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OPEN FILE REPORT 63

A FOSSIL HUNTER'S GUIDE TO THE GEOLOGY OF PANHANDLE FLORIDA

By

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The Florida panhandle is perhaps the most geomorphically and stratigraphically unique portion of Florida. Figure 1 illustrates the more extensive geomorphic zones comprising the panhandle. A series of topographic highlands extend across the northern edge of the panhandle, and are comprised of two geomorphic provinces named the Northern Highlands and the Western Highlands. These highlands are composed largely of clayey sands and sandy clays of the Hawthorn Group and the Miccosukee and Citronelle Formations. In the panhandle, the Northern Highlands are locally called the Tallahassee Hills. The Western Highlands contain the highest land surface elevations in the state, topping out at 345 feet above mean sealevel on a hilltop in northern Walton County. The Tallahassee Hills and Western Highlands are separated by an elevationally-lower region named the Marianna Lowlands, an area underlain by shallow, solution-hole-pocked limestones. Bordering the southern edge of the Marianna Lowlands are two topographically higher sand ridges named the New Hope Ridge and Grand Ridge. These ridges include a number of remnant hills, which may approximate the original elevation of the Marianna Lowlands.

The highlands of the northern panhandle are bounded on the south by the Gulf Coastal Lowlands, a flat, seaward-sloping plain associated with marine erosion by high-standing Pleistocene seas. In the eastern panhandle, a distinct marine escarpment named the Cody Scarp marks the dividing line between the zones. Several sandy, ramp-like topographic slopes lie along the northern edge of the Gulf Coastal Lowlands. These include the Beacon Slope, the Fountain Slope, and the Greenhead Slope. Within the Gulf Coastal Lowlands many of the geologic units comprising the highlands to the north have been removed by erosion, leaving only a relatively thin veneer of undifferentiated sands resting on the bedrock. The age and makeup of this shallow bedrock underlying the Gulf Coastal Lowlands varies considerably from east to west, but nearly all is carbonate rock.

In the deeper subsurface, the panhandle retains the thick Eocene and Oligocene carbonate substructure common to much of the peninsula, but is characterized by a complex series of younger geologic units, many with lithologic components derived from the continental mainland. Figure 2 illustrates a geologic map and a shallow west-to-east geologic cross section through the panhandle.

The geologic map is constructed to show the extent of the formations as they occur within 20 feet of land surface. Each formation may be much more extensive in the subsurface, but because each eventually dips below the arbitrary 20 foot depth or pinches out, their entire extent is hidden by shallower units shown on the map. Areas underlain by more than 20 feet of undifferentiated Pleistocene and Holocene sands are shown as white areas on the map. These illustrations should give even the casual reader a visual perspective on just how complex and varied the geology of northern Florida actually is. The cross section trends along the approximate dividing line between the highlands zones on the north and the Gulf Coastal Lowlands on the south. Bear in mind that the local stratigraphy can and does vary somewhat both north and south of this section.

In general, the stratigraphic units dip gently to the west-southwest, into the broad Gulf of Mexico Sedimentary Basin. This is especially apparent at the western end of the cross section in Figure 2. At the eastern edge of the panhandle, the Cenozoic units lap onto the flank of the Ocala Platform, a structurally positive feature centered under Levy County in the Big Bend Area. As these units lap onto this platform, they rise to the surface in broad, erosionally-planed regions, especially obvious in the Gulf Coastal Lowlands. Both the Suwannee Limestone and the younger St. Marks Formation are brought to the surface in the southern Wakulla-Jefferson County area as they lap up onto the platform. Further west, limestone of the Intracoastal Formation rises to the surface along the eastern edge of Franklin County. Because of the extent of marine erosion that occurred in the

