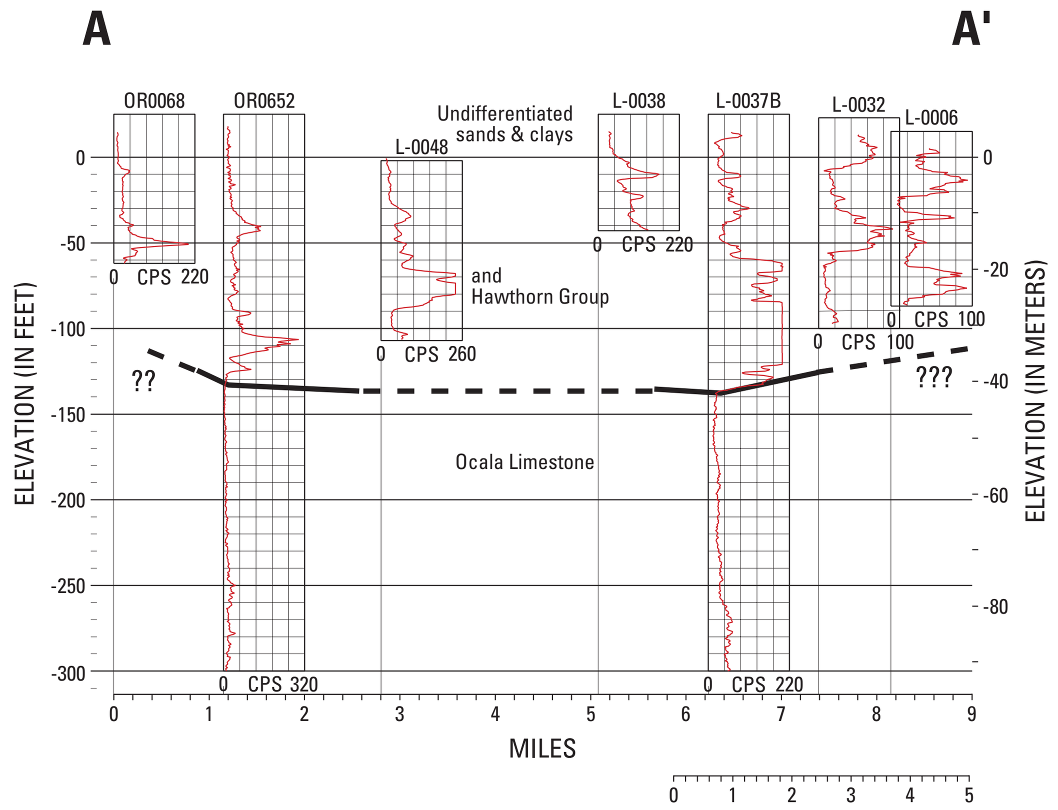
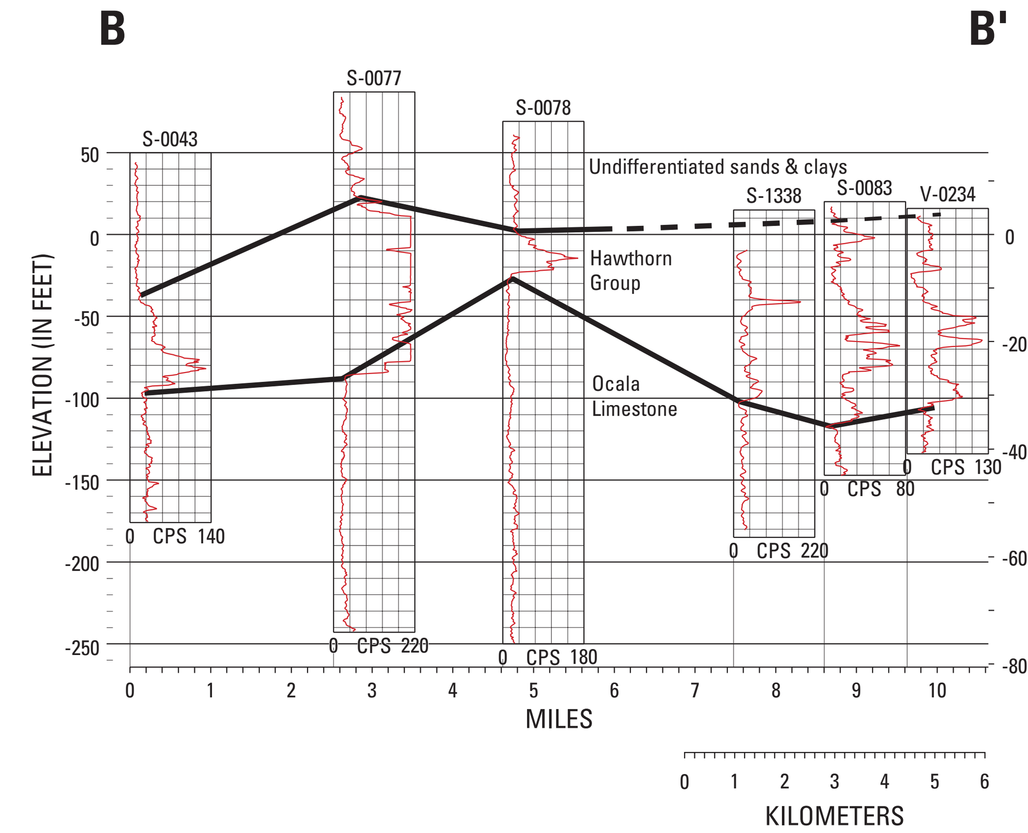
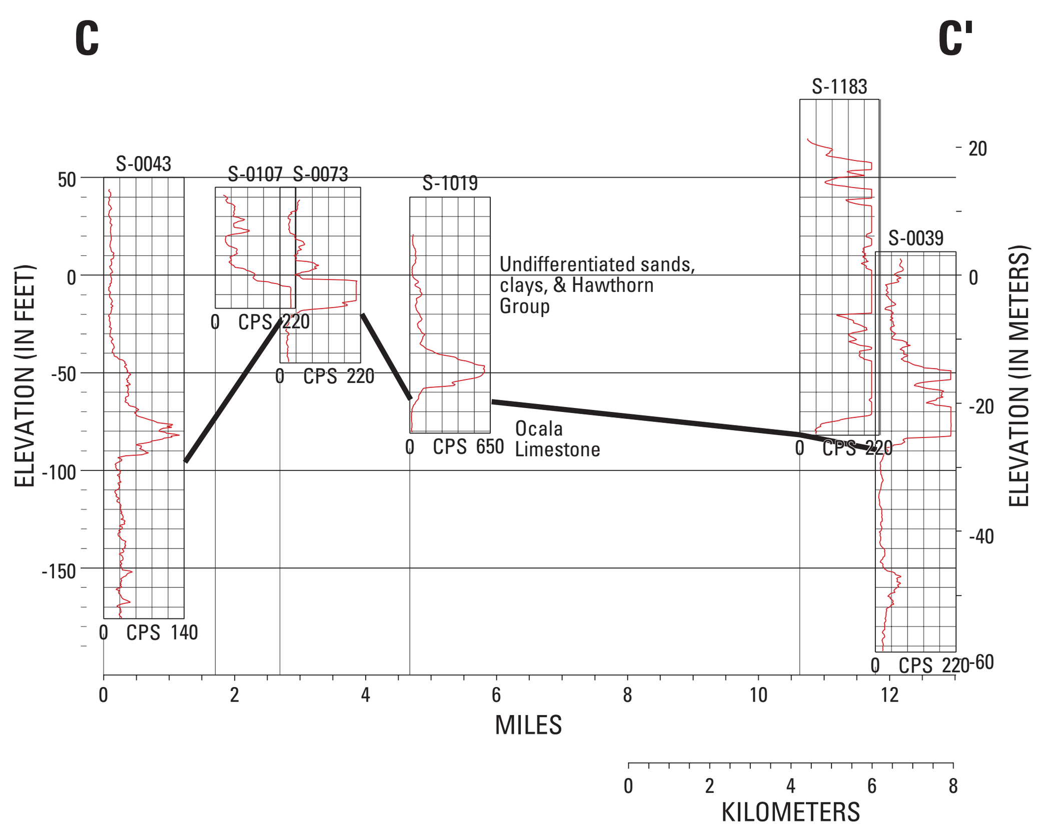
