



Cape Byron, NSW, the easternmost point in Australia, Dec 25, 2024 (T. Redding)

President's Message

Welcome to 2025.

The start of term in the fall seems to have a nice slow, sunny and relaxed start, where the whole educational enterprise has just not quite hit its stride. In comparison, the start of the year in January always seems to just launch directly to full speed, with to-do lists pre-filled with items from before the break. So, I hope that everyone was able to get a good break between the fall and winter before things got going, and that you are still ticking off those completed New Year's resolutions with a cheerful pen. We have hit our first real blast of winter weather here, but the chilly days also mean some welcome sunny days too.

The new year means it is also time to renew NAGT memberships and to think about encouraging colleagues to join. Take a moment to forward this newsletter on to someone else you know who may be interested in learning more about NAGT. Are there keen K-12 teachers in your district? Who is it who brings school students to visit your school, campus, or museum? Think about reaching out to undergraduates who may be keen on education or who are working as a teaching assistant in your department. Do you have graduate students who are looking to improve their teaching while looking for research positions, or have decided on a pure education role? Have any new faculty colleagues just started out who are struggling to put together courses? The Earth Sciences are a critical part of understanding our world, and I am proud to be part of NAGT and to help build communities of educators to get that message out. Join us in trying to get the message out about the resources and opportunities that NAGT can offer.

Your executive team are still busy helping to plan for the June 26-28th, 2025 in Portland Oregon - *Geoscience along the margin: Intersections of people, community, and science*. This is being held in parallel to the [Cascadia Region Earthquake Science Center](#) (CRESCENT) annual stakeholder meeting. We are hoping to have further details of the program settled soon as we work with CRESCENT and their team to plan the

program. Please pay a visit to the [CRESCENT](#) website to check out the wide range of initiatives they are undertaking.

This spring we are looking to start a regular series of course-specific informal discussion groups. Many of our members are teaching introductory Earth Science, Environmental Science and Physical Geography courses, and so we are hoping to bring those communities together to learn from each other and share resources. Look for sessions in February, March and April. Check out the announcements in newsletter for talks as well.

As always, please send your suggestions for section talks, activities or resources you would like to see along to the executive. We are also always on the lookout for extra volunteers to help run the section.

Happy Educating
Craig Nichol
UBC Okanagan

PNW Section Executive

President

Craig Nichol, University of British Columbia,
craig.nichol@ubc.ca

Vice President

Crystal Huscroft, Thompson Rivers University,
chuscroft@tru.ca

Past President/Awards Coordinator

Derek Turner, Douglas College,
turnerd1@douglascollege.ca

Secretary

Jodie Harnden, Sunrise Middle School,
jharnden@pendletonsd.org

Treasurer/Website

Zachery Schierl, Yakima Valley College,
zschierl@yvcc.edu

Newsletter Editor

Todd Redding, Okanagan College,
tredding@okanagan.bc.ca

Councilors

Alaska

Vacant

British Columbia

Todd Redding, Okanagan College,
tredding@okanagan.bc.ca

Saoirse MacKinnon, UBC Okanagan,
Saoirse.mackinnon@ubc.ca

Idaho

Vacant

Oregon

Steve Carlson, Portland State University,
scarlson@pdx.edu

Washington

Vacant

Please send information about upcoming events, new publications, teaching resources, photos or other items of interest for the next newsletter to tredding@okanagan.bc.ca

Upcoming Section Events

Friday Feb 21 - 12 to 1pm PT: *Lunchtime teaching discussion group - **Physical Geology*** – hosted by Jacob Selander, Highline College

Thursday March 20 – 11am-12pm PT: *Accessibility in Field-Based Learning and Indigenous Course Revision: Lessons from a Capstone Course in Natural Resources Conservation* - hosted by EASIL UBC
Registration link to receive an email with the zoom
link: https://ubc.ca1.qualtrics.com/jfe/form/SV_bOTZYwY7596JEpM

Thursday March 27 – 12 to 1pm PT: *Lunchtime teaching discussion group - **Historical Geology*** – hosted by Daina Hardisty, Mt Hood Community College

Thursday April 17 – 12 to 1pm PT: *Lunchtime teaching discussion group - **Physical Geography*** – hosted by Crystal Huscroft, Thompson Rivers University