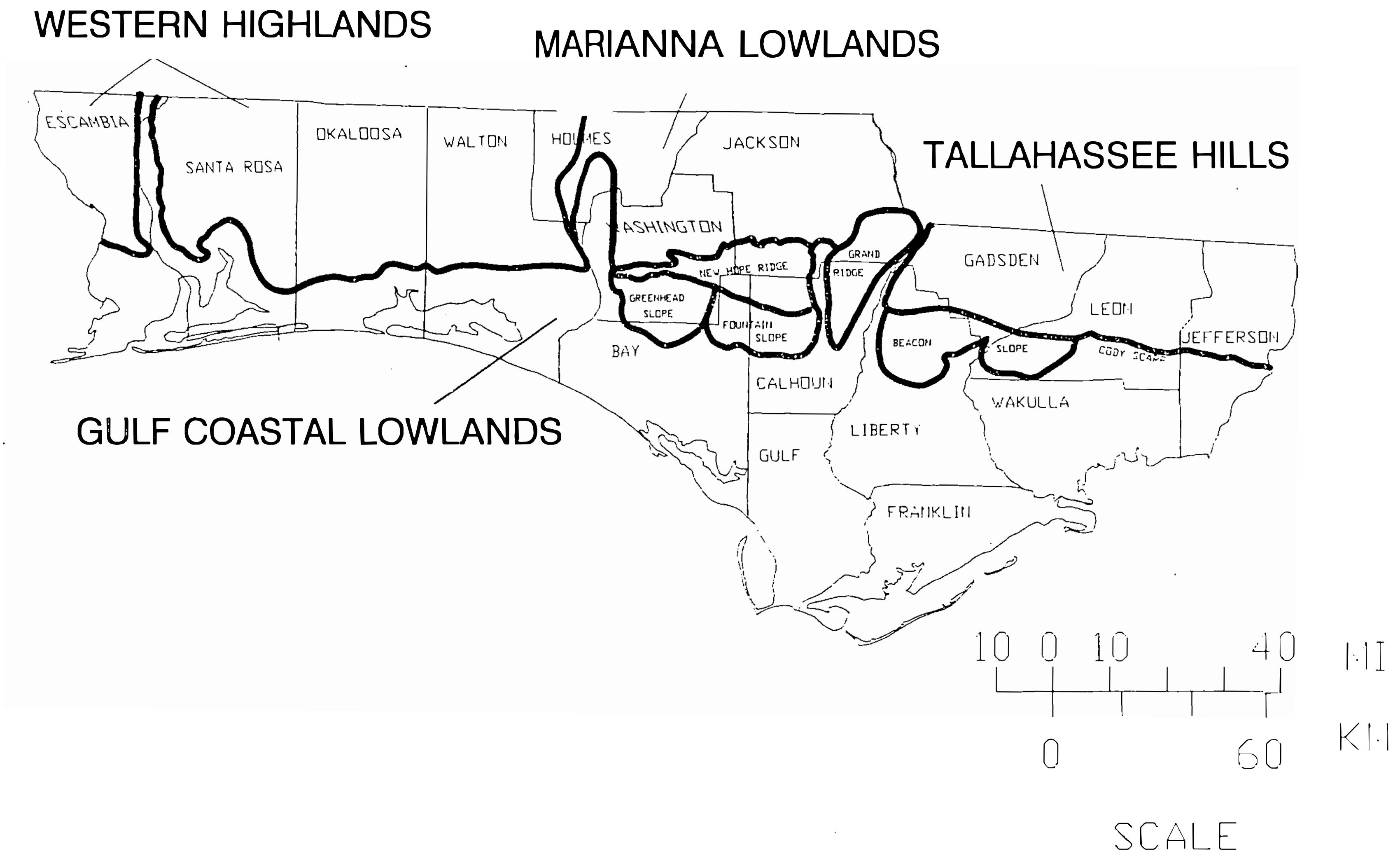

Figure 1: Geomorphic map of the Florida panhandle

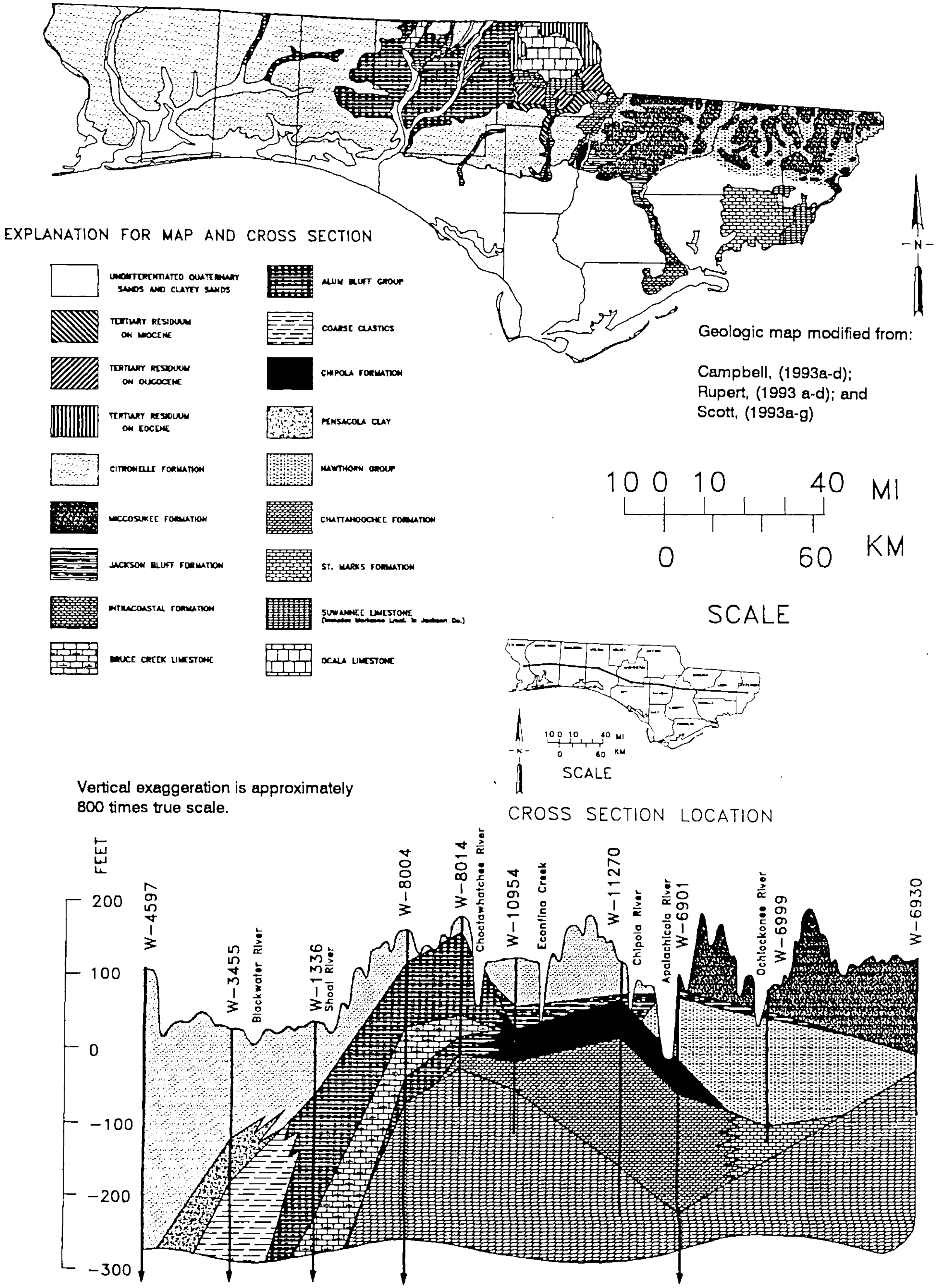

Figure 2: Geologic map and west-east cross section for the panhandle.

Gulf Coastal Lowlands, many of the Middle Miocene and Pliocene units that would normally overly these carbonate units are largely missing in the eastern panhandle. In the highlands extending across the northern edge of the panhandle, portions of these units remain, forming the hills characteristic of this region.

The stratigraphy of the panhandle is further complicated by a series of subsurface structural features (Figure 3). As they dip off the flank of the Ocala Platform, the geologic units of the

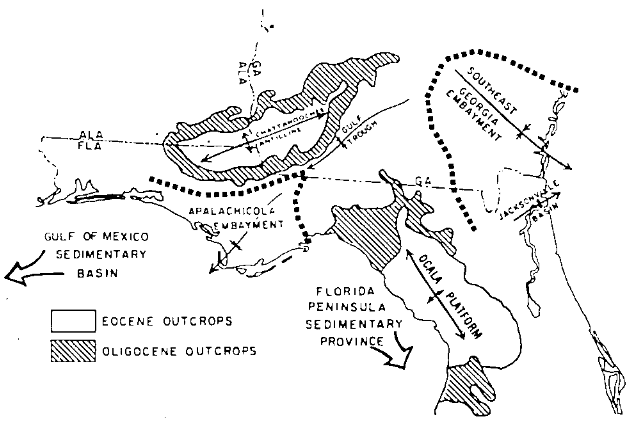

Figure 3: Subsurface structural features.

(from Schmidt, 1984)

eastern panhandle locally dip generally west-south-westward into a structural basin named the Apalachicola Embayment, situated approximately under the Calhoun-Liberty County area. This basin-like depression accumulated thousands of feet of Mesozoic and Cenozoic sediments. The Oligocene and older units typically show a trough-like depression in their structure tops, corresponding to the axis of this basin.

Just north-northwest of the embayment, in southern Alabama, is a structurally positive feature called the Chattahoochee Anticline. Like the Ocala Platform to the east, this dome-like feature brings Eocene and Oligocene carbonates close to the surface in Jackson and portions of Washington and Holmes Counties. It also tends to cause all the Eocene and younger sediments to shoal as they lap over the southern flank of this feature. West of the Chattahoochee Anticline, the sediments assume a west-southwestward dip into the Gulf of Mexico Sedimentary Basin.

The sediments composing the shallow formations in the Florida panhandle were deposited largely in shallow marine or marginal marine paleoenvironments. Although many, such as the Chipola Formation, are limestones, they generally contain significant percentages of quartz sand and clays, derived from the continental mainland to the north. Most