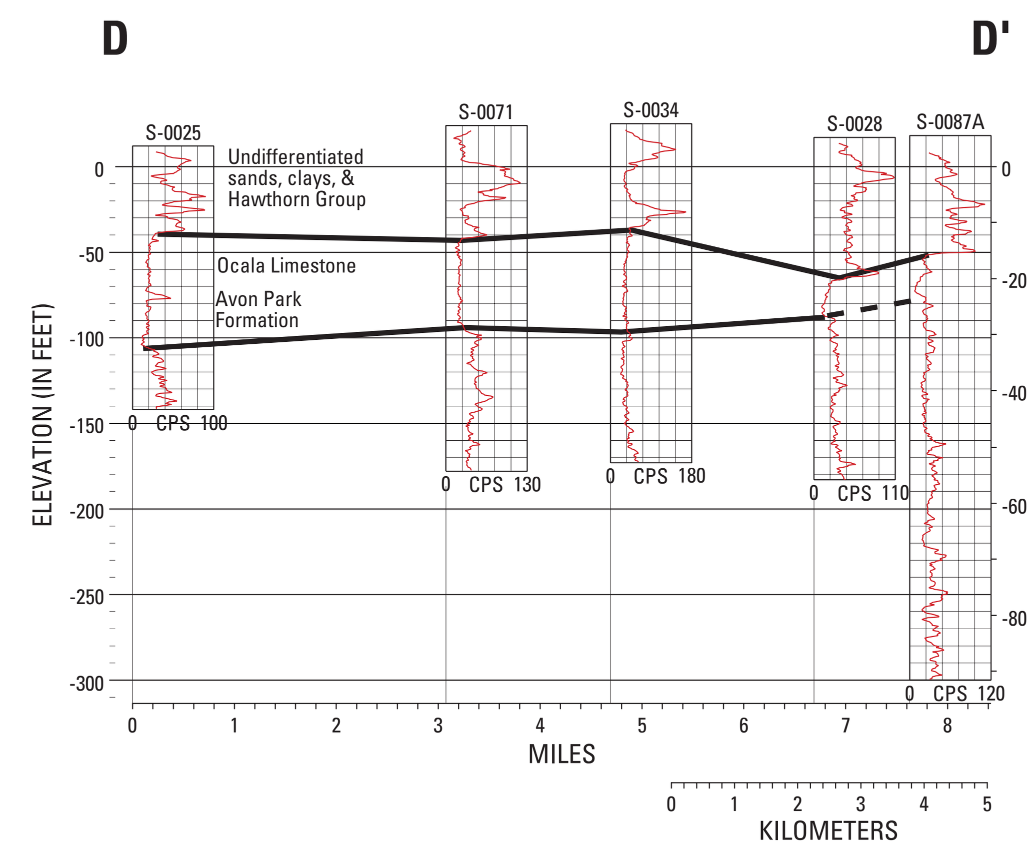
INDEX MAP AND GAMMA LOG

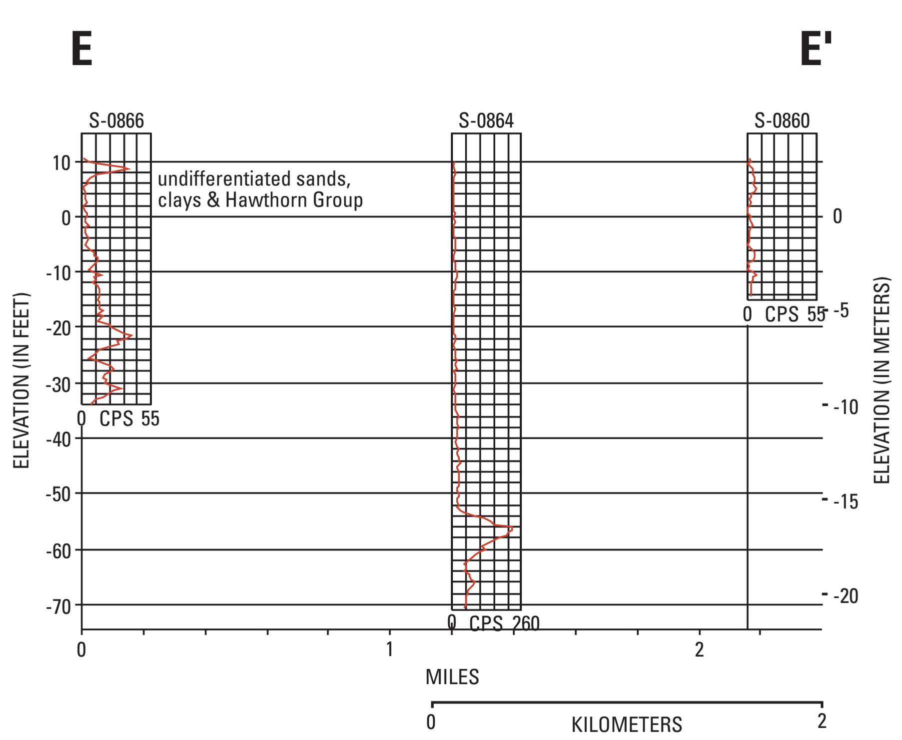
