Third-day trip 1 road log, from Albuquerque to Tijeras, Cedro Canyon trilobite locality and Kinney Brick quarry

Spencer G. Lucas, Barry S. Kues, and John W. Estep

1999, pp. 67-73. https://doi.org/10.56577/FFC-50.67

in:

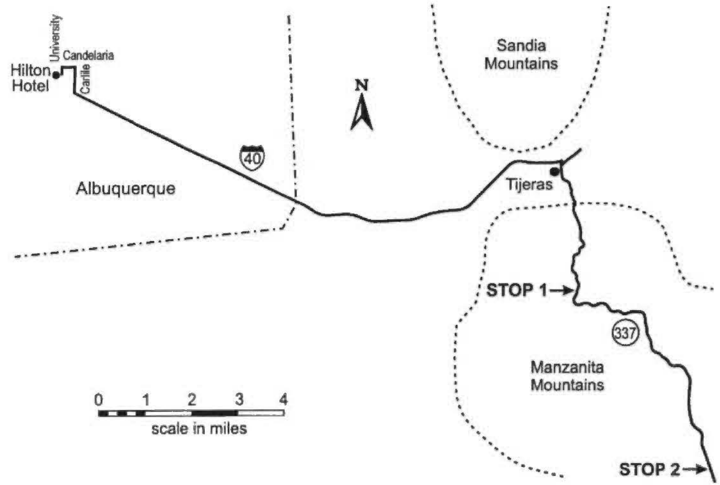
Albuquerque Geology, Pazzaglia, F. J.; Lucas, S. G.; [eds.], New Mexico Geological Society 50 th Annual Fall Field Conference Guidebook, 448 p. https://doi.org/10.56577/FFC-50

This page is intentionally left blank to maintain order of facing pages.

THIRD-DAY TRIP 1 ROAD LOG, FROM ALBUQUERQUE TO TIJERAS, CEDRO CANYON TRILOBITE LOCALITY AND KINNEY BRICK QUARRY

SPENCER G. LUCAS, BARRY S. KUES, and JOHN W. ESTEP

SATURDAY, SEPTEMBER 25, 1999



Assembly point: South end of parking lot of Hilton Hotel, Menaul and University, Albuquerque.
Departure time: 8:00 a.m.
Distance: 22.9 mi.
Stops: 2

Mileage

0.0 Start at Hilton Hotel. **Turn left** onto University Blvd., heading north. Move to right lane. **0.1**

0.1 **Turn right** at Menaul Ave., heading east. **0.7**

0.8 Cross North Diversion Channel. Move to right lane. **0.4**

1.2 **Turn right** onto Carlisle Blvd. **Immediately get into left lane** as preparation to enter I-40 eastbound. **0.3**

1.5 **Turn left** at I-40 east entrance ramp. Note ahead Sandia Crest at 10:00, South Sandia Peak at 11:00 and Tijeras Canyon at 1:00 in the distance. **5.5**

7.0 Pass under Juan Tabo Blvd. bridge. Continue east on I-40. **1.0**

8.0 Tramway Blvd. exit (no. 167) to right; continue east on I-40. **1.1**

9.1 Note Sandia Granite here and in roadcuts for next few miles. See the Second-day Road Log for more information on the Proterozoic (ca. 1.4 Ga) granite that forms the core of the Sandia Mountains. **0.4**

9.5 Carnuel Exit (no. 170); Continue east on I-40. **0.3**

9.8 Spectacular, tall roadcut in Sandia Granite to left. **0.2**

10.0 I-40 crosses over old US-66, which ran from Chicago, Illinois to Santa Monica, California, crossing 8 states and 3 time zones—the country's major east–west highway until the 1970s. **0.6**

10.6 Cross the river bed of Tijeras Canyon. **1.2**

11.8 Cibola Gneiss in road cuts on right here and for next 0.2 mi. **1.3**

13.1 Note the Tijeras fault across the highway to the left (Fig. 3.1.1). Here, the fault is well exposed, approximately vertical, and strikes N 40° E, juxtaposing Cibola Gneiss and Quaternary colluvium on the northwest with Tijeras Greenstone on the southeast. **0.9**

14.0 To left are roadcuts in I-40 and a frontage road above where an excellent cyclic sequence of Pennsylvanian strata, and a diverse, mollusc-rich fossil locality, were formerly exposed. About 10 years ago these roadcuts were covered with gunnite by the New Mexico State Highway Department, presumably to protect the highway from falling rocks. For a photo and description of these roadcuts before they were "improved," see Connolly and Kues (1987). **0.3**

14.3 **Exit no. 175 to Tijeras on right; leave I-40 at this exit** and proceed toward NM-337. **0.4**

14.7 Intersection of Tijeras offramp with NM-337; **turn right** on NM-337. **0.1**

14.8 Fourway stop intersection in Tijeras. Continue straight through intersection, heading south on NM-337; cross Tijeras Arroyo. **0.3**

15.1 On right, entrance to Rio Grande Portland Cement Company plant. Pennsylvanian limestone has been mined here since 1956, when the plant was first built by Ideal Cement Co. In 1994, Grupo Cemento de Chihuahua became the plant's parent company. About 120 employees work at the plant, 8–10 of which drill and shoot

FIGURE 3.1.1. Photograph of Tijeras fault on north side of I-40 at Road Log Mile 13.1. The fault is in the gully just to the right of the car hood.