fossil collecting sites are located in areas where local rivers or streams have cut down into fossiliferous strata. The most abundantly fossiliferous units are situated in the central panhandle. These include the Miocene and Pliocene sandy, clayey shell beds and limestones of the Chipola Formation, Alum Bluff Group, and Jackson Bluff Formation. Several of the major panhandle streams may be seen cutting through shallow portions of these formations in the cross section in Figure 2.

A Grand Tour of Panhandle Paleontology

In order to better examine the geology in this interesting region, let's proceed on a car trip, heading westward through the panhandle and discussing some of the fossiling opportunities along the way. Figure 4 summarizes one possible route. The trip will commence at the Aucilla River, on U.S. Highway 98, in southern Jefferson County. Although fossils have been found in northern portions of Jefferson and Leon Counties, they are rare, and from an amateurs perspective, a southern route offers more opportunities.

The primary source of fossils in the eastern panhandle are the placer deposits of Pleistocene bone fragments trapped in pockets in the limestone streambeds. These are typically only accessible through diving. The Aucilla River, which forms the Jefferson-Taylor County boundary, is a dark-water stream flowing in a channel incised in 33 million year old Suwannee Limestone. Holes in the bottom and bars along its course have yielded numerous Pleistocene vertebrate fossils over the years. It alternately flows underground and reemerges several times along a line of sinks several miles north of Highway 98. Locals have worked the stream for years, so many of the easy finds are gone. However, careful searching with snorkeling or SCUBA gear should yield more. Much of the land along the river is private, and access points are limited. A canoe is a necessity for transiting this and most other northern Florida rivers. The best put-in points are at the bridges over the Aucilla, particularly at U.S Highway 27 near Lamont, and at the S.R. 257/14 bridge, 10 miles north of U.S. 98 on SR 14.

