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ABSTRACT

Five sites on or near the present shoreline of Lake Arenal were tested for artifacts, ecofacts, features, and stratigraphy. John Bradley describes work at G-161 and G-169, John Hoopes describes work at G-175, and Payson Sheets describes work at G-156 and G-163. The sites varied in cultural components present, features, and stratigraphy, and thus each contributed to understanding of prehistoric adaptations in the Cuenca de Arenal.

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SITE G-156, CAÑERAS Payson Sheets

The Cañeras site, G-156 (Fig. 1), is the boat launch location for the Club Cañero, the boating club of Cañas. It is located on the south shore of Lake Arenal, due south of the old town of Tronadora and 3 km east of the present town of Tronadora. Its precise location is at UTM 382x751 on the Tilarán 1:50,000 topographic map, at an elevation of 540 m. Prior to ICE taking over the area, the land was owned by José Luis Villalobos and used by him for his finca roads and buildings.

This was the first of the lakeshore sites to have been recorded during 1984. The wave action had eroded an area of the site approximately 520 m long and 50 m wide, allowing for a large surface collection. The site was greatly disturbed by construction of roads, buildings, and utilities on the old Finca Joluvi, as well as by the lakeshore wave action and by the new road around the lake. The closest available permanent source of fresh water is the Rio Tronadora, 200 m west of the site. The old lakeshore was 1.2 km north of the site.

Four surface collections were made: a general collection, a special collection of sherds apparently from a single vessel and including a celt, a special collection of a 3 x 5 m area of concentrated artifacts, and a collection of sherds from Strata Cut 2. Strata Cuts were made by cleaning the eroded shore bank, looking for stratigraphy and artifacts. These were recorded by drawings, descriptions, and photographs. Posthole testing, with a double-bladed posthole digger, was used to roughly examine stratigraphy and to look for artifact concentrations as an aid to placement of 2 x 2 m test pits.

Three test pits were excavated under the field direction of Mark Chenault and John Bradley. All three revealed considerable modern trash, particularly a lot of recent iron and glass artifacts, and considerable physical disturbance that frequently delved below

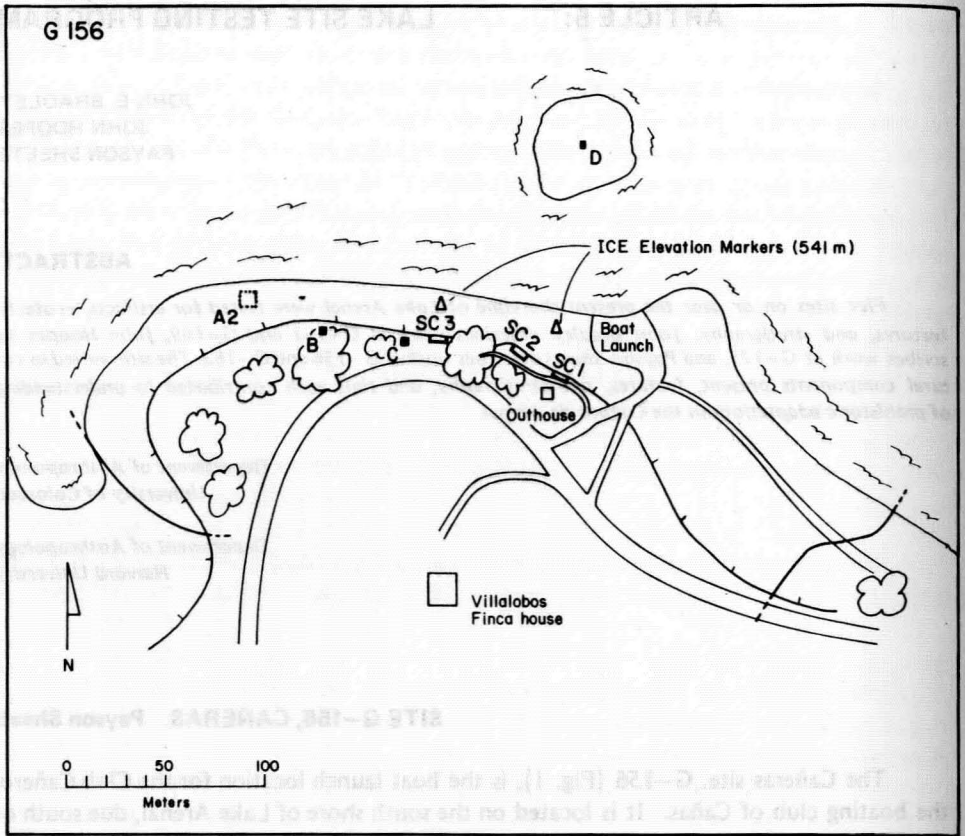


Figure 1. Map of G-156, the Cañeras site.

Unit 20. Where it was undisturbed, the stratigraphy was consistent. Beginning at the bottom, the Aguacate Formation was buried by a thick black layer (Fig. 2). This is likely the Black 1 and Black 2 layers, and may include more in this undifferentiated zone. It is overlain by a light brown sandy layer, which is probably a modified tephra deposit or deposits. This likely includes tephra from eruptions in the Unit 50 Complex and possibly Units 40 or 41. That lighter layer is overlain with a dark brown soil which is Unit 30. The lower boundary of Unit 30 and the upper boundary of Unit 50 are not clear, and particularly when the recent disturbance is taken into account, the lower and upper lots of the test pits cannot be considered to have crisply separated earlier from later artifacts. On top of the dark brown soil is the Unit 20 lapilli. Finally, that is capped by Unit 10, a tephra layer derived from the 1968 eruption, along with a soil. In undisturbed areas the bottommost black layer and the dark brown soil immediately below Unit 20 contained the most artifacts. No features were encountered.

Three test pits were excavated, designated Operations B, C, and D. Operation B had 2 lots, Lot 1 with an Arenal Phase sherd identified in the layer below Unit 20 and Lot 2 with 4 Arenal Phase sherds found in the layer just above Aguacate.

UNITS	Comments
10	Pumice from the 1968 Arenal Eruption. 0–10 cm.
20	Lapilli from the A.D. 1500 eruption. 20–40 cm.
30	Medium–dark brown soil. 40 cm. With artifacts.
50 Complex	Light brown granular layer, probably tephra. May be numerous tephra units. c. 30 cm.
60	Black clay soil, 25–30 cm. Black 1 and Black 2. Probably included other levels.
65	Aguacate formation

Figure 2. Composite stratigraphy, G-156, the Cañeras Site.

Note: Thicknesses are averaged from a number of exposures.

