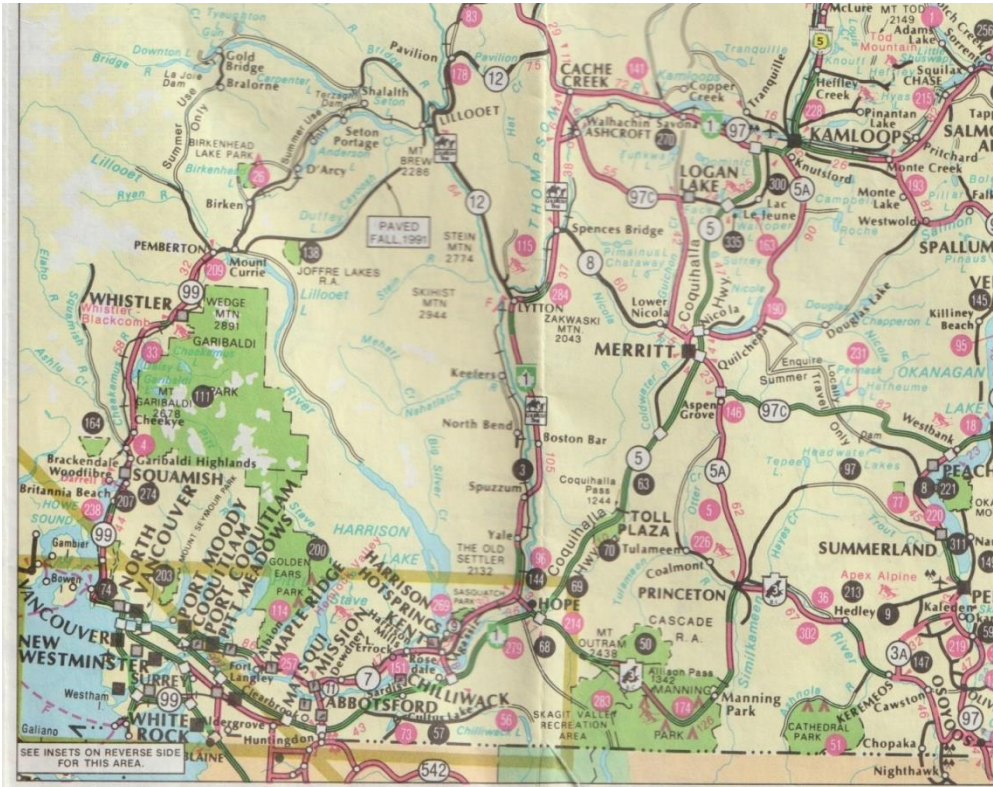


13th BCPA Symposium 2021

Princeton Fossil Field Trip

July 11, 2021



Vancouver to Princeton Map. From Hope take Highway 3. Remember to have at least half a tank of gas. There are no gas stations in Manning Park. Manning Park is a good stop off for a break, grab a snack, and use the washroom. There is a gas station as you exit Manning Park. The next gas station is in Princeton.

Meeting place in Princeton: Meet in front of the Princeton Museum at 9 am, on July 11. Brennan Martens is the field trip leader. Perry Poon will assist Brennan. Please note that if anyone wishes to stay in Princeton on July 12, Perry will remain in Princeton to take participants back to Blackmine Road site.



March fly (*Plecia* sp.)



Dawn Redwood leaf (*Metasequoia occidentalis*)

Paleontology of Princeton

During the middle Eocene (50 to 55 million years ago) along the southwest coast, the Pacific Rim Terrane collided with Vancouver Island followed by the Crescent Terrane. These terranes pushed north as smaller plates slide against North America that created crustal faulting and fractures forming basins in the earth's crust. Intense volcanism occurred from B.C.'s interior plateau to Washington State. Numerous volcanic eruptions spread lava over huge areas, built the huge plateaus, and blocked rivers. In the Princeton area, these rift valleys filled with fine grained volcanic ash from eruptions, collected water, and formed freshwater lakes. A number of these freshwater lakes deposits are found from Smither, Quesnel, Horsefly, Kamloops, Princeton, Thompson River basin, Nicola Valley, Okanagan Valley, in BC, and Republic, in Washington.