Thursday June 26 – Saturday June 28: **NAGT-PNW Section Conference**, Portland Oregon.
Details coming soon (see outline in Fall 2024 newsletter)

Other Events

March 6-8: *Western Division of the Canadian Association of Geographers*, Thompson Rivers University, Kamloops, British Columbia. <https://www.wdcag2025.org/>

May 18-20: *Rocky Mountain GSA Section Meeting*, Provo, UT.
<https://www.geosociety.org/GSA/GSA/Sections/rm/2025mtg/home.aspx>

June 22-26: *Early Career Geoscience Faculty Workshop*, Macalester College, MN.
Application Deadline: March 16, 2025.
<https://serc.carleton.edu/NAGTWorkshops/earlycareer2025/index.html>

NAGT Outstanding Earth Science Teacher (OEST) award

Recognizing educators is a wonderful way to share the important and meaningful work that they do each day in making a difference in your community. If you know of an outstanding K-12 Earth Science teacher or informal educator, please consider nominating them for the **NAGT Outstanding Earth Science Teacher (OEST) award**.

OEST awards are given for "exceptional contributions to the stimulation of interest in the Earth Sciences at the pre-college level." Any teacher or pre-college educator who focuses on Earth Science content is eligible. There are state/provincial awards and a Pacific

Northwest Section award. Self-nominations are permitted, or nominations may be submitted by others.

Nominations are due by March 1st and the application form can be found on the NAGT OEST Award Page. Simply find your NAGT section and begin. Please take a few minutes to recognize a great teacher and spread awareness of Earth science education!
OEST website: <https://nagt.org/nagt/awards/oest.html>



**NAGT**
**OUTSTANDING
EARTH SCIENCE
TEACHER AWARD**

GIVEN FOR EXCEPTIONAL
CONTRIBUTIONS TO THE
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COLLEGE LEVEL



Are you or do you know a K-12 educator who goes above and beyond to educate the next generation about the Earth Sciences? Then consider nominating yourself or a colleague for the National Association of Geoscience Teachers (NAGT) Outstanding Earth Science Teacher Award (OEST) to honor your/ their efforts!

NOMINATE BY MARCH 1ST!

 <https://nagt.org/nagt/awards/oest.html>

Research opportunities for students

Here is an up-to-date [list of ongoing research programs that are accepting 2YC students!](#) Please share widely with your student networks.

So how do we encourage more research opportunities for 2YC students? Consider seeking funding via the National Science Foundation. There are a number of programs and solicitations that focus on providing financial support to proposals that emphasize student research and/or two-year colleges.

- [ATE](#) - Advanced Technological Education
- [IUUSE: ITC](#) - Innovation in Two-Year College STEM Education
- [REU](#): Research Experiences for Undergraduates
- [S-STEM](#) - NSF Scholarships in Science, Technology, Engineering and Math Program

Don't forget [NAGT has resources for grant writers](#) (Acrobat (PDF) 3.8MB Dec13 24), including workshops with sessions on fitting grant writing into your professional life, avenues of dissemination to promote your work, and most importantly, a network of colleagues who have been-there, done-that who can share their experiences!

OEST Share-a-thon

One of the greatest assets of NAGT are our K-12 teachers. NAGT provides recognition for outstanding K-12 teachers that include Earth science in their curriculums. There are regional and state-level awards to honor the many creative ways young students experience Earth science through the dedication and unique lessons their teachers provide. If you missed the online Outstanding Earth Science Teacher(s) presentation, you can still enjoy it by visiting the website of the recording. You can watch how these teachers engage their students in phenomena-driven activities and authentic research. From earthquake science, to geologic history, to space, students are getting an opportunity to explore and understand their world. What a great way to see just what future higher ed students have experienced! [Check it out here!](#)

Know a talented K-12 teacher who uses Earth Science in their curriculum? Nominate them for an award! [Outstanding Earth Science Teacher Award](#)

Publications and Resources

Chitty, EG and Hesp, PA. 2024. **The value of field studies in earth and environmental science: A review.** Natural Sciences Education, 53:370004
<https://access.onlinelibrary.wiley.com/doi/abs/10.1002/nse2.70004>

siwłk^W Water Curriculum K-12 Teacher's Resource Guide, incorporates Syilx traditional water knowledge into the curriculum objectives based on the core competencies listed in B.C.'s new curriculum. <https://syilx.org/natural-resources/water/siw%c9%ack%ca%b7-water-curriculum-k-12-teachers-resource-guide/>