Operation C had 3 lots defined. The top was in a disturbed area. The second lot was apparently from upper level contexts, i.e. probably including Unit 30 as well as delving down into the Unit 50 Complex, yet it contained 4 Tronadora Phase sherds. The lowermost lot was immediately above the Aguacate and contained no diagnostic ceramics. Operation D was a shallow 1 x 2 m pit on a small hill connected with the site. Its sole lot yielded 3 Arenal Phase sherds.

The excavations were stratigraphically disappointing, in view of the multiple components represented in surface collections. Following are the percentages of ceramics from this site by phase: 14% Tronadora, 31% Arenal, 31% Silencio, and 9% Tilarán. Thus, had the cultural materials been stratigraphically separated, clear volcanic/cultural relationships could have been established.

A total of 104 chipped stone artifacts were found, including 43 fragments of thermally fractured debitage, 3 boiling stones, 23 debitage flakes, 26 unidentified fragments, 1 unifacially flaked scraper, 2 hammerstones, 2 flake cores and a double-bitted chipped stone axe. No hinge fractures were noted. A surprisingly low frequency of chalcedony was noted: only two were found. This appears to be unusual for habitation sites, as most habitation sites have much more fine cutting edges. One whole and one fragmentary metate were found, and one groundstone celt was found. Thus, the site yielded a considerable variety of chipped and groundstone artifacts, with a wide range of evidence for manufacture of most implements within the settlement. Other than charred wood, no carbonized plant macrofossils were recovered. A charcoal sample was collected, but it was not submitted for C14 dating because other samples were available from other sites that were from less-disturbed contexts and closer cultural associations.

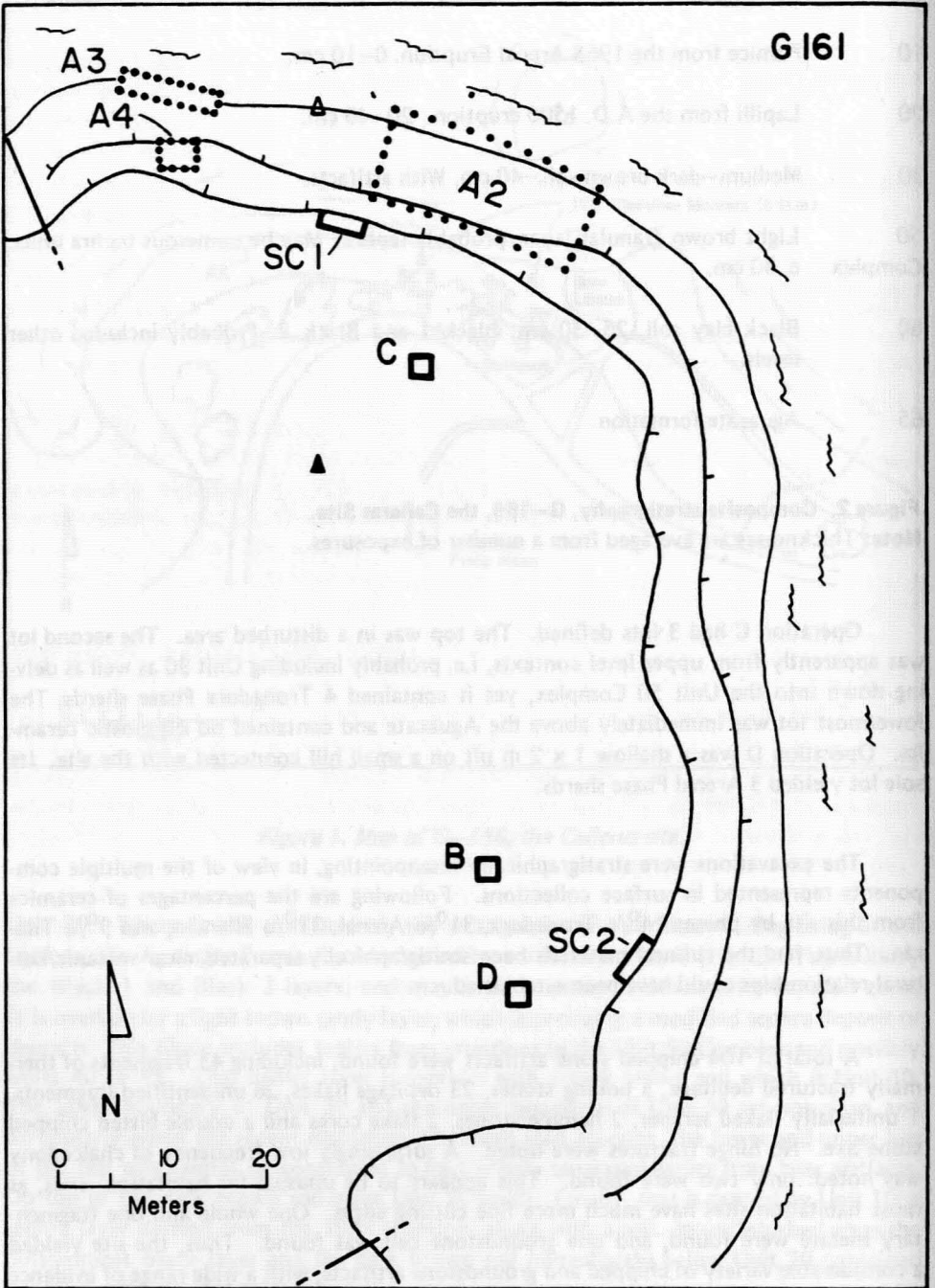


Figure 3. Map of G-161, the Tronadorcita site.

G-161, the Tronadorcita site (Fig. 3), is located on the present shoreline of Laguna Arenal (540 meters elevation) just northwest of the mouth of Quebrada Tronadorcita. On the Tilarán topographic map, it lies at UTM 413x753. The site boundary generally corresponds to a small northwest-southeast trending ridge, approximately 100 meters long and three meters high situated on the north edge of what today forms a small peninsula extending into Laguna Arenal. Prior to the recent damming of the lake, the shoreline was approximately 300 meters to the northeast of the site.

Surface collections from the approximately 130 meters of wave-eroded cut bank included a general collection of diagnostic artifacts, a 9 m x 20 m transect sample in an area of high sherd density, and two special collections. The special collections, a 1 m x 9 m and a 2 m x 2 m sample area, were made within two concentrations of chipped stone and sherds.

Posthole testing in two rows parallel to the wave-eroded cut bank along the full length of the mound resulted in the identification of three artifact concentrations ranging from 50 cm to 110 cm below the present ground surface. Carbonized remains as well as sherd concentrations were encountered and their depth and stratigraphic association were recorded. Three 2 m x 2 m excavation units (Operations G-161B, C, and D) were placed near or directly over the areas of interest and excavated down to the pre-volcanic clay.

All three operations produced ceramic and/or lithic cultural levels separated by sterile tephra layers or characterized by distinct color and texture changes in the soil at these levels (Fig. 4).