CROSS-SECTIONS, SECTION E

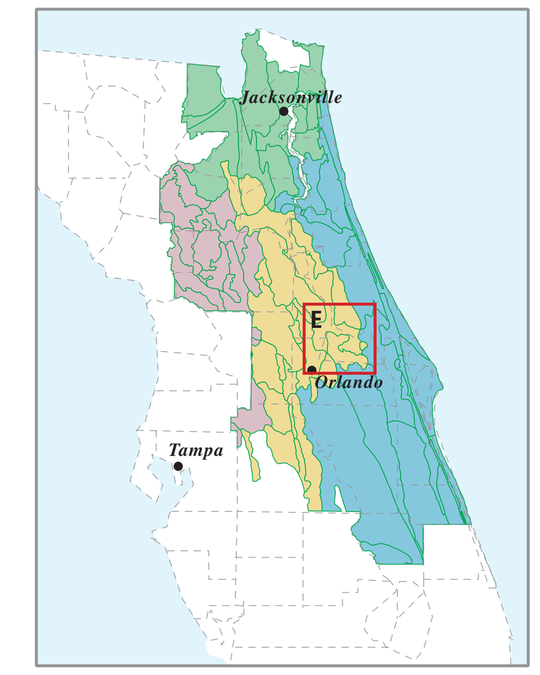




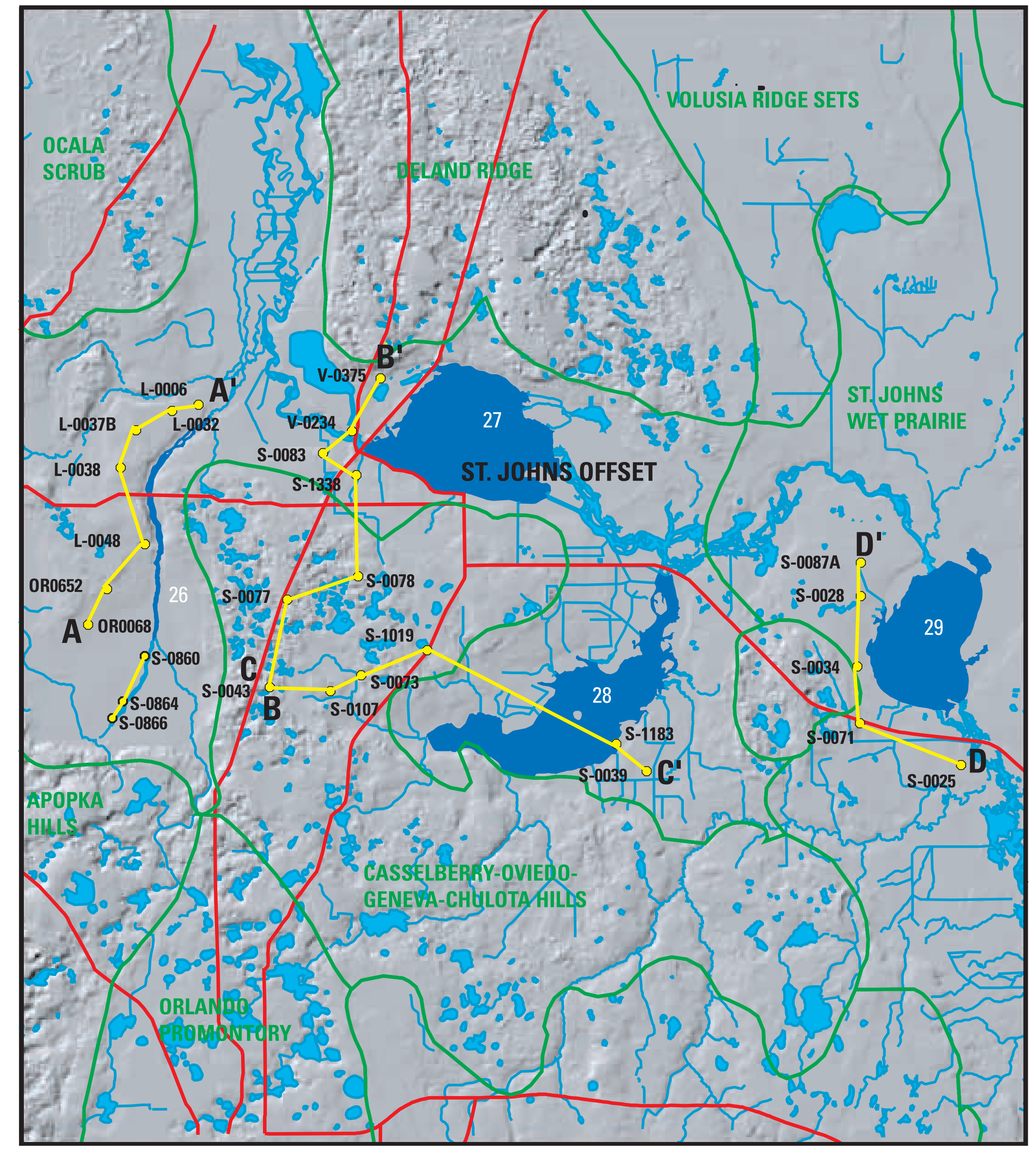