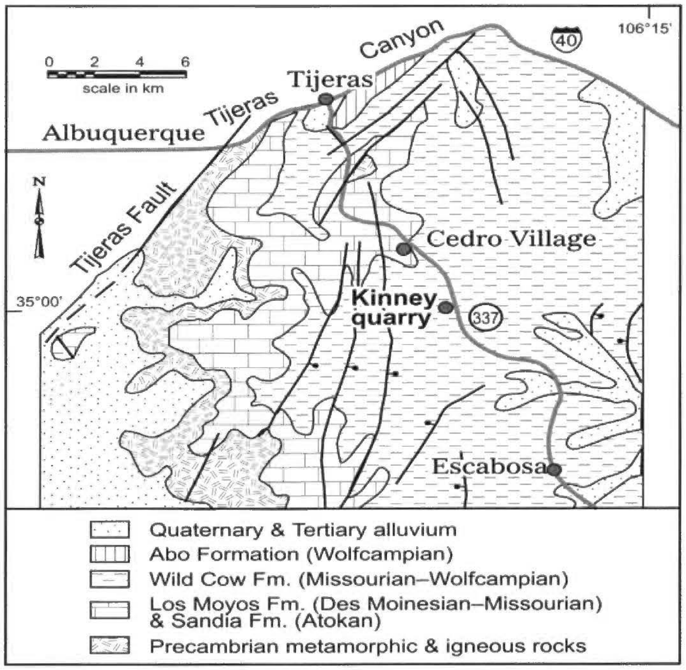


FIGURE 3.1.2. Geologic map of the northern Manzano and the Manzanita Mountains (after Myers, 1982). From Tijeras, the roadlog proceeds south on NM-337 along Cedro Canyon through outcrops of the Pennsylvanian Los Moyos and Wild Cow formations.

limestone in the large open-pit quarry that adjoins the plant. In 1997, approximately 500,000 st of cement were produced here with a gross value of about $35–40 million. The cement from this plant is mostly sold in New Mexico and southern Colorado. Road now will proceed up the winding course of Cedro Canyon (Fig. 3.1.2). **0.1**

15.2 Roadcuts on right include sandstones, limestones, and red mudstones of La Casa Member of Wild Cow Formation (Fig. 3.1.3 presents an overview of Pennsylvanian stratigraphy in this area). The La Casa Member, of middle Virgilian to possibly earliest Wolfcampian age, is the youngest unit of the Madera Group exposed in the Manzanita Mountains. It is overlain by the red clastics of the Abo Formation, well exposed on the northern side of I-40, at the Tijeras on-ramp. To left, entrance to Sandia Ranger Station. **0.1**

15.3 Roadcuts to right are massive gray limestones and reddish-gray shales of the Pine Shadow Member of the Wild Cow Formation. We are driving downsection through the Wild Cow section.

Pennsylvanian stratigraphic nomenclature employed in the Manzanita Mountains (Fig. 3.1.3) is that of Myers (1973); Myers and McKay (1976) geologically mapped the northern Manzanitas, through which NM-337 winds southward to the Kinney Quarry. The oldest Pennsylvanian strata here are olive-drab micaceous sandstones, siltstones, and mudstones, with a few marine limestone lenses assigned to the Sandia Formation, of Atokan age. Thickness of the Sandia Formation ranges from 49 to 302 ft (Myers, 1982), but we will not be encountering this formation in this road log.

The overlying Madera Group in the Manzanita Mountains consists of the Los Moyos Limestone (Desmoinesian–early Missourian in age, based on fusulinids; about 590 ft thick), overlain by the Wild Cow Formation (Missourian to earliest Wolfcampian age; about 720 ft thick). We will be seeing roadcuts and exposures of both formations as we drive southward to the Kinney quarry. The Los Moyos Formation includes a lower interval of calcarenite and conglomerate as much as 200 ft thick, and an upper interval of massive, cliff-