Unit	Comments
10	1968 Arenal eruption. 10-15 cm.
20	Pumice from A.D. 1500 eruption. 25-35 cm.
30	Medium brown soil, numerous artifacts. 30-40 cm.
41?	(Unit 40 missing) 5 cm.
50	Dark brown to black soil, numerous artifacts. 20-30 cm.
52/53?	Thin layer dark tephra. 10 cm.
54?	Dark brown to very black soil. 35-40 cm. Hearth and a few artifacts. Black 2? 3?
55/55A	Beige-brown tephra layer, with yellow pumice flecks. White 2? 3? 10-15 cm.
60	Very black soil, clay-laden, a few artifacts. 20-30 cm. Black 1?

- White 1 (intermittent). Thin tephra layer immediately on top of Aguacate.
0–10 cm.
- 65 Aguacate Formation: Orange–red pre–volcanic clay.

Figure 4. Composite stratigraphy for G–161, Tronadorcita.

In Operations C and D, at the deepest levels immediately above Aguacate, a hard beige tephra level (White 1) was encountered. Lot C7 at this level produced a small *Zea mays* cob fragment, thermally fractured debitage and a single chipped stone flake. No ceramics were encountered. Operation D, Lot 7, contained a hearth–like feature at the White 1/Aguacate contact consisting of a semicircle of four oxidized rocks, thermally fractured and general debitage flakes, and a carbonized *jícara* fruit fragment (*Crescentia alata*). Again, no ceramics were observed. Unit 60 (“Black 1”) contained two Tronadora Phase sherds in Lot B6, Arenal Phase sherds and a thermally fractured debitage flake in Lot C6.

Above Unit 60, a discontinuous hard yellow–orange level (Unit 55/55A) was found intact in Operations B and D. In Operation C, this level was apparent only as a light brown transitional zone grading into Unit 60. Cultural material from the discontinuous portions of this level produced thermally fractured and general debitage flakes (Lots B5 and D6). In Unit 54, a thick dark brown to very black soil, two additional Tronadora Phase sherds (Lot D5) and two Arenal Phase sherds (Lot C5) were found. In Operation B, a hearth consisting of an oxidized rock concentration above a 60 cm deep pit was revealed. The pit profile was preserved and outlined as it penetrated Units 55 and 60. A Tronadora Phase sherd found at its base may represent a Middle Formative occupation during Unit 54 times, or disturbance of lower earlier Tronadora Phase materials associated with Unit 60. Flotation of soil from the fire pit produced an *Oxalidaceae oxalis* seed (Article 13). Lithic material from Lots C5 and D5 in Unit 54 included thermally fractured and general debitage flakes.

A distinct change in soil color and texture separated Unit 54 from Unit 50 in all operations. Remnants of a thin layer of dark tephra, possibly Unit 53A, appeared in Strata Cut 2 but appeared intermittently in Operation profiles. Cultural association in Unit 50, a medium brown, somewhat clayey soil, are complicated by what appear to be later intrusive activities exposed in profiles of Lots B4, C4 and D4. In Operation B, Arenal Phase ceramics were found in lots from Unit 50 to the surface, while in Operation D, a few meters to the east, all lots above and including Unit 50 contained Tilarán Phase ceramics. The stratigraphy in Operation D and earlier material found near the surface of Operation B suggest soil disturbing activities and redeposition of Arenal Phase and Tronadora Phase materials during the Tilarán Phase. Lot B4 contained Arenal Phase ceramics, a mano fragment and a thermally fractured debitage flake. Lot C4 contained two Silencio Phase sherds and one Tilarán Phase sherd.

In Operation C, Unit 30 is a light–to–dark orange–brown soil. Although no remnant of Unit 40 was observed, Unit 30 was visually distinct from Unit 50 below. Lots C2 and C3 from this soil unit produced two Tilarán Phase sherds and thermally fractured and general debitage flakes. Operation D, Lot 3, contained three Silencio

Phase and Six Tilarán Phase sherds. Lot D2 above, contained Tilarán Phase ceramics (14 sherds) along with one small bifacial trimming flake, thermally fractured and general debitage flakes, and an associated carbonized *jícara* fruit pericarp (*Cescentia alata*) lying directly on two Tilarán Phase sherds. Additional carbonized material was collected for an as yet undetermined C14 date. Lots B2 and B3, corresponding in depth to Unit 30, but probably disturbed, contained two Arenal Phase sherds, five Tilarán phase sherds, one uniaxially flaked tool and thermally fractured and general debitage flakes. Charred wood fragments were also identified.

What little cultural evidence does occur above the thick Unit 20 lapilli layer, separating Unit 30 activities from the modern topsoil and root zone, appears to be the result of animal disturbance occurring after the fall of Unit 20 lapilli at around A.D. 1500.

Distinct earthquake cracks up to 1 cm wide appeared in both plan and profile views in all test units. They extended from the base of Unit 20 down to and including Units 55 and 55A at approximately 90 cm below the surface. The absence of Unit 20 lapilli in the cracks themselves supports the interpretation that the seismic activity was immediately prior and probably associated with the Unit 20 phase of Volcán Arenal's activity. Had the seismic activity occurred subsequent to the fall of Unit 20, the lapilli would no doubt have fallen into the cracks. This seismic activity during the Tilarán Phase occupation of the site may in itself have been a factor in bringing activities at G-161 to an end. If not, it was a harbinger of the disastrous fall of Unit 20 to come.

SITE G-163, TRONADORA VIEJA Payson Sheets

The Tronadora Vieja site (Fig. 5) is located at UTM 377x757 on the Tilarán 1:50,000 topographic map. Measuring along the road that runs on the south side of Lake Arenal, it is 2.2 km east of Quebrada Bolivar and 2.75 km west of the Rio Tronadora. The closest permanent source of water was 3/4 km southeast at the Rio Tronadora, or 3/4 km north to the old lakeshore.

Two surface collections were made, a general and a special collection. The general collection includes 459 sherds, 4 metate fragments, 3 other groundstone artifacts, and 37 chipped stone artifacts. The special collection, at a notable artifact concentration, consisted of 63 sherds and 3 chipped stone artifacts. There was no transect collection made.

Five units, or operations, were excavated, lettered B through F. All were begun along the sloping, eroded present shore of Lake Arenal, and thus took advantage of the wave removal of upper overburden. Operation B began with Lot 1 in the Unit 50 Complex. Lot 2 was in Unit 60 and Lot 3 consisted of the artifacts associated with Feature 1, a hearth resting in basal Unit 60 at the contact with the Aguacaté (Fig. 6).