The Allenby Formation consists of Tertiary strata of a mixture of breccias, conglomerates, sandstones, mudstones, sedimentary rocks, shale, siltstones, and soft mudstones-claystone. Fossil bearing rocks consists of shale, siltstone, and laminated diatomites, amongst coal seams, and volcanic rocks. The solidified volcanic lava formed the cliffs of modern day valleys. The carbonaceous paper shale, and very fine laminated shale are colored brownish red, buff, dark grey, white dominant, and shades of grey and red are common. Fossil preserved in the shale are compressed carbonaceous impressions.

Compression fossils of fish and insects died on the shore of the freshwater lakes and beside river banks, amongst plant parts falling into the water. The organisms settled into the lake, and were covered by fine volcanic ash sediments brought to the lakes by the river systems into the lakes. The lake bottom was low in oxygen levels, and slowed decomposition of organisms. More sediments and volcanic ash flowed into the lakes forming layers of sediments at the bottom of the lakes.

During the Early Eocene, the Earth underwent a global greenhouse effect. Temperatures were warmer, and winters were milder than present day, due to the abundant carbon dioxide in the Earth's atmosphere. Paleoclimate indicate Mean Annual Temperature of about 10 to 15°C. Eocene plant fossils from B.C. interior suggested that the freshwater lakes were surrounded by temperate mixed forest of conifers and deciduous species that were probably situated at an altitude between 0.5 to 1.2 km in elevation. The temperate upland plant community called the Okanagan Highlands produced diversity richer than the present day forest. There were deciduous conifers (Dawn Redwoods, and maidenhair trees), conifers (pines, spruces, true firs, sequoias, red cedars, yellow cedars, yews, and hemlocks), broad-leaf trees (elms, beeches, alders, and maples), and shrubs (roses, myrtles, grapes, sumacs, elderberry, saskatoons, currants, and raspberries). A modern naturalist would feel very much at home walking along the trails of B.C. around 50 million years ago. Princeton plant fossils represent modern genera, others extinct genera, and plant groups that exist in present day Asia. Collectors can hope to find fish, a variety of insects, most of which closely resemble modern forms, and occasionally, evidence of birds, and non-insect invertebrate animals. Exquisite details are preserved in the compression fossils.

Complete fossil insect or their body parts (like wings) can be found in the Allenby Formation. Major groups of insects are found in the Allenby Formation. Some fossil insects look like they resemble their present day living relative, but are separated by slight differences. Eocene fossil insects include grasshoppers, water striders, froghoppers or spittlebugs, stink bugs, beetles, lacewings, parasitoid wasps march flies, crane flies, and dance flies. Some of these insects may be found in the Allenby Formation.

Eocene fossil fish fauna include the Bowfin (*Amia Hesperia*), which is rare to find. A 55 cm specimen was found near Princeton. Mostly scales of the fish are found on deposit near coal seam. There is only one living bowfin, *Amia calva*, which is found in southeastern North America. Another fish found in the Princeton area is *Eohiodon rosei*, which has 2 living relatives, the Goldeneye and the Mooneye. Both fish are not found west of the Rocky Mountains. Other fish include suckers, *Amyzon brevipinne*; oldest member of the salmon family, *Eosalmo driftwoodensis*; and the trout-perch, *Libotoniuss blakeburnensi*.

A Brief History of the Dawn Redwood and The Maidenhair Tree

There are two trees worth mentioning that they are found as fossil in Eocene sedimentary rocks, and they are found growing in the city. The Dawn Redwood Tree and the Maidenhair Tree are both found as fossils in the Princeton area, and have present day living relatives. The fossil Dawn Redwood, *Metasequoia occidentalis*, is common in the Princeton area, and it has a living relative, *Metasequoia glyptostroboides*. The fossil Maidenhair Tree or Ginkgo, *Ginkgo adiantoides*, *G. biloba*, *G. dissecta* are occasionally found in Princeton area, and its living relative is *Ginkgo biloba*.

Dawn Redwood

In 1941, Shigeru Miki, Japanese paleobotanist, first described *Metasequoia*, based on fossil specimens of cones and leaves from Japan and Manchuria

In 1941, there are rumors of a large conifer tree were being reported from Szechwan Province, China, possibly living Dawn Redwood, *Metasequoia*.