A short distance further west, the spring-fed

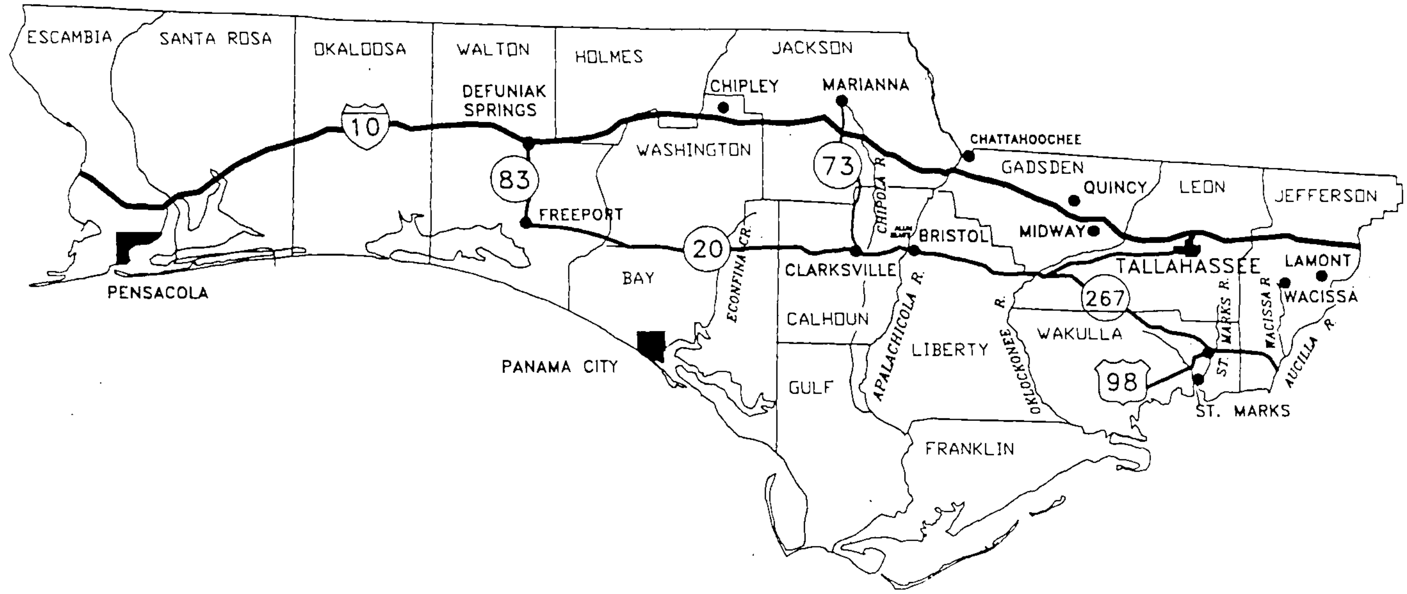

Figure 4. General panhandle fossil collecting route map.

Wacissa River also flows over a sand and Suwannee Limestone bottom, ultimately joining the Aucilla just north of U.S. 98. Entry is at a small park in Wacissa, near the spring-fed headwaters (Take S.R. 59 north from U.S. 98 to Wacissa, then south to the small park and boat ramp). According to Brown (1988), the best collecting on the Wacissa is about three miles downstream, past the old logging dam. Here, Pleistocene vertebrates may be found in pockets in the river bottom.

West from the Aucilla River bridge, U.S. 98 traverses the broad, flat Gulf Coastal Lowlands, locally characterized by shallow limestone bedrock brought close to the surface over the western flank of the Ocala Platform. Boulders of this limestone are observable in places along the side of the highway. Oligocene mollusk and echinoid fossils are present in the limestone, but are hard to locate and remove, being locked up in the rock matrix.

Near the Jefferson-Wakulla County line, we cross the contact between the Suwannee Limestone and the overlying Miocene St. Marks Formation, stepping forward some 8 million years in geologic time. Like the Suwannee Limestone, the St. Marks is brought to the surface in a broad, flat, limestone plain. You would never notice the change from the highway. The seemingly endless pine flatwoods and swampy bays continue into Wakulla County, all part of the extensive karst area called the Woodville Karst Plain. The St. Marks Formation contains fossil mollusk molds, rare corals, and foraminifera, but few extractable fossils. Therefore, as is true to the east, Pleistocene stream deposits are the main fossils in this region.

Five miles into Wakulla County, we reach the St. Marks River. Like the Aucilla, the St. Marks flows in a limerock channel containing holes and pockets that trap Pleistocene vertebrate fossils. These are the characteristically black bone fragments of animals such as turtles, glyptodonts, and horses. Just before the U.S. 98 bridge over the St. Marks, a turnoff on the north side of the road leads into a small Forest Service campground and boat ramp. This is a good place to put in a canoe and head upstream. The St. Marks has also been well worked over by divers, and one Tallahassee dive shop regularly takes their SCUBA classes there. It is best to travel a couple of miles upstream to look for fossils. During low water conditions, the water is very clear, and it's possible to snorkel for fossils. Watch out for motor boats however. Also, avoid the Indian artifacts, and do have your vertebrate permit with you...the river is patrolled by both Marine Patrol and Fish and Game officers. Even if you don't find anything fantastic, it is a very beautiful river, flanked by dense forest, teeming with turtles, birds, otters, and yes, alligators.