Operation C was excavated in two lots, with Lot 1 including the Unit 50 Complex. Of the identifiable sherds, 21% were Tronadora Phase, 36% were Arenal Phase, and 5% were Tilarán Phase. The second lot was in Unit 60 and all of the identified ceramics were from the Tronadora Phase. These artifacts were associated with Feature 2, a concentration of three oxidized rocks. Maize was found within this hearth (see below). Operation D began with Lot 1 in Unit 60, and consisted entirely of Tronadora Phase ceramics. Two lots were defined below Unit 60, one purely in the white tephra layer (Fig. 1) and one between that layer and the Aguacaté. Operation D had two extensions,

G 163

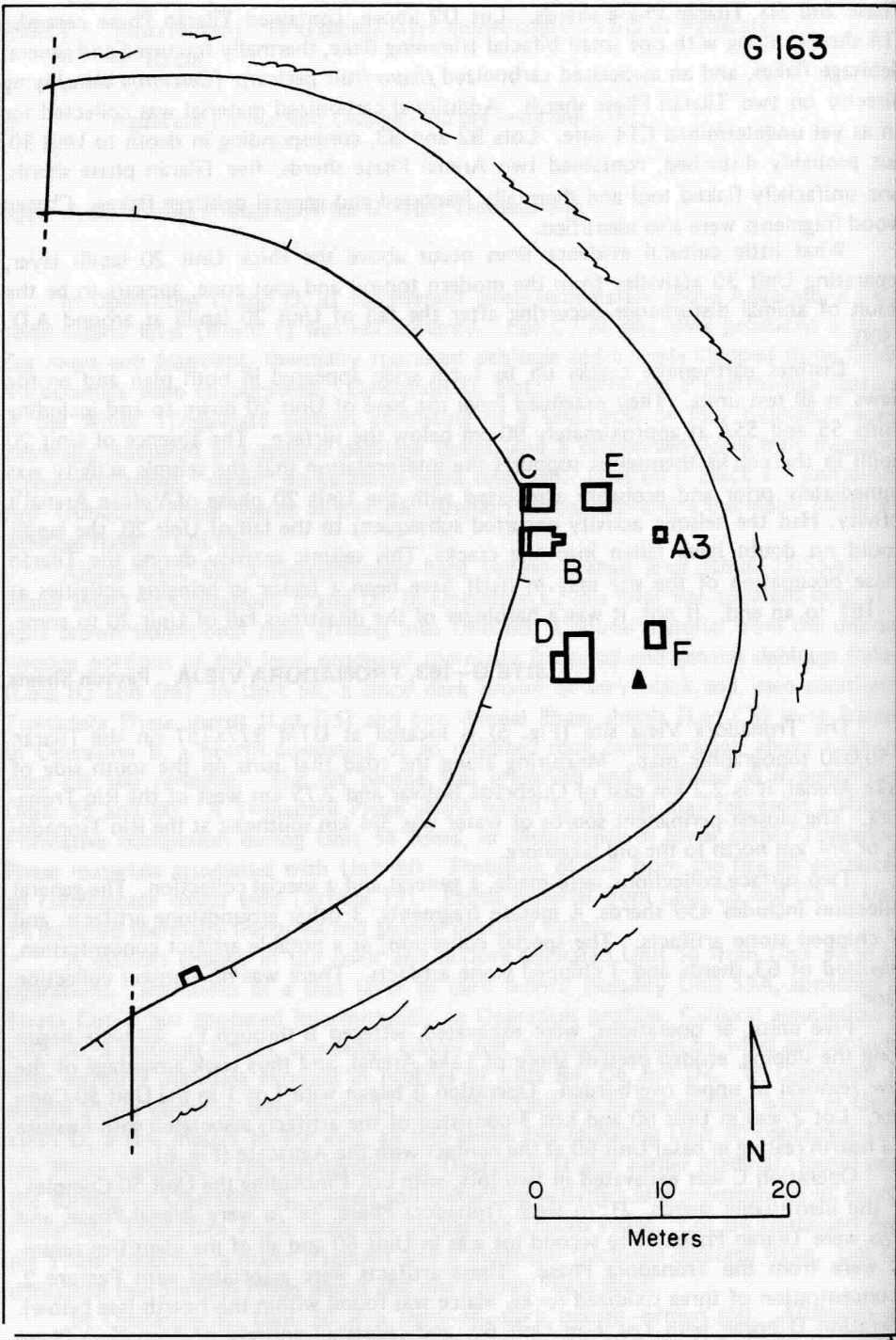


Figure 5. Map of G-163, the Tronadora Vieja site.

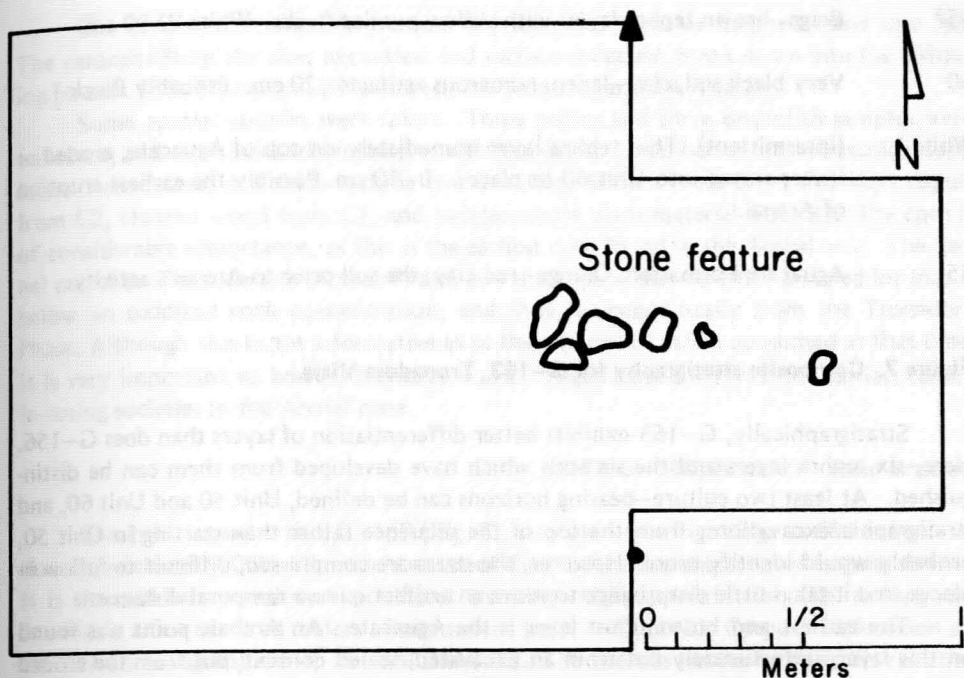


Figure 6. G-163B3 Stone Feature, probably a disturbed hearth.

and each began slightly higher, and included some ceramics younger than the Tronadora phase. Operations E and F were very shallow excavations, and each had only one lot. In both cases, all identified ceramics were classified as Tronadora Phase. In summary, in all cases where sealed Unit 60 excavations were conducted, all materials are from the Tronadora Phase. Some upper layers exhibit some mixing.