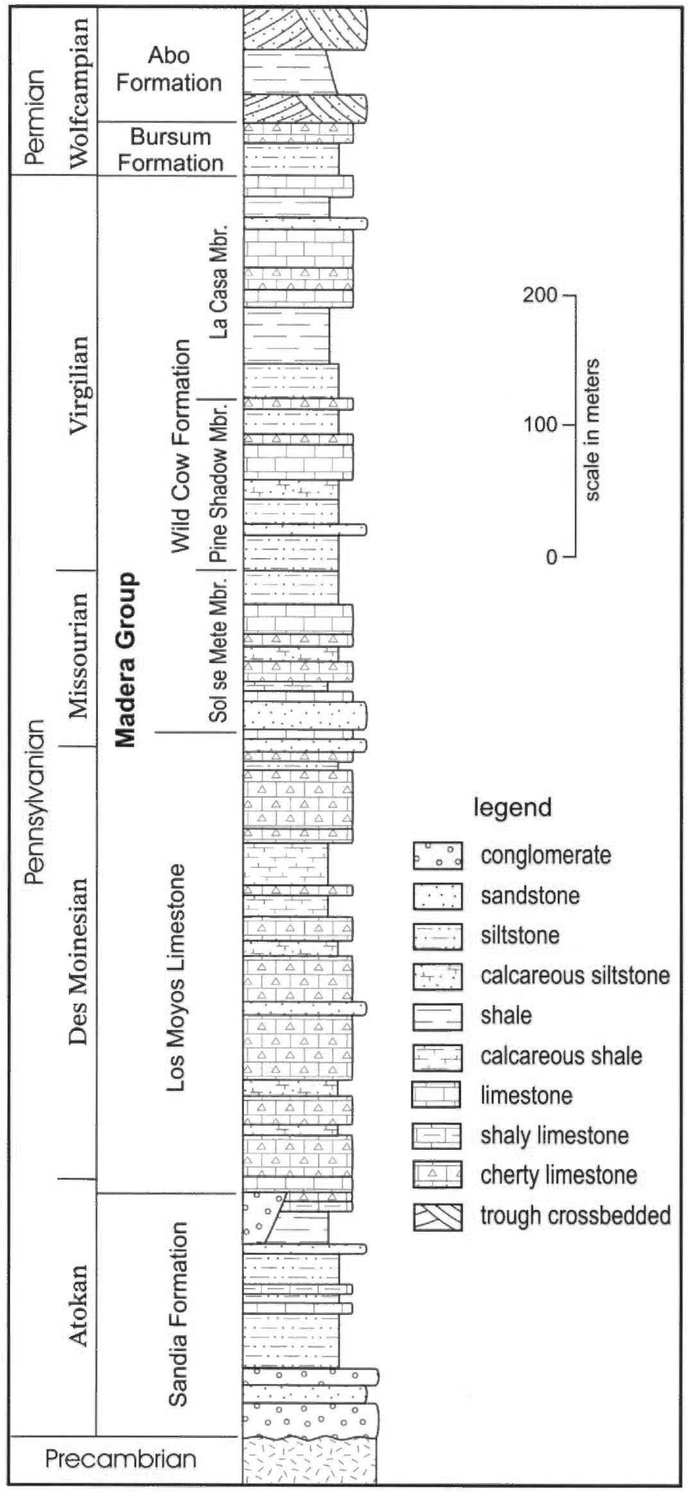


FIGURE 3.1.3. Summary of the Pennsylvanian stratigraphy in the Manzano and the Manzanita Mountains (after Myers, 1982). Note that the Bursum Formation is present in the southern Manzano Mountains, but in the Manzanita Mountains Abo red beds rest directly on the Wild Cow Formation.

forming, medium-gray limestones.

The Wild Cow Formation is lithologically more complex than the Los Moyos, consisting of interbedded arkosic sandstone, conglomerate, shale, siltstone, and limestone. The Los Moyos is divided, in ascending order, into the Sol se Mete, Pine Shadow, and La Casa members (Fig. 3.1.3). **0.2**

15.5 Roadcuts are now in Sol se Mete Member, note faults to right; dips of strata change, suggesting a breached anticline. Thick- to thin-bedded, brown-to-gray limestones separated by brownish shales continue in roadcuts on right for a few tenths of a mile, and are also visible in slopes to left. Cedro Peak (elevation 7767 ft), a knob of Wild Cow Formation with a beacon on its summit, is visible at 10:00–11:00, about 2 mi away. **0.1**

15.6 Enter private land, with several mountain homes. Long roadcut of nodular limestones of Los Moyos Formation, next 0.3 mi. **1.3**