From the St. Marks River, we head west again on U.S. 98, passing the two small restaurants, Forest Service vehicle yard, and the few houses comprising the once-bustling town of Newport. At the western edge of Newport, turn right (north) on S.R. 267, and head northwest to the small hamlet of Wakulla. Mansfield (1937) reported finding numerous Miocene mollusk species in the St. Marks Formation in the vicinity of Wakulla. Limestone is not visible at the surface here today, and Mansfield may have sampled "float" boulders or rock brought up by excavation work. Any mollusks will most likely be molds in the rock and probably not worth the effort to look for unless you plan to make latex casts of them.

If your schedule permits on our geologic tour, two interesting side-trips are possible from Wakulla. At Natural Bridge, the St. Marks River siphons underground and emerges again 6-tenths of a mile to the south. The emergence and the area immediately downstream have been an excellent place to dive for Pleistocene vertebrates, but the surrounding land is private property. If you would like to see some fossiliferous St. Marks Formation close-up, and also see some more local history, head south from Wakulla on S.R. 365 to Ft. San Marcos de Apalachee, in the town of St. Marks. This historic fort, or what's left of it, is situated at the confluence of the Wakulla and St. Marks Rivers. The remaining walls of the structure are constructed of blocks of St. Marks limestone.

Traveling northeast from Wakulla on S.R. 267, we pass Wakulla Springs on the left. This is an interesting stop if time permits. Now a state park, the springs offer a 1930's vintage lodge and restaurant, swimming area, and glass-bottom boat tours over the huge Wakulla Spring, headwaters for the Wakulla River. Numerous Pleistocene vertebrates have been found in the spring pool, including the famous mastodon "Herman", on display at the Museum of Florida History in Tallahassee. The park is protected, and you can't collect fossils here now.

Highway 267 continues northwestward, past Camp Indian Springs, a large spring-fed sinkhole. This portion of the Woodville Karst Plain is peppered with sinkholes and water-filled caverns, some penetrating through the St. Marks into the deeper Suwannee Limestone. Further up the road, we begin to pass through low sand hills and the terrain becomes more rolling. These gentle sand hills are ancient dunes and bars, formed by the high-standing Pleistocene seas which covered this area.

As we pass the flashing light at U.S. 319 and continue northwestward on 267, we leave the karst plain and enter a topographically higher zone of sandy flatlands called the Apalachicola Coastal Lowlands. The surface change is not dramatic, but in the subsurface, the first vintages of the fossiliferous units of the central panhandle appear. Below the sandy surface sediments lie the Miocene Hawthorn Group and Pliocene Jackson Bluff Formation. The Hawthorn Group sediments, which underlie much of the Northern Highlands area, extends westward to the Apalachicola River and southward into this part of Wakulla County. The Jackson Bluff Formation, a generally sandy, shelly unit, dips and thickens to the west-southwest from west-central Wakulla County; it occurs in stream cuts through portions of the central panhandle, and as we will see, offers some good invertebrate fossil collecting.

S.R. 267 joins S.R. 20 in western Leon County, near the southern shore of Lake Talquin. Two Pliocene fossil hunting opportunities lie near this juncture. Four miles east of the intersection, Harvey Creek passes under S.R. 20 as it meanders southeastward out of the National Forest. In places, the creek cuts down into the Jackson Bluff Formation, exposing some mollusk-rich sediments. About a mile and a half west of the S.R. 267/S.R. 20 intersection is the only entrance to Jackson Bluff, the type location for the formation of the same name. Jackson Bluff is situated on the east bank of the Ochlockonee River, just below the hydroelectric dam which forms Lake Talquin. The bluff is on the electric plant property, currently owned by the City of Tallahassee. You must turn into the main plant gate off S.R. 20 just before the bridge over the river. Entry is kind of a hit or miss proposition...if the gate is closed you're out of luck. If it's open, you can follow the road around to the plant building, and ask permission to continue on to the bluff from someone in the electric plant office. The paved road ends at the dam, and continues on to the bluff as a dirt road. An old borrow pit, which you must look closely for, extends to the edge of the bluff and exposes Pliocene shelly, clayey sands.

From the Ochlockonee River, our geological journey takes us westward on S.R. 20, along the southern edge of a region offering some of the best Miocene and Pliocene invertebrate fossil collecting in Florida. The gently-rolling hills north of the highway are dissected by numerous deeply-incised creek and stream valleys, which in some areas expose fossiliferous Miocene and Pliocene units. Gardner (1926-1950), in her classic work on Alum Bluff Group mollusks, lists over 50 collecting localities between Leon and Okaloosa Counties (Figure 5). Most of these are stream and creek bank sites, and not all are still accessible to individuals. As with the rest of Florida, the land is largely private property, and a boat or canoe is required to access many of the sites. There are a few, however, accessible by foot from a roadway; we will discuss these as we go.

As we cross Liberty County, the land surface itself belies the increasingly complex geology of the subsurface. Surface sediments are predominantly Pleistocene and Recent sands and clayey sands. These are in turn underlain by Pliocene Jackson Bluff Formation and by older, deeper Miocene Hawthorn Group and Chipola Formation sediments. Miocene fossils have been found in Telogia Creek, at the northern edge of the county, but for the most part the center of the county offers little to the collector. The western edge of the county is quite a different story. Here the eastward-migrating Apalachicola River has carved a series of steep bluffs, some attaining relief of 150 feet. These bluffs also mark the western edge of the Tallahassee Hills.