Unit	Comments
10	1968 Arenal eruption. 0–8 cm.
20	Pumice from A.D. 1500 Arenal eruption. 20 cm.
30	Medium brown soil. A few artifacts. 35 cm.
41	Light gray tephra layer. 10 cm.
50	Dark brown to black soil, some artifacts. 15–20 cm.
52–3?	Light gray–white tephra. 10 cm.
54?	Thin gray soil zone. Black ? 10 cm.

- 55? Beige—brown tephra layer, with yellow pumice flecks. White 2? 20 cm.
- 60 Very black soil, clay—laden, numerous artifacts. 20 cm. Probably Black 1.
- White 1 (intermittent). Thin tephra layer immediately on top of Aguacate, eroded or incorporated into Unit 60 in places. 0—10 cm. Possibly the earliest eruption of Arenal.
- 65 Aguacate Formation. Orange—red clay; the soil prior to Arenal's activity.

Figure 7. Composite stratigraphy for G—163, Tronadora Vieja.

Stratigraphically, G—163 exhibits better differentiation of layers than does G—156. Here, six tephra layers and the six soils which have developed from them can be distinguished. At least two culture—bearing horizons can be defined, Unit 50 and Unit 60, and stratigraphic excavations, from the top of the sequence rather than starting in Unit 50, probably would identify more. However, the strata are compressed, difficult to follow in places, and it takes little disturbance to move an artifact quite a temporal distance.

The earliest and bottommost layer is the Aguacate. An Archaic point was found on this layer, unfortunately not from an excavated, sealed context, but from the eroded shore. Resting intermittently upon the Aguacate is a white tephra layer that probably is the earliest Arenal eruption, Unit 9 at El Tajo, dating to c. 1000 B.C. In places it is missing in the site, because it has been eroded or incorporated into Unit 60 by bioturbation or pedogenesis. Unit 60 is a striking, very black, clay—laden soil with numerous Middle Formative artifacts. That was followed by an eruption or eruptions that resulted in a beige—brown hard layer with yellow flecks of pumice, which may include Unit 55. From that developed a relatively weak soil, perhaps Unit 54 identified at G—151. Above that is a thin light gray—to—white tephra zone, which might be Unit 52 and/or Unit 53 of the Silencio Sequence. Unit 50 is a dark brown—to—black soil. At this site it does contain some artifacts. However, our excavations in 1984 began at or below this stratum along eroded areas of the lakeshore where we could avoid excavating through later overburden.

Unit 41, a light gray tephra horizon, is thin and intermittent. Unit 30 apparently contains an occasional artifact at this site. That soil was buried by Unit 20 lapilli. That layer, with its soil, was thinly buried by Unit 10.

A total of 114 chipped stone artifacts were recovered from G—163. These consist of 29 pieces of thermally fractured stone, one small biface trimming flake, 50 general debitage flakes (including 10 chalcedony and 2 jasper flakes), 25 other specimens, 2 unifacially—flaked artifacts (scrapers), 1 bifacially flaked Archaic point, 4 flake cores, and 2 percussion blades. This lithically is an ample range of forms, techniques, and materials, and apparently derives from habitational activities. Four percent of the general flakes contained hinge fractures, a higher rate of misjudgement than occurred in our overall collection. The overall hinge fracture rate for the entire collection is 2.6%. The rate at the Silencio Phase graveyard, using G—150C2 as a sample, was 2%. If the samples are representative, this indicates an improvement in lithic skills or partial specialization through time.

The groundstone analysis (Article 11) tabulates 2 mano fragments and one celt. The ceramics from the site, excavated and surface-collected, break down into the following phases: 55% Tronadora, 24% Arenal, 1% Silencio, and 3% Tilarán.

Some special samples were taken. Three pollen and three phytolith samples were collected, and two radiocarbon samples were collected. A number of macrobotanical specimens were found, and these include two *Zea Mays* kernels from B1, a *Zea Mays* cupule from C2, charred wood from C1, and indeterminate plant material from B3. The corn is of considerable importance, as this is the earliest corn found in the Arenal area. The kernel could be Tronadora or Arenal Phase, but the cupule derives from a sealed lot that is below an oxidized rock concentration, and thus is unequivocally from the Tronadora Phase. Although this is not informative as to the amount of maize consumed at that time, it is very important to know that maize was a cultigen associated with the earliest ceramic-using societies in the Arenal zone.

SITE G-169, JOLUVI John Bradley

The Joluvi mound site, G-169 (Fig. 8), is located on a high ridge at 680 m in elevation approximately 0.75 kilometers south of the modern day shoreline of Laguna Arenal. It is situated on a northwest-southeast trending ridge, approximately 200 m long and lies within a few hundred meters of permanent water in Quebrada Corpus. Its location on the Tilarán topographic map is UTM 384x742. The site was encountered as the result of an interview conducted with the property owner, Jose Luis Villalobos.

Posthole testing conducted on and off the 30 m diameter mound area revealed abundant subsurface material throughout the length of the ridge. Five 2 m by 2 m test units, Operations B through F, and additional shovel testing in areas with rock features near the surface were then initiated. All operations were excavated following natural and cultural stratigraphic levels (Fig. 9) and, in the case of thick cultural levels, separated into 20 cm lots. Except in Operation F, all operations were excavated down to and just below the sterile prevolcanic clay.

Operations B and C, along the ranch fence where sherds were initially exposed, were relatively shallow with Aguacate encountered at about 130 cm below the surface. Operation D, south and east of the mounded area, had an additional 30 cm of cultural fill down to 160 cm. Operation E, on the mound proper, was approximately 60 cm deeper still, extending down to 215 cm below the present ground surface.

Unit	Comments
10	1968 Arenal eruption. 0-5 cm.
20	Pumice from A.D. 1500 Arenal eruption. 10-20 cm.
30	Medium brown soil. Stone feature and numerous artifacts. <i>Phaseolus vulgaris</i> . 20 cm.
41?	(40 missing).
50	Dark Brown to black soil, stone feature and numerous flakes. 15-45 cm.