16.9 Milepost 27 on left. Los Moyos Formation on right in roadcuts. **0.1**

17.0 On right, fractured gray limestones of upper Los Moyos Formation. **0.3**

17.3 To right, mouth of Tunnel Canyon. Just beyond, in limestone roadcut, is an outcrop that yielded an upper Desmoinesian marine invertebrate fauna, within the upper quarter of the Los Moyos Formation, described by Kues and Koubek (1991). The fauna, from a thin calcareous shale unit, is dominated by brachiopods (especially *Phricodothyris perplexa* and *Hustedia mormoni*) and bryozoans, with fewer fusulinids, solitary rugose corals, gastropods, trilobites, and partial crinoid calyxes. **0.5**

17.8 Milepost 26. To right, note old road bed with low limestone cliffs and recent rock slide debris; to left, thick, well-exposed section of Los Moyos Formation within a large natural amphitheater. **0.2**

18.0 **Pull off road to left** on broad graveled turnaround across from tall cliff of Los Moyos for **STOP 1**. Walk back down old road bed to trilobite locality, marked by a talus pile just beyond a medium-sized tree on the road bed (Fig. 3.1.4).

This stop is the Cedro Canyon trilobite section (Fig. 3.1.5) of Szabo (1953), which was subsequently described by Kues (1982). Trilobites are extinct marine arthropods that first appeared in the earliest Cambrian and became extinct during the Late Permian. These animals characteristically had a head with eyes (the cephalon), a body of 2–40 segments (thorax) and a tail (pygidium). Trilobites were common members of early Paleozoic mud-bottom marine communities. However, by the late Paleozoic (Carboniferous–Permian), trilobites were not common, so this Pennsylvanian Cedro Canyon locality, where trilobite fossils abound, is an unusual occurrence.

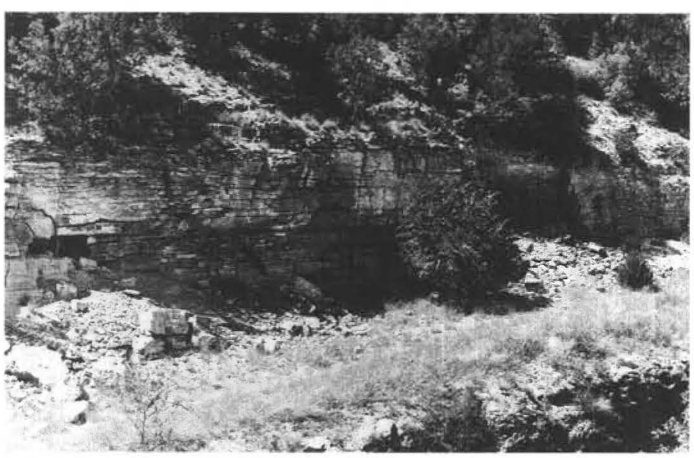


FIGURE 3.1.4. Los Moyos Formation along old road bed at STOP 1. Main trilobite locality is beyond bush to right, at talus pile.

The trilobites at this locality, *Ditomopyge scitula* (Meek and Worthen) (Fig. 3.1.6), occur in large numbers in a 0.66-ft-thick interval of relatively soft, dark gray shale in the Los Moyos Formation, together with abundant and diverse brachiopods and bryozoans, and rarer bivalves, and solitary rugose corals. Kues (1982) interpreted the facies as representing deposition in normal marine, moderately deep water, many miles offshore. Most of the fossils represent epifaunal filter feeders. The abundant trilobites are anomalous here; they are typically absent to minor elements of Pennsylvanian marine assemblages elsewhere in New Mexico. The concentration of trilobites here reflects a favorable microhabitat, but the parameters of this microhabitat are difficult to identify. Although this locality has been collected for decades, fragments to complete specimens of the trilobites can still be found, although the producing horizon is mostly covered by talus now. After stop, continue south on NM-337. **0.1**

18.1 Roadcuts and ridge slopes in generally thick, medium-gray limestones of Los Moyos Formation, next 2 mi. **0.2**

18.4 Small quarry in Los Moyos to left. **1.3**

19.7 Pass junction with Forest Service Road (FS) 242 (Juan Tomas Road, leading to Cedro Campground) to left; continue on NM-337. **0.4**

20.1 To left, a long roadcut composed mainly of shaley beds, with minor, thin limestones. This was mapped as upper Los Moyos by Myers and McKay (1976). At the southern end of this road cut (Fig. 3.1.7) is a unit of fissile, soft, micaceous greenish-gray shale, which contains a sparse assemblage of marine fossils dominated by the chonetoid brachiopods *Mesolobus* and *Chonetinella*, and diverse bivalves, but also including sparse bryozoans, gastropods, ammonoids, nautiloids and echinoderms (Kues, 1983). Also present are well-preserved specimens of cephalopod aptychi, which are seldom preserved opercula or mouthparts of cephalopods. **0.4**