Geo-Launchpad

 **Paid geoscience internship program exclusively for community college students!**

When? Late May - early August (11 weeks)

Application Deadline? February 15

Get ready for:

 **Hands-on Science:** projects include **lab experiments, field equipment testing, GIS mapping** - all in a day's work!

 **Meet Experts:** Rub shoulders with scientists who are also **awesome mentors**. Plus, connect with other students who **share your passion for planet Earth!**

 **Boost Confidence:** leave with more knowledge, confidence, and a **broader network!**

Geo-Launchpad offers:

 **Cash In:** **paid** competitive weekly stipend (\$720/week), plus **free** housing

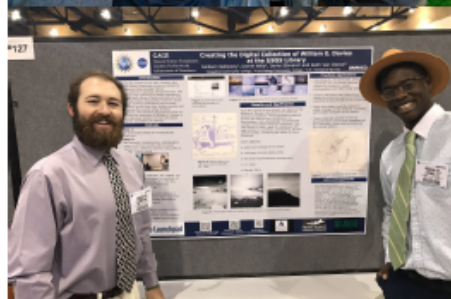
 **More Than Work:** professional development, team building, **career exploration**, and field trips

 **Showcase Your Genius:** present at a conference, **travel funding available**

Don't miss out! Your paid summer geoscience adventure awaits!

Scan QR code for more info & application requirements!

Questions? Reach out! geolaunchpad@earthscope.org



**GAGE
SAGE**



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**EarthScope
Consortium**

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Teaching Technique: Creating a Community of Learners

Steve Carlson*, Portland State University (scarlson@pdx.edu)

One of the my most useful teaching strategies is what I call challenge points. At the beginning of class I have the students fill out a 3 X 5 card with their name, contact phone number, email and any ADA accommodation they need. I put this in a packet secured with a rubber band and use these during class. The points they earn are added to their mid-term or final test scores. (Makes the points important). The idea is to connect information from the beginning of class to the final.

Students in my classes must be in their seats ready to go immediately when class is to begin. If they aren't ready, they are ineligible to take part in the challenge point process. I then pull one of the 3 X 5 cards and asked a conceptual questions over anything covered from the previous readings, activities, (labs) field studies, assigned media or lecture. **IF** they answered the question satisfactorily, they received a challenge point.

I also wrote out the possible questions before hand and then after a particular class I give out a study sheet from that class with the questions that were possible. This becomes a study sheet for any test and similar questions that might be asked later in the course. The process makes your class into a learning community as rarely do students get the correct answer right away and I'd pull more cards and see if the next student could embellish the answer. Students can "play or pass" and are expected to answer quickly or I pull another card. Often I would ask if they agreed or disagreed with the previous student and why. This process was usually the most enjoyable part of the class. It also takes the students mid-set out of the hall and into the classroom right away. I use no more than 10-15 minutes of class.

An example of what this might look like would be asking early on what the diagnostic quality of a mineral would be in the first part of the course, and later what that mineral in an Igneous rock would tell about its formation in terms of temperature and pressure. Or its effect on the viscosity and explosivity of a volcano.

If I didn't have to have a mid-term and a final, I would just use the challenge point scores as a grading basis as the correlation among the students and success on those tests are usually one to one. There are outliers who did well on the tests and not on the points, but that was the exception. The students who don't like the process are usually the ones who seemed to have signed up for the class just to read and take the tests just for the credit. They usually dropped the class before the deadline (around 7% of the students).

The class truly becomes a community of learners and the interaction among the students is the most important. I no longer have to grade quizzes and if there is a field studies as part of the class, I take the cards with me and ask questions about the stops or movies I show on the bus. An important part of this process is the feedback on what the students are retaining from all your effort. I hope you try this in one of your classes because it takes a few times to adapt it to your own style.

*Steve was the NAGT Teacher of the Year in 1984

10 days in the greatest geologic cathedral- Kayaking the Grand Canyon of the Colorado

Jacob Selander, Highline College Geology Faculty

December 2024:

With Fall Quarter grades submitted and the email “Out-Of-Office” reply turned on, I met up with an old friend and we headed south from the Pacific Northwest to Lees Ferry, Arizona to spend the next 10 days kayaking just under 300 miles through the full Grand Canyon of the Colorado River. This trip had been in the planning for over 18 months, and we were both hoping that the long-term forecast of seasonally warm* weather would hold out.