G169

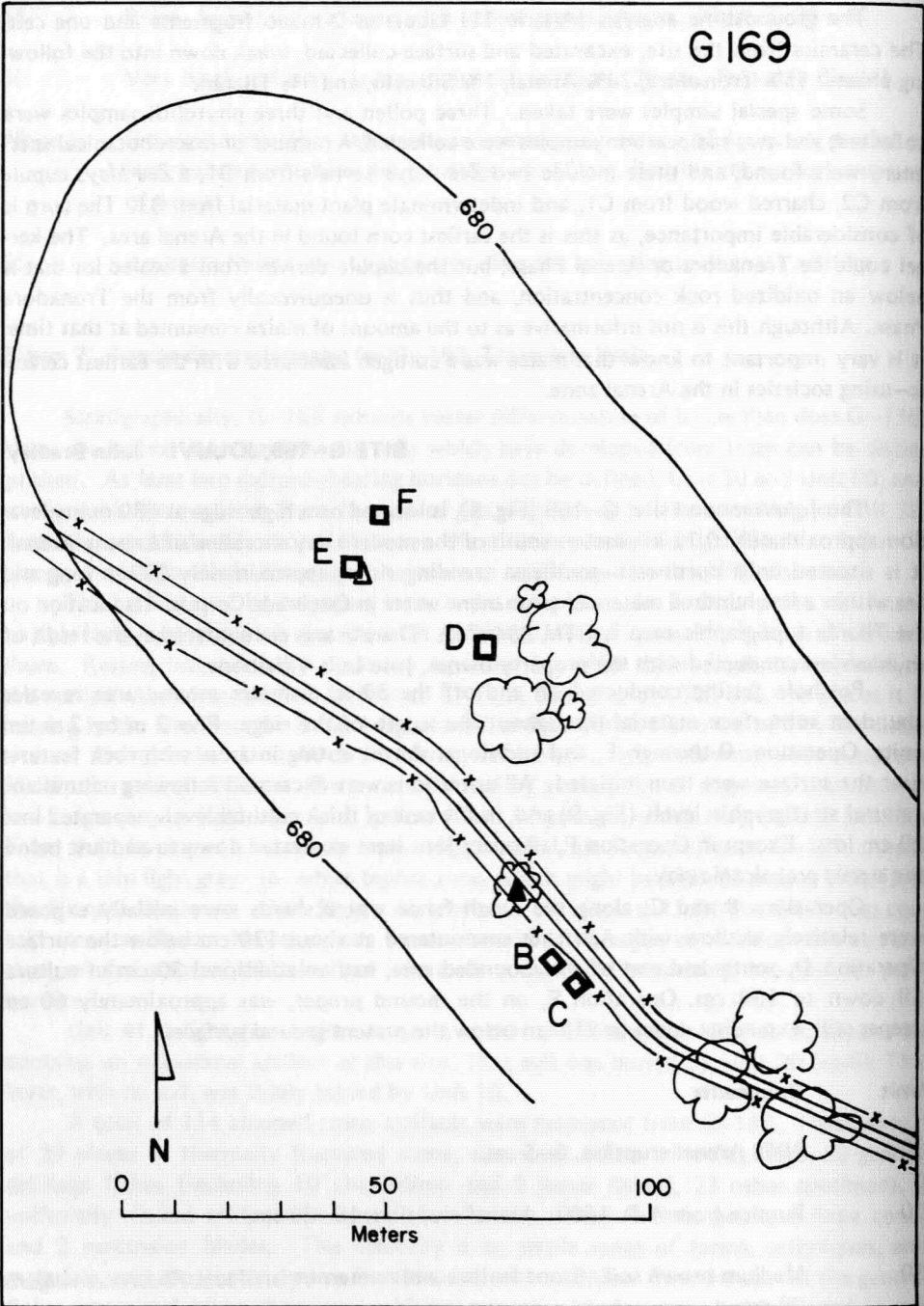


Figure 8. Map of site G-169, Jolivi.

- 52/53? Light yellow—white tephra. 10–25 cm.
- 54 Dark brown to very black soil. A few artifacts. 10–25 cm.
- 55/55A Beige—brown tephra layer, with yellow pumice flecks. White 2? 3? 5–20 cm.
- 60 Dark brown to black, high carbon clay soil. Feature, living surface and numerous artifacts. Black 1? 20 cm.
- White 1 (intermittent). Hard yellow—orange sandy level.
- 65 Aguacate Formation Orange—red clay.

Figure 9. Composite stratigraphy for G-169, Joluvi.

At the lowest level of Operation E, immediately above Aguacate, White 1 consists of a hard yellow-orange sandy level with a thin layer of tan clumps of tephra separating it from the lower sterile clay. This lower thin level may represent Unit 9 of the El Tajo sequence. In Operation D, White 1 was not discernible. Unit 60, a dark brown to black high carbon clay, was directly above the Aguacate. Only a very hard transitional zone separated Unit 60 from the Aguacate. No cultural material was encountered in White 1 or the transitional zone.

In Operation E, Unit 60 contained two Tronadora Phase sherds, one Arenal Phase sherd and charred wood fragments. Lithic material included an abundance of thermally fractured and general debitage flakes and a celt fragment. In Operation D, Lot 6, Unit 60 produced a hearth-like feature sitting on what appeared to be a hard-packed living surface, thermally fractured debitage flakes, charcoal and charred wood fragments and a concentration of general debitage flakes approximately 40 cm south of the hearth. Two sherds identified as Tilarán Phase were found at this level and in the lot above. Their appearance in these deeper levels in Operation D suggests animal disturbance. Operation C produced no cultural material from Unit 60.

Unit 55A appeared as a layer of grey specks (Operation E) or grey clumps (Operation D). In Operation E this layer is the basal portion of a thicker sterile light yellow-tan level, possibly corresponding to Unit 55, separating Unit 60 from the dark brown cultural-bearing stratum Unit 54. In Operation D Unit 55 was not present.

Unit 54 contained two Tronadora Phase sherds, three Arenal Phase sherds, a boiling stone, a piece of thermally fractured debitage and general debitage flakes (Lot E5). In Operation D, Lot 4, only an intrusive Tilarán Phase sherd was found. Operation C, Lot 4, contained only charred wood fragments in this soil unit.

Above Unit 54 and physically separating it from the Silencio Phase cultural level in Operations C, D and E is another thick and sterile light yellow-tan tephra level. This stratum appears to correspond to Units 52 and 53 of the Silencio stratigraphic sequence. Above this level is Unit 50, a medium brown to black soil with some clay. Silencio Phase ceramics were in the majority in three of the four lots from this unit. Lot B3, in a

midden area along the edge of the south slope of the ridge, contained equal numbers (46) of Silencio and Tilarán Phase sherds, a metate fragment, a utilized flake and thermally fractured and general debitage flakes. Operation C, Lot 3, a few meters to the south of Operation B, contained five Silencio Phase sherds, two Tilarán Phase sherds, one flaked core, two boiling stones and thermally fractured and general debitage flakes. Carbonized plant material was also collected for a C14 sample; however, no results are available at this time. Lot D3 contained the base of a stone feature consisting of a 40 cm long vertical laja slab penetrating partially into Units 52 and 53 below and extending upward into Unit 30 above. The rock possibly represents a house wall foundation; however, additional work is needed in order to prove or disprove this hypothesis. Associated cultural material included thirteen Silencio Phase sherds, seven Tilarán Phase sherds, thermally fractured and general debitage flakes and charred wood. Lot E4 contained four Silencio Phase, sherds, a small bifacial trimming flake and thermally fractured and general debitage flakes.