Florida's most spectacular geologic exposure occurs along a portion of these bluffs situated about two miles north of Bristol, at Alum Bluff (Schmidt, 1985). Here, approximately 120 vertical feet of strata are exposed, representing some 20 million years of geologic time. It gives the onlooker a visual sampling of many of the normally subsurface stratigraphic units underlying the panhandle. The basal unit in the exposed bluff is mollusk-rich Miocene Chipola Formation, which at low to medium water levels forms a small bench below the bluff. Fossil mollusks, along with occasional corals, and even rarer vertebrate fossils may be found while by walking this bench. The Chipola is overlain in turn by younger Miocene Alum Bluff Group/Hawthorn Group sands and clayey sands. Miocene palm leaf fossils of the species Sabalites apalachicolensis are found in this unit. Overlying the Miocene units are Pliocene Jackson Bluff Formation and Citronelle Formation sediments. Alum Bluff is owned by the Nature Conservancy. The land access, from State Road 12 out of Bristol, is gated and locked. Entry is by permission only. In the past, the Conservancy caretaker has allowed individuals in to hunt fossils. However, they now take a more wary approach about letting strangers on the property. It's possible to launch a boat at Bristol and approach the bluff from the river. While it is technically State property up to the mean high water line, keep in mind that the bluff itself is private property. Also, watch out for barges rounding the bend in the river..they have been known to hit the east bank of the river.

Heading west on S.R. 20 from Bristol, we cross the high bridge over the Apalachicola River. Much of the west end of the bridge passes over swampy floodplain. The west bank of the river is noticeably low and devoid of bluffs, and represents the ancient, flat-lying floodplain deposits left behind as the river cut eastward.

An excellent fossil collecting locality lies 5 miles north of the town of Clarksville in Calhoun County. Turn north off S.R. 20 onto S.R. 73 at Clarksville and proceed north to the bridge over Ten Mile Creek. Cross the bridge and turn off the road to the right. Ten Mile Creek contains exposures of molluskan-fossiliferous Jackson Bluff and Chipola Formation sediments, best observed by walking the streambed. The land around the creek is private property. Recent destruction of parts of the stream bank by fossil hunters has angered the land owner, and of this writing, a portion of the property has been fenced off. Because of this, present and future accessibility is uncertain. It's always wise to seek out the land owners and ask permission to enter. Wherever you hunt fossils, please respect the integrity of the land and use discretion in your activities there.

Ten Mile Creek joins the Chipola River about 2 miles east of S.R. 73. The area around the intersection of these streams is the type area for the Chipola Formation, and this unit is exposed along the Chipola River at low water stage. Some fine specimens of Miocene mollusks and corals are found on the west bank of the Chipola River, just north of Ten Mile Creek.

Tributary creeks on the east side of the Chipola River offer other opportunities as well. Farley Creek, for example, is a well-known Miocene mollusk collecting area. This region has been collected extensively by Emily and Harold Vokes of Tulane University, and the Chipola sediments have yielded hundreds of mollusk species. Again, the land is private, so