**warm = daytime temperatures above 0°C...*

Between the two of us there's over 50 years of paddling experience, and we had decided early on to make this a self-support trip. So- all the food, clothing, camping gear, first aid, waste management, and other miscellaneous items we'd need for 10+ days had to fit inside our kayaks. The majority of people who travel through the Grand Canyon do it via raft, which allows for a lot more stuff to be taken with. (for example, one morning we passed a group that had packed 4 guitars, a snare drum, and an amp and were holding a riverside jam session) But, there is something to be said about the simplicity of lightweight travel, and with being self-sufficient we were able to cover around 30 miles per day and still have time to stop for hikes and some exploring.

This would be my 3rd trip through the Grand Canyon, with two main things drawing me back. First, the whitewater! While not technically difficult, the rapids are big, splashy, and just downright fun. Second, of course, the geology! If you ever want to go somewhere to feel really small in space and time, this is the place. Just about 2 billion years of North America's history is recorded here, even with a few (big) gaps the record is quite spectacular.

Rather than recap the full geologic history of the Grand Canyon- since there are many, many excellent field guides for that (check out the [GSA Special Paper 489 “Grand Canyon Geology”, Timmons and Karlstrom, eds.](#) for an excellent review)- here's a photo essay with some geologic and other highlights from the trip.



35 miles in on the morning of Day 2 of the trip in Marble Canyon, in the upper portions of the Grand Canyon. Here the river has incised into a series of Mississippian carbonates, deposited along the passive margin of Laurentia. These carbonates and intermixed clastic rocks record multiple cycles of transgression- regression along Laurentia's western edge, but going into more detail is above my pay grade as a structural geologist 😊

The major cliff-forming unit in the photo is the early Mississippian Redwall Limestone, named for the steep iron-oxide stained cliffs this unit forms. The staining comes from leaching of iron oxides from younger clastic units stratigraphically above the Redwall Limestone.



Day 3, 71 miles into the trip. Quick morning hike to cliffs overlooking the Unkar delta and namesake rapids. The rocks in the Grand Canyon can be divided into three general groups- the Paleo-proterozoic crystalline metamorphic and igneous basement rocks (formed during assembly of the early Laurentian continental mass); Meso- and Neo-proterozoic Grand Canyon Supergroup sedimentary and intrusive rocks (recording the final assembly and breakup of Rodinia); and the thick, primarily passive margin Paleozoic flat-lying strata. The red rocks in the foreground are part of the larger Dox Formation, Meso-proterozoic fluvial and deltaic sandstones, likely derived from mountain belts to the east- northeast, remnants of the Grenville Orogeny while the proto-North American continent was being assembled.

Between the Dox Formation in the foreground and the canyon rim in the background is a pretty prevalent angular unconformity which separates the dipping Grand Canyon Supergroup rocks from the flat-lying Paleozoic strata. One of the main cliff-forming members just barely visible in the background is the Redwall Limestone from the previous photo.



Day 4, 98 miles in at Crystal Rapid. Looking downstream at some of the classic basement rocks- holy schist!

One of the more prominent basement units is the Vishnu Schist- part of the larger Granite Gorge Metamorphic Suite. These rocks began as sediments shed from a volcanic island arc around 1.8 Ga, and then metamorphosed as the arc was accreted to the growing Laurentian continental mass around 1.65 Ga. Though presently at the surface (or at least partially exposed in the depths of the Grand Canyon), these distinct dark rocks formed at mid-crustal depths of ~20- 25 km. Later, around 1.4 Ga the metamorphic basement rocks were intruded by a series of granitic melts, a few visible as a pink dike swarm in the photo center- right.

The flat-lying rocks in the background are our friends the Paleozoic strata- can you pick out the Redwall Limestone?