No evidence of Unit 41 or Unit 40 was encountered in any of the operations. These tephra units fell during the Middle Polychrome Period, approximately A.D. 800-900, as evidenced by excavations at the Silencio cemetery, G-150 (Article 6).

In the midden area, Operation B, Lot 2, Unit 30 exhibited 23 Silencio Phase sherds, 19 Tilarán Phase sherds and thermally fractured and general debitage flakes. In adjacent Lot C2 from this soil unit, Tilarán Phase sherds (13) outnumbered Silencio Phase sherds (6). This lot also contained an unidentifiable groundstone fragment, a celt flake, a flaked core, and thermally fractured and general debitage flakes.

In Operation D, Lot 2, a bean colytedon (*Phaseolus vulgaris*) was found in association with Silencio Phase and Tilarán Phase sherds. Groundstone tools included a whole celt and a chisel. Abundant charcoal, an unidentifiable bone fragment, two dozen thermally fractured debitage flakes and 69 general flakes were also found. An additional pecked-to-shape laja slab adjacent to the vertical slab mentioned previously was also found.

On the mound proper in Operation E, Lot 2, additional Silencio Phase and Tilarán Phase sherds were found along with thermally fractured and general debitage flakes.

Lot 1, in Operations C, D and E, consisted of the modern topsoil and root zone above the Unit 20 lapilli. These levels were disturbed and contained two unclassified sherds. Lot 1 in Operation B in the midden area included 11 Tilarán Phase sherds and 4 Silencio Phase sherds and thermally fractured and general debitage flakes.

SITE G-175: VIBORIANA John Hoopes

The Viboriana site (Fig. 10) is located on the south shore of Lake Arenal, on what was once a ridge overlooking the Río Arenal drainage. Its precise location is at UTM 437 x 725 on the Tilaran 1:50,000 topographic map, at an elevation of 540 m. The easternmost portion of the site overlooks Quebrada Mulas, which was probably the principal source of water for the aboriginal settlement.

The site was located by Mueller and Hoopes during the 1984 lakeshore survey (Article 4), and was immediately recognized as an extensive occupation owing to both the quantity and the horizontal extent of cultural debris on the surface. The surface was sampled by both general and controlled transect collections of ceramic and lithic artifacts. Each of these collections was composed predominantly of Arenal Phase ceramics

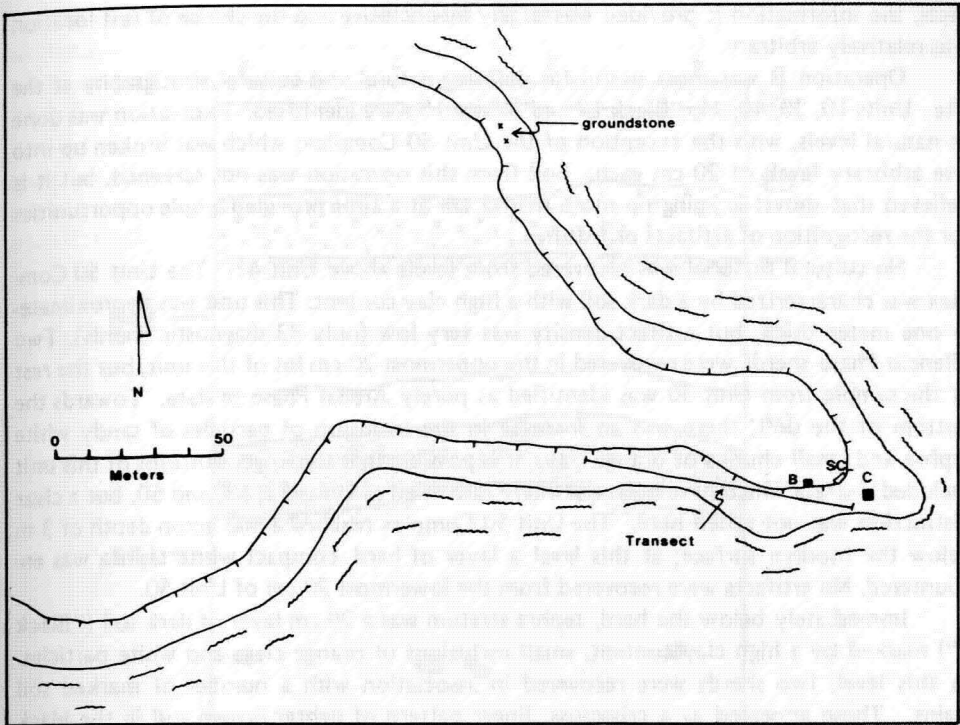


Figure 10. Map of site G-175, Viboriana.

(56% of 155 sherds for the general and 45% of 53 sherds for the transect collection), with only small quantities from the Tronadora, Silencio, and Tilarán Phases.

Viboriana has been drastically affected by erosion from the lake. Wave action, particularly on parts of the site with an eastern exposure, has undoubtedly removed a significant part of the cultural deposit. The lakeshore perimeter of the site is now defined by high, eroded vertical sections and broad slopes whose width varies by grade and by lake height. Strata Cuts were made in two exposed sections, and a posthole digger was utilized without much luck in an attempt to locate concentrations of sub-surface artifacts.

The quantity of ceramic and lithic material (including metate and mano fragments, groundstone celts, and flaked stone), and its almost exclusive identification as Arenal Phase made it a promising candidate for test excavation. No looting was evident at the site, and the flat, level surface of the uneroded portion of the site indicated a complete succession of stratigraphic units with potential for clarifying both the volcanic and cultural sequences in the easternmost portion of the 1984 survey area.

Two test pits, Operations B and C, were excavated under the direction of Mueller and Hoopes. Operation B, a 2 x 2 m unit, dissected a portion of the high, eroded bank, cutting back into the intact portion of the deposits. Operation C, a 3 x 3 m unit, penetrated the exposed, horizontally-eroded portion of the site and cut into the lowest cultural deposits. While a posthole digger was used to sound this portion of the site for arti-

facts, the information it provided was largely inconclusive and the choice of test location was relatively arbitrary.

Operation B was most useful for defining natural and cultural stratigraphy at the site. Units 10, 20, 40, 41, "Black 1" and "White 1" were identified. Excavation was done in natural levels, with the exception of the Unit 50 Complex, which was broken up into five arbitrary levels of 20 cm each. Soil from this operation was not screened, but it is believed that shovel-scraping no more than 5 cm at a time provided ample opportunities for the recognition of artifacts or features.