20.5 To right is El Cedro Road, leading to small village of Cedro, visible in the hills near NM-337. The long roadcuts to the left, nicely faulted in places, display a prominent sequence of thin, gray, micritic, locally concretionary limestone beds, alternating with dark-gray shale and calcareous shale interbeds near the boundary between the uppermost Los Moyos Formation and basal Sol se Mete Member of the Wild Cow Formation. **0.1**

20.6 In lower part of predominantly gray, massive limestone roadcut to left note a thin (0–3 ft thick) stringer of gray-green shale sharply bounded above and below by thick limestones (Fig. 3.1.8). The shale thickens gradually to almost 10 ft at the south end of the road cut, and represents the sudden, short deposition of clastics in the pre-

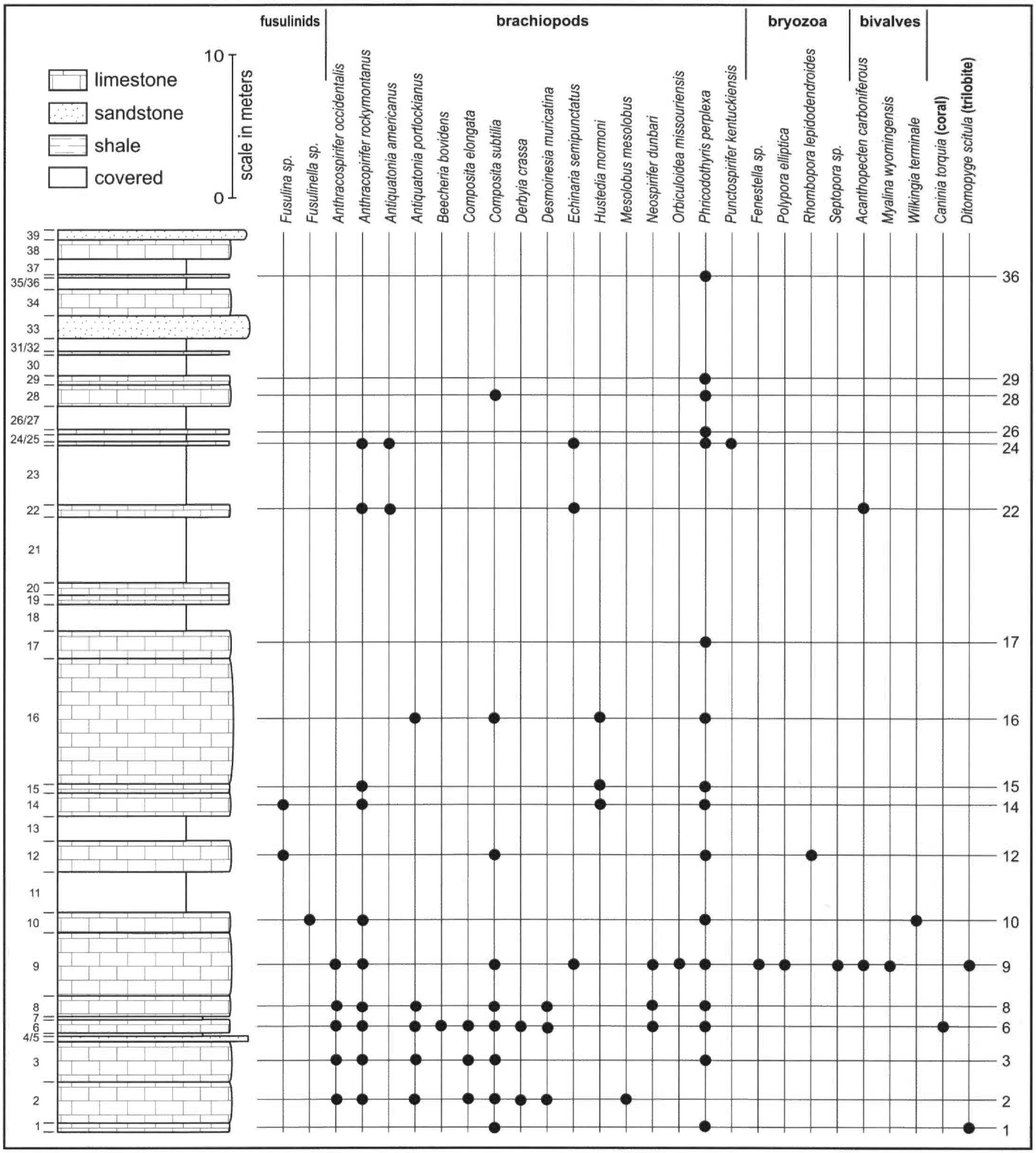


FIGURE 3.1.5. Measured stratigraphic section at the Cedro Canyon trilobite locality (based on data in Szabo, 1953). Note that the trilobites (*Ditomopyge*) only occur in the lowermost part of the section, which is just above highway level here.