Day 4 in the afternoon, 116 miles in. While we typically think of the basement Granite Gorge Metamorphic Suite as the “oldest” rocks in the Grand Canyon, there are a few places deep in the canyon where older still rocks are exposed. For a couple miles around Elves Chasm (a very popular short side-hike to a small waterfall in a moss-lined sandstone and travertine canyon), rocks at river level are the Elves Chasm Pluton- a ~1.84 Ga intermediate quartz diorite and tonalite intrusive body interpreted to be a magma chamber from the island arc that produced the sediments that would go on to become the metamorphic suites. So in other words- the Elves Chasm Pluton (the rocks outcropping in the foreground of the photo) is the basement of the basement rocks!



Of course, no geologist can really go to the Grand Canyon without stopping at Blacktail Canyon (120 miles into the trip, morning of day 5) and making a short hike to the brilliantly exposed “Great Unconformity”. This unconformity separates the semi-horizontal Paleozoic strata from underlying basement or Grand Canyon Supergroup rocks. In Blacktail Canyon, the Tapeats Sandstone (~540 Ma coastal beach and fluvial deposits) sits directly on top of some paleo-topography carved into the Vishnu Schist- giving a time gap of about 1.2 billion years.

Side note- Blacktail Canyon is a great winter campsite, one of the few that has morning sunshine. Which we needed that day, freezing temperatures overnight left a thick frost on our sleeping bags. Definitely good to dry/ thaw out the gear before getting back on the river!



Evening of day 5, 145 miles into the trip. With just 2 of us on the trip, and carrying everything we need in our kayaks, daily camp logistics were pretty simple. Arrive at our planned site for the night (with so few people in the Grand Canyon during the winter months, we never had trouble finding a campsite), unload the drybags from the kayaks, set up your tent/sleeping arrangement, lay out the fire blanket (doubled as kitchen tarp), Cook up some dinner, and head to sleep! We only used the fire pan a couple times (Park Service regulations state you need to take one with on winter trips), but glad to have it anyway.



Day 7 of the trip, and about 190 miles in. It's not just all Paleozoic and Precambrian rocks in the Grand Canyon! In the western reaches a series of Quaternary basalts (erupted from cinder cones mostly on the north rim) flowed over the canyon rim, down pre-existing side canyons, and into the main stem of the Colorado River. Some flows extend for kilometers downstream at river level, really neat to have a change from the red Paleozoic rocks to the dark basalts. In some places, the contact between the bottom of the basalt flows and underlying Colorado River gravels and cobbles are visible.



Day 9 of the trip, somewhere around 250 of the ~280 mile trip. With the construction of Hoover Dam and creation of Lake Mead in the 1930s, a significant portion of the lower (western) Grand Canyon was flooded. Skip ahead almost a century, and years of below-average rainfall and snowpack in the Colorado River basin has led to a drop in the level of Lake Mead. As a result, the Colorado has incised into layered sandy/ silty sediments that were deposited in Lake Mead, exposing a pretty good record of modern-day sedimentation. The silt cliffs were too unstable to get a good close-up look at (large pieces were constantly falling into the water as we paddled past), but one could almost make out individual pulses of flood-carried sediments in the layering.



Pearce Ferry, just before noon on day 10 and 281 river miles from where we put on. It's a pretty cool feeling paddling through the Grand Wash Cliffs (background), the geologically-defined western edge of the Colorado Plateau. Within less than half a mile, one goes from a deep canyon to the flat lacustrine plain of Lake Mead, from Paleozoic strata to silt layers deposited in the last 100 years.