No cultural material was recovered from levels above Unit 41. The Unit 50 Complex was characterized by a dark soil with a high clay content. This unit was approximately one meter thick, but artifact density was very low (only 33 diagnostic sherds). Two Silencio Phase sherds were recovered in the uppermost 20 cm lot of this unit, but the rest of the sample from Unit 50 was identified as purely Arenal Phase in date. Towards the bottom of the unit, there was an increase in the inclusion of particles of sandy white tephra and small chunks of orange clay. It is possible that the lower portions of this unit included strata which have been elsewhere identified as Units 52, 53, and 60, but a clear distinction was not noted here. The Unit 50 Complex reached a maximum depth of 3 m below the modern surface; at this level a layer of hard, compact white tephra was encountered. No artifacts were recovered from the lowermost 20 cm of Unit 50.

Immediately below the hard, tephra stratum was a 20 cm layer of dark soil ("Black 1") marked by a high clay content, small inclusions of orange clay, and white particles. In this level, two sherds were recovered in association with a number of marked soil stains. These appeared as a crisscross, linear pattern of lighter brown soil in the black matrix, but were not recognizable as structural or other cultural remains. These stains were approximately 5–10 cm deep, and were sampled for pollen and phytoliths. No charcoal, stone, or other remains were associated with these features, which may have represented root casts or fallen vegetation.

"Black 1" was underlain by a lighter soil layer—"White 1"—between 10–15 cm thick. Artifact density was extremely low, and consisted of unidentifiable body sherds, one rim of a Los Hermanos Beige (Arenal Phase) jar, and a single fire-cracked rock. This level overlay the Aguacate, and contained inclusions of chunky, grey tephra. It was penetrated by an intrusive rectangular feature in the eastern portion of the unit which began at the level of the soil stains and continued for some depth into the Aguacate base (Fig. 11).

The nature of this intrusive feature is still very puzzling. Only one sherd (Arenal Phase) was recovered from it, and the lack of cultural associations made it very difficult to interpret. The pit, whose excavated horizontal section measured 80 cm east–west and 40 cm north–south, was defined by excavating a 1 x 1 m section into the Aguacate in the southeast corner of the operation. The feature was capped with a thin layer of sandy white tephra at the level of "White 1" and filled with black soil, effectively forming a column which extended 2 m down into the Aguacate and terminated at a depth of 5 m below the modern surface. The bottom 60 cm of the pit were filled with a deposit of coarse grey lapilli, at the top of which was a shallow cap of fine white tephra (about 1 m below the surface of Aguacate). It should also be noted that a thin lens of tephra was noted at about 25 cm below the surface of Aguacate, and that this lens apparently continued across the pit feature. Samples of all of these tephra and soil matrices were collected for pedological, palynological, and phytolith analyses, and it is hoped that these

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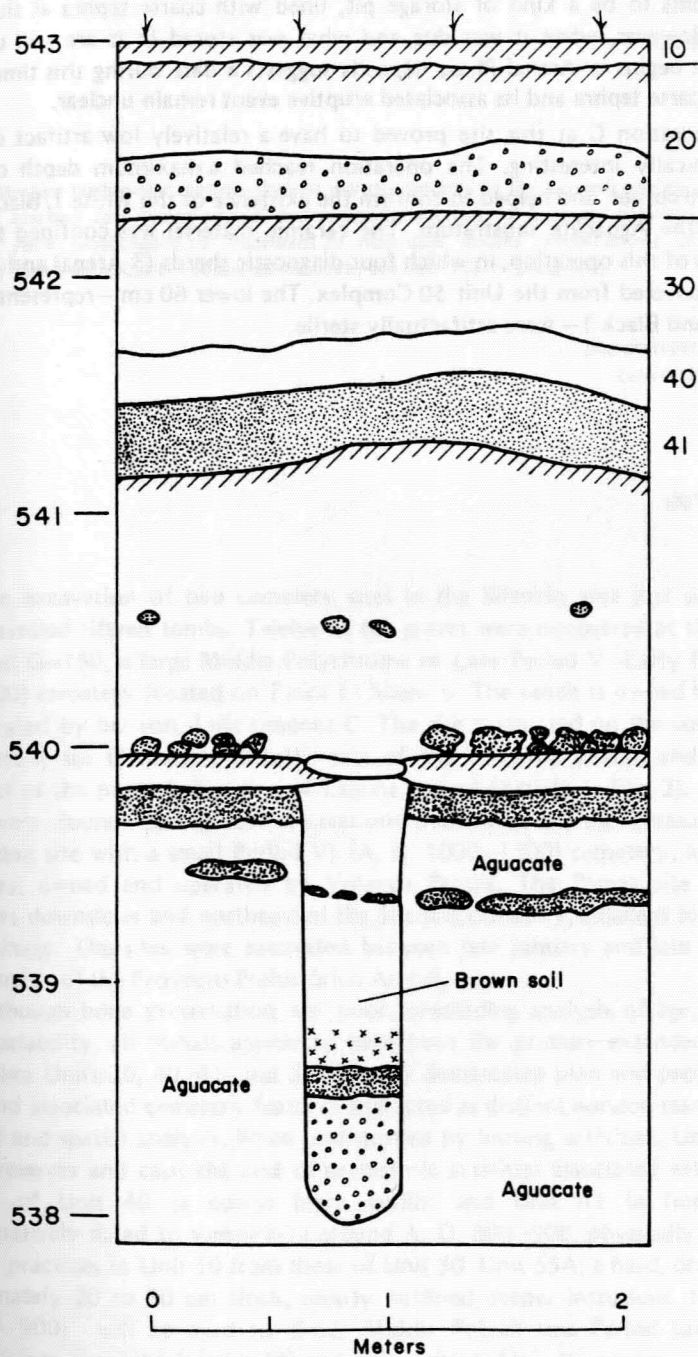


Figure 11. Profile of Operation G-175B showing pit feature prehistorically excavated.

will throw some light on the nature of the pit's construction. At this time, the best explanation seems to be a kind of storage pit, lined with coarse tephra at the bottom for drainage. However, when it was dug and what was stored in it are still unknown. The fact that it begins in Arenal Phase deposits suggests a date during this time; but the source of the coarse tephra and its associated eruptive event remain unclear.

While Operation C at this site proved to have a relatively low artifact density, it was stratigraphically interesting. The operation reached a maximum depth of 1 m in its northwestern corner, and helped to confirm the existence of the White 1/Black 1 succession overlying the Aguacate substratum. The ceramic material was confined to the uppermost 40 cm of this operation, in which four diagnostic sherds (3 Arenal and 1 Silencio Phase) were recovered from the Unit 50 Complex. The lower 60 cm — representing Aguacate, White 1, and Black 1 — were artifactually sterile.