vailing carbonate environment. The shale unit contains a diverse marine assemblage dominated by brachiopods (e.g., *Mesolobus, Neochonetes, Orbiculoidea, Derbyia*), bivalves (*Euchondria* and other pectinids, *Permophorus, Parallelodon*), and fenestrate bryozoans. **0.2**

20.8 Ramblewood Road and mailboxes to right. **0.2**

21.0 To left in roadcut are dark green shales of Sol se Mete Member of Wild Cow Formation. **0.5**

21.5 On left is entrance to Pine Flat picnic area. No outcrops are exposed here, but we are passing upward from the Sol se Mete into the Pine Shadow Member of the Wild Cow Formation. **0.9**

FIGURE 3.1.6. A slab of three complete trilobites, *Ditomopyge scitula*, and several pygidia, from Desmoinesian strata at STOP 1.

22.4 Entrada de Cibola Road to right. **0.1**
22.5 Entrance to Deadman Campground on left. **0.2**
22.7 **Turn right** on unmarked gravel road, the entrance to the Kinney Brick quarry. **0.1**
22.8 On left, the old quarry pit where the first paleontological collections were made at the quarry. **0.1**
22.9 **STOP 2** is at the active pit of the Kinney quarry. During the late Pennsylvanian, an epicontinental seaway covered most of New Mexico (Fig. 3.1.9). Marine deposits of the seaway are the characteristically carbonate-dominated portions of the upper parts of the Madera and equivalent units. The Kinney Brick quarry exposes an unusual, clastic-dominated deposit of deltaic and estuarine origin.

The Kinney Brick quarry is a clay pit developed in the lower Virgilian Pine Shadow Member of the Wild Cow Formation of the Madera Group. Strata exposed here (Fig. 3.1.10) provide a unique glimpse of a diverse and well-preserved Late Pennsylvanian lagoonal biota, and

FIGURE 3.1.8. Roadcut at Road Log Mile 20.6, in massive limestone of Los Moyos Formation. The thin shale unit near base contains a diverse brachiopod-bivalve fauna.

FIGURE 3.1.7. Roadcut, Road Log Mile 20.1, in upper Los Moyos Formation, showing fossiliferous shale bed.

the quarry stratigraphy and paleontology was the subject of a recent symposium volume (Zidek, 1992). Students at the University of New Mexico discovered the rich fossil biota of the Kinney quarry in 1961. During the 1960s, large collections were made of fishes, plants and other fossils from the quarry, especially by D. Dunkle and S. Mamay of the National Museum of Natural History. Extensive fossil collections from the Kinney Brick Quarry are now housed at the Carnegie Museum of

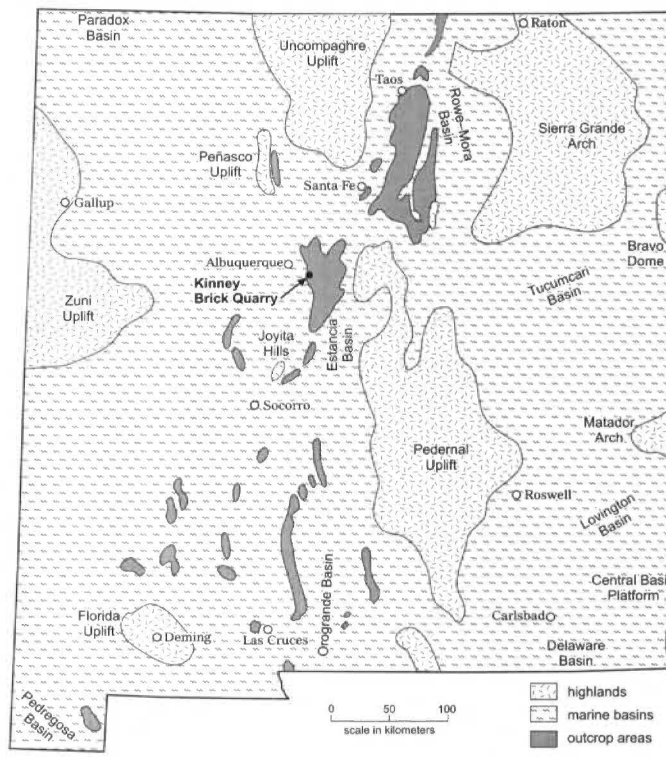


FIGURE 3.1.9. Pennsylvanian paleogeography of New Mexico, showing location of the Kinney Brick quarry.