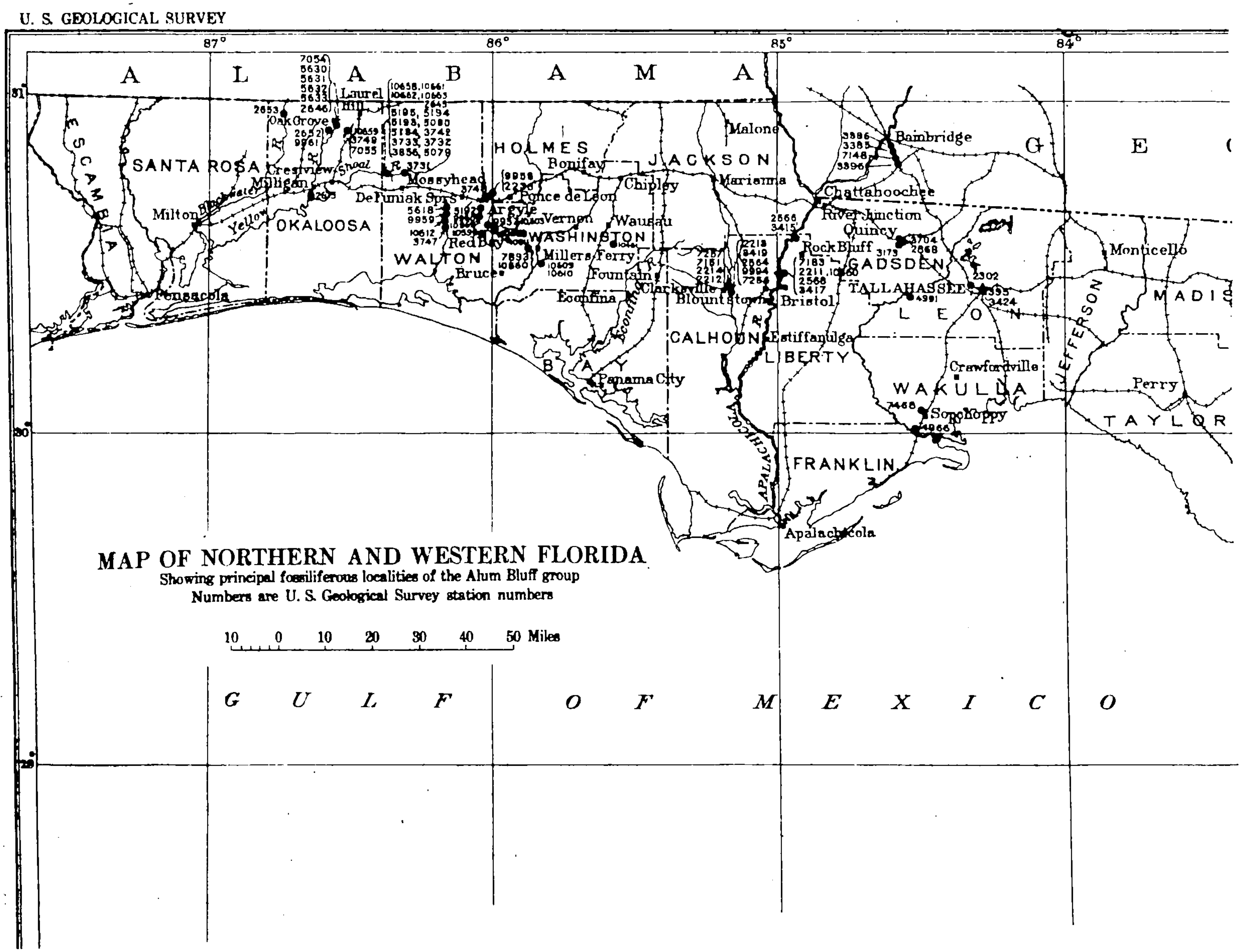

Figure 5: Collecting stations of Gardner (1926-1950).

use discretion.

If you wish to launch a canoe on the Chipola River, there is a ramp downstream at the S.R. 20 bridge. Further north in Jackson County, Pleistocene vertebrate fossils may be found in the limestone bottom of the Chipola River. This site involves a trip of some 25 miles north from S.R. 20, and so is discussed below in the return trip section.

The panhandle area west of the Chipola River contains many classic invertebrate sites originally studied by a secession of authors, including Mansfield, (1930, 1932, and 1935) and Gardner (1926-1950). These fossiliferous stream and springhead sites include the Gilbert Farm, south of Chipley in Washington County, Red Bay, Cosson Farm, and the Shoal River in Walton County, and the Yellow River in Okaloosa County. Some of these sites were the type localities for older formations that are now generally lumped into the Alum Bluff Group. These formations were originally erected based on the unique molluskan faunal assemblage present at each locality. I don't emphasize these sites because they are on private property, and the current status of accessibility is uncertain. However, if you are in the area anyway, it might be worth visiting and asking permission to collect from the current owners. Figure 6 provides directions and notes these and other classic panhandle sites.

Brown (1988) discusses some other, more publicly-accessible sites in this area. Both Chipola Formation shells and vertebrates may be found in Econfina Creek, which flows under S.R. 20 in Bay County, about 20 miles west of Clarksville. He recommends putting a canoe in at S.R. 20 and floating south to where S.R. 388 crosses the river, about 4 miles south. The stream is best explored with mask and fins.

Several of the classic collecting sites occur in Walton County (see Figure 6), and Brown (1988) describes one site north of DeFuniak, which I mention below. By the time you reach Okaloosa County, fossil collecting sites are dwindling rapidly westward. The Oak Grove locality, situated on the Yellow River north of Crestview (see Figure 6), is the western-most of the fossiliferous, Alum Bluff Group exposures. A quick glance at the cross section in Figure 2 tells why. The fossiliferous Alum Bluff Group sediments are dipping rapidly southwestward at this point, leaving only a thick series of sands and clayey sands at the surface over the western-most panhandle. Some of these surface sand units are comprised of the reddish-colored Citronelle Formation, which caps much of the Western Highlands. Rare petrified wood is occasionally found in the Citronelle, but not with enough frequency to be of interest to the amateur collector. As such, our westward journey is complete, and it's time to consider the return trip. One option is to return the way you came, perhaps revisiting some of the same sites. Or you cut north to Interstate 10 on S.R 83 from S.R. 20, in Walton County. S.R. 83 meets I-10 at DeFuniak Springs.

Brown (1988) describes a good Miocene vertebrate fossil site in this area at Camp Creek, north of DeFuniak Springs. Take S.R. 83 north for 8 miles to County Road 183A on the right. Take 183A 4.5 miles to the bridge over Camp Creek. Park and wade the streambed for fossils. You can then retrace the route back to DeFuniak Springs, and proceed back east on I-10.

This route winds through the red clayey sand hills of the Western Highlands. When you reach central Washington County, you are in the Marianna Lowlands. Due to the relatively shallow carbonate rock, karst features become more common. Falling Waters State Recreation Area, a few miles south of the Chipley exit, features an interesting tubular limestone sinkhole, into which a small water fall cascades. In this area, Oligocene and Miocene carbonates are near the surface, as they lap up onto the southern flank of the Chattahoochee Anticline. The limestone terrain becomes even more obvious further east, as you approach Marianna. The dry caves at Florida Caverns are also worth a visit. These caves are developed in the Eocene Ocala Limestone, and are perched high and dry above the water table. The Marianna area offers the collector a few opportunities. The exit off I-10 heads straight north into the town. A couple of private limerock quarries are situated northwest of Marianna (see Figure 6). Although the current status of each is unknown, it might be worth checking them out. These quarries produced from the Ocala Limestone, which contain specimens of the large foraminifera *Lepidocyclina* and *Asterocyclina*, as well as the rare nautiloid *Aturia alabamensis*. Remember to obtain permission before entering any of the quarries.