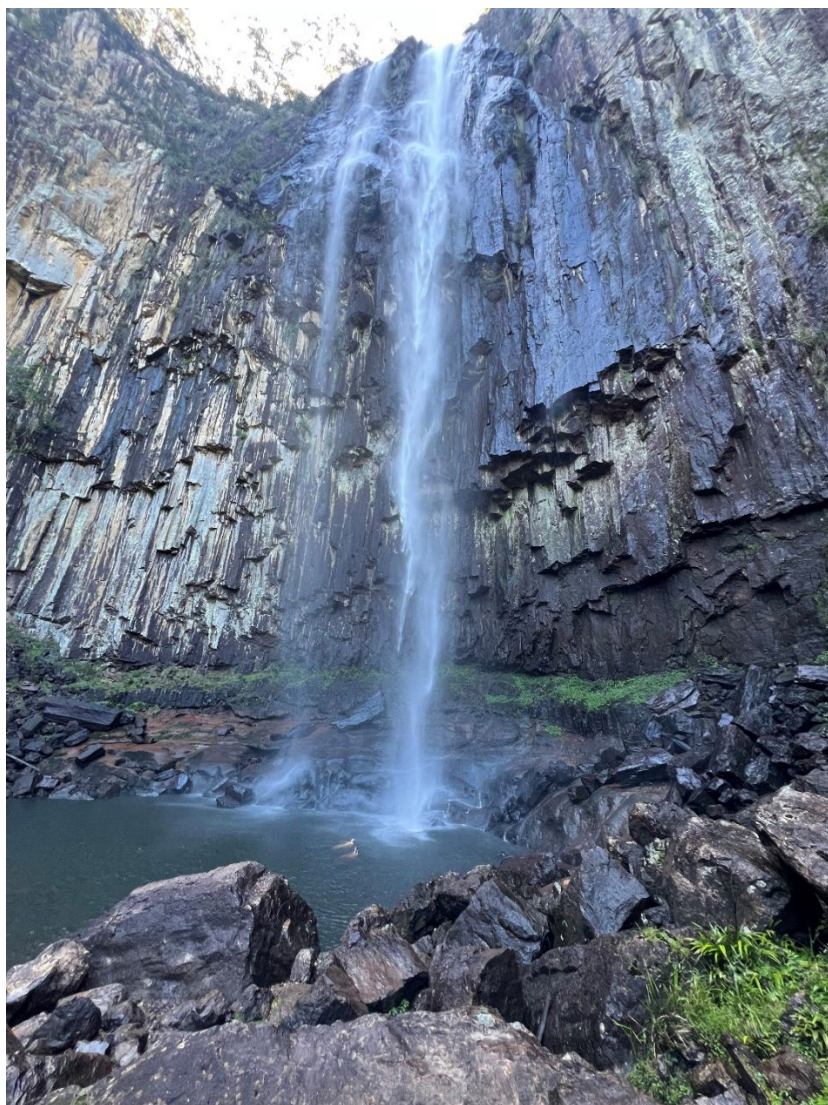
Would I do this trip again in the same manner? Absolutely! Though admittedly it might be a few years until the next visit to the Grand Canyon.

Geological Highlights of Winter Break in Northern NSW, Australia

Todd Redding, Okanagan College

Winter break 2024 was spent visiting family in the Byron Bay region of New South Wales, Australia. Here are a couple geological highlights amidst the visiting, eating, body surfing and swimming.

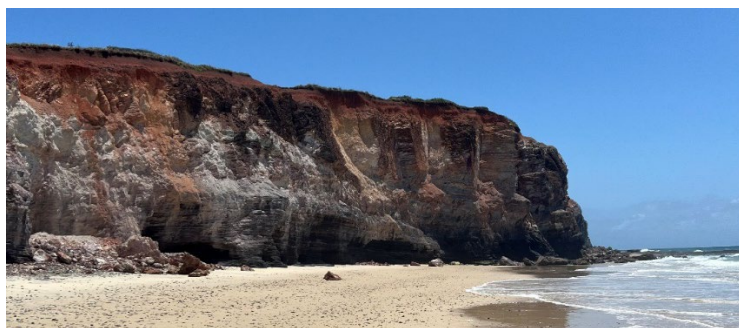
About a 10 minute drive from my in-laws home is Minyon Falls (28.61S, 153.39E). The falls are within Nightcap National Park and have a height of approximately 100 metres tall. The bedrock is early Miocene Lamington Volcanics. At Minyon Falls the bedrock is made up of [rhyolite flows](#). For more information on the geology of the area see this [link](#). The hike to the base of the falls takes about an hour, and the water is refreshing on a hot summer day.



Minyon Falls, December 26, 2025 (T. Redding)

Minyon Falls rhyolite flow member, December 26, 2024 (T. Redding)

About 100 km south of the falls is Red Cliff at Yuragir National Park (29.57S, 153.34E). The cliffs are formed of Clarence Basin Triassic sedimentary rocks: thin bedded, to laminated carbonaceous claystone and siltstone, interbedded with lenses and beds of pebble-granule conglomerate and breccia (debris flows); minor carbonaceous fine lithic sandstone and coal. The cliffs are topped by a red podzolic soils and surrounded by coastal dunes.



Red Cliff at Yuragir National Park, NSW (T. Redding)



Triassic conglomerate (T. Redding)



Red podzolic soil (T. Redding)