LYONS	220	PINK SANDSTONE	HARD RIDGES
	PENNSYLVANIAN	305	FOUNTAIN	600	RED SANDSTONE AND CONGLOMERATE	LOCALLY HARD RIDGES
	MISSISSIPPIAN	350				
	DEVONIAN	400				
	SILURIAN	420				
	ORDOVICIAN	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)

When trail turns left, there are light gray rocks with wavy lines in them – the forelle limestone member of the Lykins formation. Will fizz in acid. Rock on right of trail shows stromatolites, formed by mats of cyanobacteria (blue-green algae). As algae grow, change local pH of water → $CaCO_3$ precipitates out and forms layers; algae grow up through the layers → rounded mounds; some of oldest fossils on earth, up to 3.5 billion yrs old; decreased as oxygen → evolution of animals; made a temporary comeback following the mass extinctions at the end of the Permian

	As trail turns back to right, around large hairpin, begin to see conglomerate boulders which have fallen from the Dakota hogback above; look for cross-bedding → evidence of water currents and deposition
	Looking east. Dakota hogback. Early Cretaceous sandstone. Cliff is made up of Plainview sandstone and Lytle conglomerate. The Plainview sandstone erodes more easily than the Lytle, which is why so many of the boulders near the trail are from the Lytle conglomerate.
After intersection with the Wapiti Trail, again can see the gray dacite intrusion as well as some of the Forelle limestone from the ridge above.	

An old limestone kiln. Color and parallel cleavage → Lyons sandstone, brought from one the quarries across the valley.

The common feature of early kilns was an egg-cup shaped burning chamber, with an air inlet at the base (the "eye"), constructed of brick. Limestone was crushed (often by hand) to fairly uniform 20-60 mm (1 to 2.5 inch) lumps - fine stone was rejected. Successive dome-shaped layers of coal and limestone were built up in the kiln on grate bars across the eye. When loading was complete, the kiln was kindled at the bottom, and the fire gradually spread upwards through the charge. When burnt through, the lime was cooled and raked out through the base. Fine coal ash dropped out and was rejected with the "riddlings".

Only lump stone could be used, because the charge needed to "breathe" during firing. This also limited the size of kilns and explains why kilns were all much the same size. Above a certain diameter, the half-burned charge would be likely to collapse under its own weight, extinguishing the fire. So kilns always made 25-30 tonnes of lime in a batch. Typically the kiln took a day to load, three days to fire, two days to cool and a day to unload, so a one-week turnaround was normal. The degree of burning was controlled by trial and error from batch to batch by varying the amount of fuel used. Because there were large temperature differences between the center of the charge and the material close to the wall, a mixture of under-burned (i.e. high loss on ignition), well-burned and dead-burned lime was normally produced. Typical fuel efficiency was low, with 0.5 tonnes or more of coal being used per tonne of finished lime (15 MJ/kg).

From http://en.wikipedia.org/wiki/Lime_kiln

ANIMALS

- Abert's squirrels – look for chewed off ends of ponderosa branches and peeled sticks
- Rabbits
- Mice, voles
- Elk

  At the turn of the 20th century, elk were eliminated from Boulder County. They were reintroduced at Heil Valley Ranch between 1913 and 1917. Heil Valley Ranch is now an important winter range for elk who migrate from the Indian Peaks Wilderness Area - the only herd along the Front Range who journey from the Continental Divide to the Plains. http://www.bouldercounty.org/openspace/recreating/public_parks/heil_ranch.htm
- Mule deer and white-tailed deer
- Bobcats, mountain lions, black bear
- Red and grey fox
- Coyote
- Wild turkey

HISTORY

Evidence shows there were at least four Native American camps here prior to Anglo settlement. The first Anglo populations were most likely beaver trappers exploring nearby creeks around 1800. Later, the discovery of gold coaxed adventurous fortune-seekers to try their luck. In 1888, Solomon Geer became the first settler to patent land here, followed by Joel Plumlee and Charles Ingersoll in 1893. During this period, building materials needed for the growing Front Range towns changed from wood to brick and stone. In fact, Lyons sandstone was quarried on this property.

In 1949, the Heil family purchased the land and grazed Hereford cattle here. In the 1970s, the family ventured into tourism and recreation, providing horseback rides, hayrides, and hunting. In 1996, Boulder County completed the purchase of Heil Valley Ranch and Hall Ranch, as well as adjacent conservation easements.

http://www.bouldercounty.org/openspace/recreating/public_parks/heil_ranch.htm

OVERLAND FIRE (http://www.bouldercounty.org/property/forest/pages/overlandfire.aspx)

On October 29, 2003, high winds were blowing across the Colorado Front Range in the approach of an autumn cold front. In the vicinity of Jamestown, those winds broke a 20-foot tall tree, which was blown into a 13,200 volt power line. That line snapped, crashed into the ground sparking a wildland fire. The fire grew quickly due to the combination of high winds, steep topography of the area, and the density of the forest. In just the one day, the fire burned 3,500 acres and destroyed 12 homes. While there was no loss of life, there were a number of close calls.

Firefighters and emergency response personnel were initially powerless to stop the spread of the fire. Instead they had to oversee evacuations of residents and structural defense of homes in Jamestown and Lefthand canyon. By late afternoon attempts to burnout areas in front of the approaching wild fire and hold control lines proved successful. By the next the day, the cold front had come through, and the storm system that had driven the fire had effectively put it out with a combination of high humidity, sleet, and frigid temperatures. Limited mop-up operations occurred for the next several days. Evacuees were let back into their homes.

A significant revegetation and erosion control effort followed the next spring, including aerial mulching of severely burned areas, and hazard tree felling along key roadways. Despite the work, several rainstorms caused significant flood events, sending water and debris flowing into Jamestown, causing additional damage and requiring more cleanup efforts.

Active forest management to replace role of fire in the ecosystem