Brown (1988) also suggests looking for Pleistocene vertebrate fossils in upper reaches of the Chipola River near Marianna. River access is

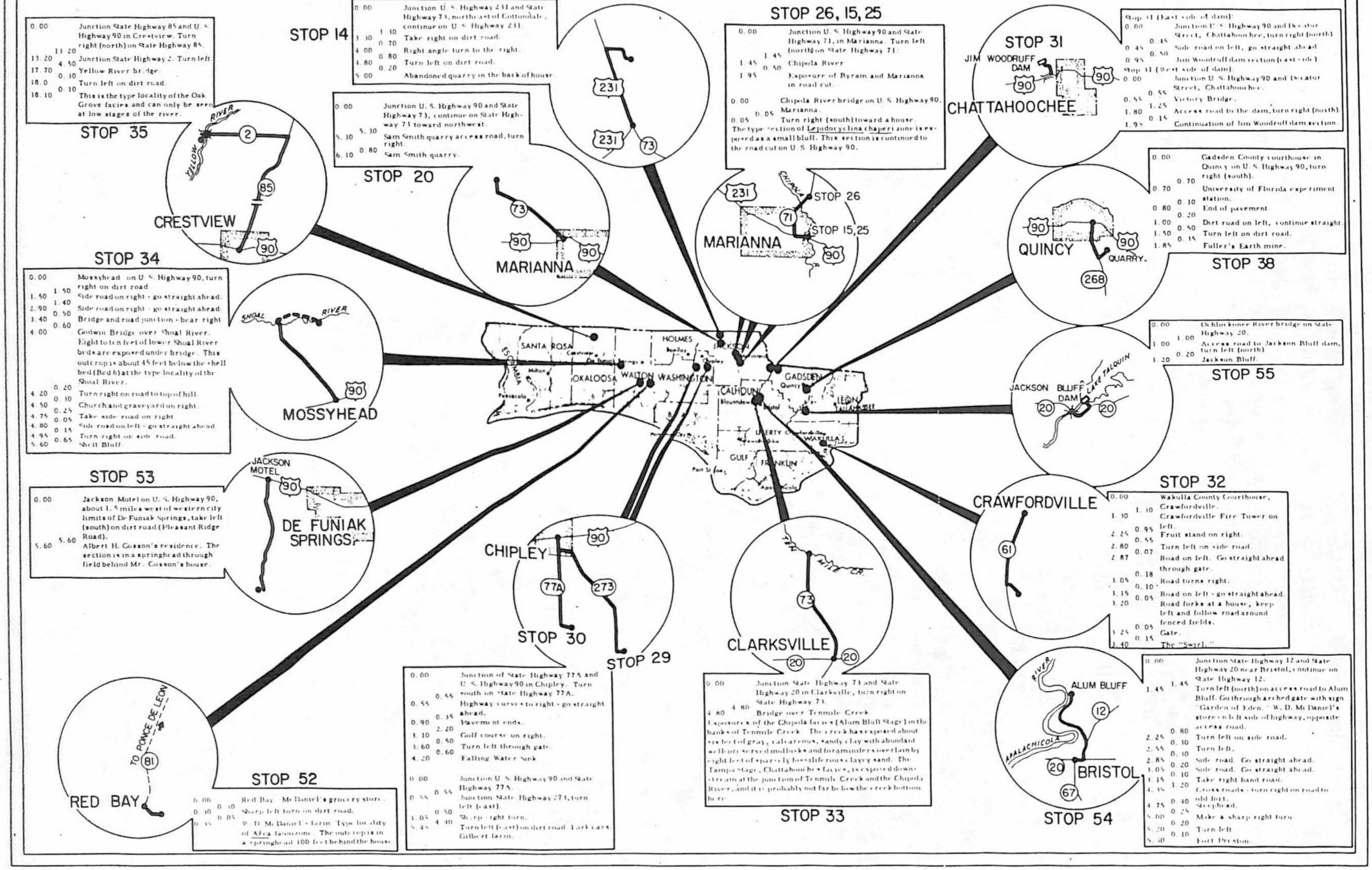

Figure 6: Classic panhandle localities (from Puri and Vernon, 1964).

available at a boat ramp south of U.S. 90. Take U.S. 90 about 2.5 miles east from Marianna, and turn south on S.R. 71. Travel another 2.5 miles to Oakdale, and turn west on C.R. 280A. Proceed about 1.5 miles to a boatramp at the river. Search the bottom north and south of the ramp.

At this point, you may return to I-10 or take U.S.90 east to Tallahassee. Both routes traverse the rolling Tallahassee Hills. If you pass through Chattahoochee on U.S. 90, you have an opportunity to see the Chattahoochee Formation exposed in a roadcut along the entrance road to Jim Woodruff Dam, on the north side of town. Northern Gadsden County, in the vicinity of Quincy and Midway, also contains a number of Fuller's Earth clay mines, which have yielded both vertebrate and invertebrate fossils. Unfortunately, most of the mines are inaccessible to the general public. If your journey home takes you through Tallahassee, stop and see the Mastodon exhibit at the Museum of Florida History, 500 S. Bronough Street, in Tallahassee. You can also stop in at the Florida Geological Survey, at the corner of Woodward and Tennessee Streets, on the F.S.U. campus. We have a Miocene dugong on display, along with other Florida minerals and fossils, and you can pick up some of our publications on the geology of Florida in the library.

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