In 1944, Tsang Wang, staff from Central Bureau of Forest Research of China discovered an enormous living dawn redwood at a shrine in a rice paddy in the village of Mo-tao-chi, in Szechwan Province. He collected specimens of living cones and leaves.

Wang showed specimens to Dr. Wan-Chan Cheng, from Department of Forestry of the National Central University, and examined the specimens. He thought that the fossils represented a new genus of conifers.

Wang showed specimens to Dr. Hsen-Hau Hu, Director of the Fan Memorial Institute of Peking, who recognize the specimens described in a paper of a fossil *Metasequoia* described by Shigeru Miki.

In 1948, Hu and Cheng publish a joint paper describing the new plant as *Metasequoia glyptostroboides* Hu and Cheng

Dr. Hu contacted Dr. Ralph Chaney, Professor of Paleontology, University at Berkley, who was at the time, Director of Save-the-Redwoods League, a group dedicated in 1918 to preserve the oldest trees in the world.

On March, 1946, Dr. Chaney and Dr. Milton Silverman, science writer for the San Francisco Chronicle, travelled to central China, in the Szechwan and Hupeh Provinces, to investigate a living representative known only from fossil record from Western North America. They found several living specimens of *Metasequoia glyptostroboides*.



Dawn Redwood (*Metasequoia glyptostroboides*) in Garden City Park, City of Richmond, BC.

Ginkgo Tree

In 980, Tsan-Ning, a Chinese monk, wrote, “Ko Wu Tshu Than” or “Simple Discourses on the Investigation of Things”, and is the earliest reference to Ginkgo.

In 1691, Engelbert Kaempfer, Dutch physician-botanist, saw a living Ginkgo trees in Japan. His journey to Persia and Asia were described in his book, "Amoenitum Exoticarum" (1712). In his book, he was the first westerner to describe and illustrate Ginkgo.

In 1771, Carl Linnaeus, Swedish physician and botanist, described and named a specimen with twigs and leaves, *Ginkgo biloba*.

Both *Metasequoia glyptostroboides* and *Ginkgo biloba* are found growing in the Lower Mainland. They have been introduced and are not native to North America. Live tree have been found in Vancouver and Richmond.



Ginkgo Tree (*Ginkgo biloba*) Garden City Park, City of Richmond, BC

What To Bring (Equipment)

The Allenby Formation shale allow for light collecting, so there is no need to bring your big sledgehammer.

A good idea to protect fragile and delicate fossil shale specimens is to use cardboard from a cereal box and plastic zip-lock bags. Cut two cardboard pieces larger than the fossil specimen. Place specimen between the cardboard pieces. The cardboard will protect the shale. Record date, specimen number, fossil site, on the plastic bag, and place fossil in the plastic zip-lock bag.

Another method is wrapping the shale specimen in newspaper. Newspaper can be cut or torn into suitable sizes. Use masking tape to wrap newspaper, and record date, fossil locality, specimen identification on the masking tape.

- Medium geology hammer
- Small geology hammer
- Couple of small chisels
- An old butter knife/pocket knife /putty knife
- Shovel or dowel
- Newspaper
- Cardboard from a cereal box, and Plastic Zip-lock bags
- Cardboard boxes or plastic containers
- Masking tape
- Felt pen or pencil
- Camera
- Hat, work boots, rain gear, work glasses/goggles/eye protection, water bottle, sunscreen, bug spray, work gloves
- Snacks and lunch

- Note book and pencil
- Crazy glue or white glue to repair fossils

Safety First

The VanPS promotes safe collecting practices. You are responsible for bringing and wearing appropriate safety gear on all field trips including gloves, a hat, and eye protection. We ask each member or family unit to have a personal first aid kit, know the contents and how to use it. Members are responsible for keeping themselves warm.