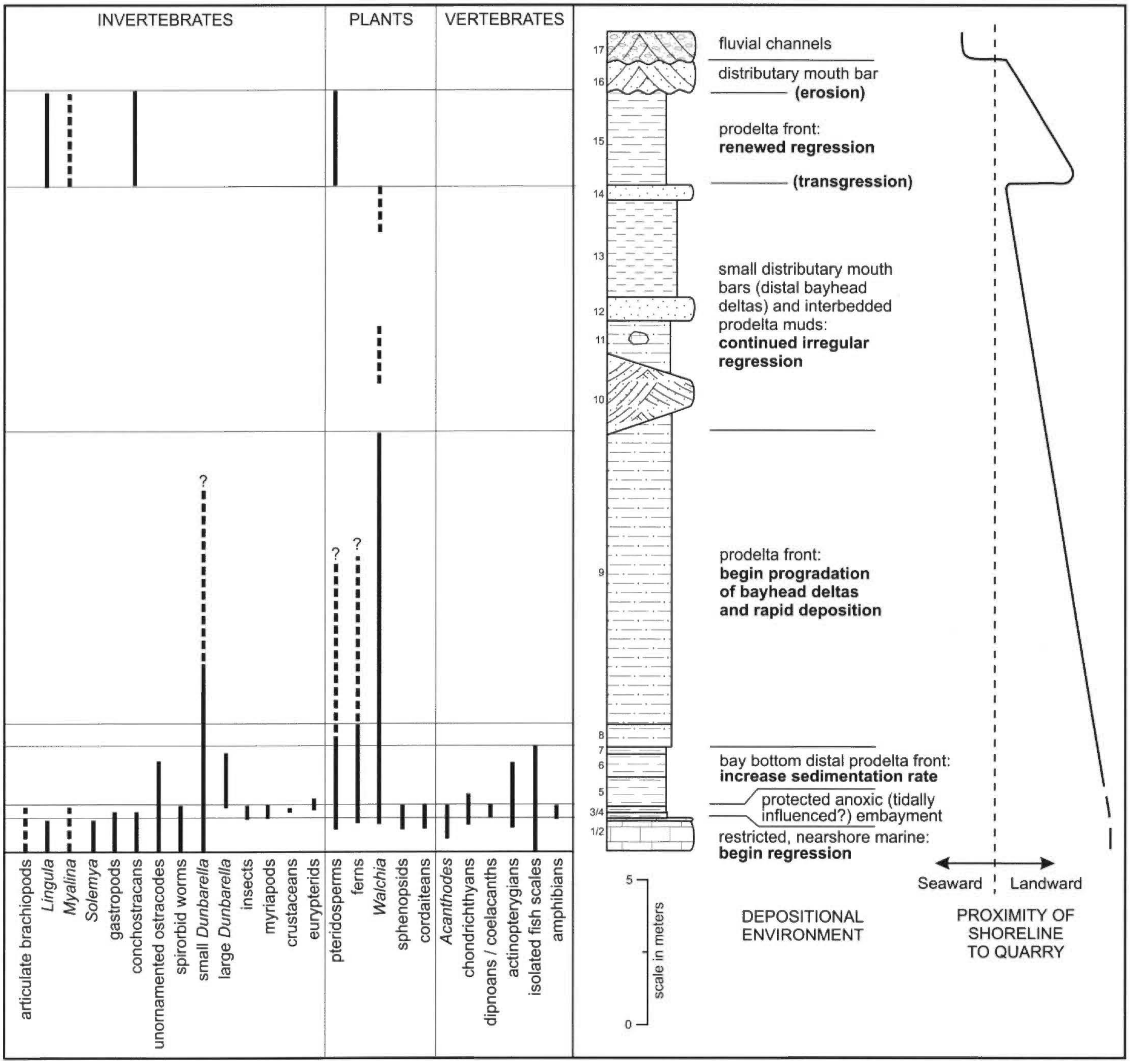


FIGURE 3.1.10. Summary chart of the paleontology, stratigraphy, depositional environments, and sea-level changes at the Kinney Brick quarry (after Kues and Lucas, 1992 and Lorenz et al., 1992).

Natural History, National Museum of Natural History, New Mexico Museum of Natural History (NMMNH), University of Kansas Museum of Natural History, and University of New Mexico.

The quarrying operation has exposed about 92 ft of the upper part of the Pine Shadow Member of the Wild Cow Formation (Fig. 3.1.10). In the Manzanita and Manzano Mountains, the Pine Shadow Member consists of 100–165 ft of intercalated limestone, calcareous shale, and sandstone (Myers, 1973, 1982). Stukey (1967) estimated that the base of the Wolfcampian Abo Formation is stratigraphically about 300 ft above the Kinney Quarry exposures. The active quarry floor typically is developed on black, platy and laminar micrite with a high content of black clay containing an invertebrate fauna indicative of abnormal marine conditions (Kues, 1992a). The upper 4 in. of this limestone are finely laminated and grade into the overlying shale. The basal shale exposed at the quarry is 1.3 ft thick, olive gray to olive black, well indurated, calcareous and highly fossiliferous. Part of this interval is highly fissile and not calcareous. Above it is 6.6 ft of olive-gray, calcareous shale that contains thin bands of plastic clay. Individual laminae in these shales are continuous on strike for at least 32 ft. Above, and in gradational contact with the underlying shale, are 35 ft of olive-gray and greenish-gray, laminar calcareous silty shale that are moderately bioturbated. These strata coarsen upward slightly and are marked by a rapid decrease in floral and faunal diversity near their base. Above them are 42 ft of olive-gray, silty shale and claystone interbedded with lenticular, yellowish-orange and grayish-brown, subarkosic and sublitharenitic, laminar and ripple-laminar sandstone ledges. The section is completed by 3.0+ ft of limestone-cobble conglomerate with clasts as much as 0.25 ft in diameter, and grayish-yellow, trough-crossbedded subarkosic–sublithic arenite.

Some early workers (e.g. Stukey, 1967; Berman, 1973) assigned a Permian age to the Kinney fossils, based primarily on an unsubstantiated report of the Permian index fossil *Callipteris* (cf. Read and Mamay, 1964) from the quarry (Kelley and Northrop, 1975). However, fusulinids of the Pine Shadow Member, from more open-marine facies than are those exposed at the quarry, include *Triticites* species indicative of the early Virgilian (Myers, 1982, 1988). Therefore, the Late Pennsylvanian age of the Kinney fossils seems to be well established.

Combining physical stratigraphy with the fossil assemblages, we recognize several distinct depositional environments at the Kinney Quarry. These make up a regressive sequence of the "R2" type described by Smith (1989), in which limestone grades up through prodelta and deltaic clastics with a capping delta-plain facies (Fig. 3.1.10).

The basal micrite (units 1–2) represents deposition in a nearshore marine environment that received some input of freshwater and clastic sediments. We point to its lithology (note especially the high black-clay content of this micrite) and unusual fauna (some stenohaline brachiopods and other groups, but dominated by euryhaline taxa, such as the inarticulate brachiopod *Lingula* and bivalves *Myalina* and *Solemya*; see Kues [1992a] to support this conclusion). The black-clay content, terrestrial plant debris, and euryhaline elements of the fauna (especially abundant *Lingula*) are consistent with deposition near the shoreline with a significant freshwater input.

The overlying highly fossiliferous shales (units 3–4) were deposited in a calm lagoonal or estuarine environment with a significant fresh-water input. Uniform, fine grain size, fine lamination and lack of bioturbation, dark colors, and preservation of soft-bodied forms suggest deposition in quiet, oxygen-poor waters with restricted circulation. A lowland, pteridosperm-dominated flora and freshwater faunal elements (especially conchostracans and trimerorhachid amphibians) suggest low salinity.

Overlying shales (units 5–7) represent a similar facies, but probably with a greater fresh-water influence. Dominant elements are *Dunbarella*, a euryhaline bivalve (Clark, 1978; Kues, 1992b), and terrestrial plants.

Overlying silty shales (units 8–9) are interpreted by us as representing increased sedimentation rates in an prodelta estuarine environment, brought about by the onset of a significant fluvial discharge. The *Walchia* floral assemblage abounds here, with sparse, small *Dunbarella*. Most of the floral assemblage, typically but questionably interpreted as an inland, relatively xerophytic flora (Read, 1947; Ash and Tidwell, 1982), may have been floated a short distance into an environment characterized by frequent shallow ponding and deposition on a surface better drained than the underlying shales.

Overlying laminar and ripple-laminar sandstone ledges and intercalated shales and claystones (units 10–14) are interpreted by us as deltafront, distributary mouth bars, and associated deposits. Unit 15 is a shale that shows marine influence indicated by the presence of *Lingula* and *Myalina*. This unit, and the overlying fluvial sandstone/conglomerate, may be the base of another transgressive sequence.

In conclusion, we interpret the stratigraphic sequence at the Kinney Quarry as mostly reflecting a marine regression corresponding to the progradation of a clastic delta. Shifting sediments from the delta probably isolated an embayment from normal marine conditions as a clastic wedge developed and extended seaward. Lagoonal conditions were established, and clastic input was initially restricted to clay-size particles. Eventually, the embayment was filled by silty shales from an advancing delta plain that later deposited sand. The onset of a subsequent transgression is documented by the highest strata in the quarry section.

End of Third-day Trip 1 Road Log.

William George Tight (1865–1910) was a native of Ohio who came to New Mexico because of health problems. He received his Ph.D. from the University of Chicago in 1901, and was UNM's second professor of geology and third president (1901–1909). Tight convinced the Geological Society of America to hold its annual meeting in Albuquerque in December 1907. A geological sketch map and cross sections of the Sandia-Manzanita Mountains were prepared by Tight were a feature of the meeting.