References

- Archibald, S. Bruce, Greenwood, David R., Smith, Robin Y., Mathews, Rolf W., and Basinger, James F. (2011). Great Canadian Lagerstätten 1. Early Eocene Lagerstätten of the Okanagan Highlands (British Columbia and Washington State). *Geoscience Canada*. 38(4):155-163. December.
- Basinger, James F., McIver, Elisabeth, and Wehr, Wesley C. (1996). Chapter 20. Eocene Conifers of the Interior. In: Ludvigsen, Rolf (ed). *Life in Stone. A Natural History of British Columbia's Fossils*. UBC Press, University of British Columbia, Vancouver, B.C. pp 248-258.
- Cameron, Alfred E. (1917). Fossil Insects, With Special Reference To These Of The Tertiary Lake Deposits Of Similkameen Valley, B.C. *B.C. Entomological Society. Proceedings*. 21-31
- Cannings, Sydney, and Cannings, Richard. (1999). The Eocene Scene. *Geology of British Columbia. A Journey Through Time*. Greystone Books, Vancouver, British Columbia. pp 34-35.
- Crane, Peter. (2013). *Ginkgo. The Tree That Time Forgot*. Yale University Press, New Haven. Pp1-384.
- Douglas, Sheila D. and, Stockey, Ruth A. (1996). Insect fossils in middle Eocene deposits from British Columbia and Washington: faunal diversity and geological range extensions. *Canadian journal of Zoology*. 74:1140-1157.
- Henrich, Thor. (1996). The Living Fossil *Metasequoia*. *British Columbia Paleontological Alliance Newsletter*. No. 14. pp 16-17. (October).
- Morrin, Joe. (2000). The Ginkgo or Maidenhair Tree. *British Columbia Paleontological Alliance Newsletter*. No. 25. pp 12-14. (July)
- Website: https://en.wikipedia.org/wiki/Allenby_Formation.
- .Wilson, Mark V.H. (1996). Chapter 17. Fishes from Eocene Lakes of the Interior. In: Ludvigsen, Rolf (ed). *Life in Stone. A Natural History of British Columbia's Fossils*. UBC Press, University of British Columbia, Vancouver, B.C. pp 212-224.
- Wilson, Mark V.H. (1996). Chapter 18. Insects near Eocene Lakes of the Interior. . In: Ludvigsen, Rolf (ed). *Life in Stone. A Natural History of British Columbia's Fossils*. UBC Press, University of British Columbia, Vancouver, B.C. pp 225-233.

Princeton Field Trip – Accommodations

Note - If you plan to look for your accommodations please be aware that there are a few USA Princeton cities that often come up (!).

Ace Motel – 130 Bridge Street

Phone: 250-295-7063

<https://www.princetonacemotel.com/>

Best Western Princeton Manor Inn and Suite – 169 No. 3 Highway

Phone: 250-295-3537

<https://www.redlion.com/canadas-best-value-inn/bc/princeton/canadas-best-value-inn-suites-princeton>

Canada's Best Value Inn and Suites – 169 North 3 Highway

Phone: 250-295-3537

<https://www.redlion.com/canadas-best-value-inn/bc/princeton/canadas-best-value-inn-suites-princeton>

The Cedars Motel – 139 3rd Street

Phone: 250-295-3237

<https://similkameenvalley.com/directory/listing/cedars-motel>

Countryside Inn - 301 Highway 3 East

Phone: 250-295-7464

<https://www.facebook.com/pages/Countryside-Inn/121290437914395>

Evergreen Motel – 250 Highway 3 East (0.8 km from Princeton)

Phone: 250-295-7179

<http://evergreenmotelprinceton.ca/vancouver-princeton-accomodations.htm>

Princeton Castle Resort – 375 Rainbow Lake Road (5 minutes away from Princeton)

Phone: 250-295-7988

<http://www.castleresort.com/>

Princeton Municipal RV Park and Campground – 365 Highway 3 East (2.8 km east of Princeton)

Phone: 250-295-7355

<https://discoverprinceton.ca/e/princeton-rv-campground>

Princeton Ponderosa Motel – 130 Bridge Street

Phone: 250-295-6941

<https://www.facebook.com/Ponderosa-Motel-133070520358814/>

Rivers Edge RV Park and Campground – 305 Sanderson Way

Phone: 250-295-6568

<https://www.riversedgerv.ca/#>

Riverside Cabins – 307 Thomas Street
Phone: 250-295-6232
<https://www.princetonriversidecabins.com/>

Sandman Inn - 102 Frontage Road
Phone: 250-295-6923
https://www.sandmanhotels.com/princeton?utm_source=google&utm_medium=maps&utm_campaign=princeton

The Village Inn – 244-4th Street
Phone: 250-295-6996
<http://villagerinnprinceton.ca/>