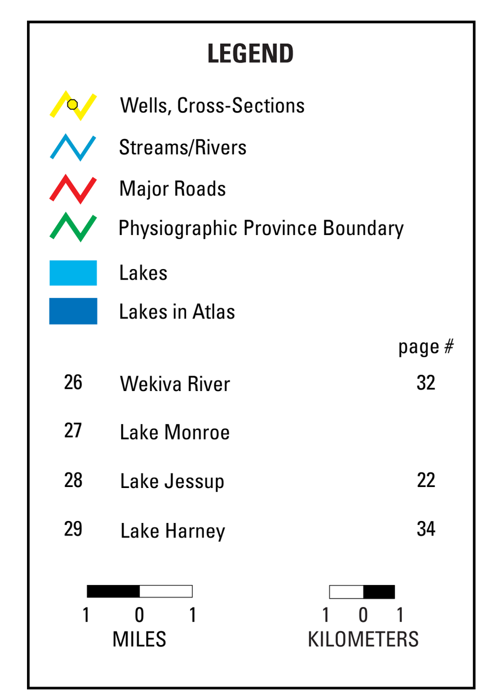






Location of survey area right (red square). Shaded relief map below showing physiographic regions, and location of wells and gamma log cross-section. Gamma Log cross-sections (left) show geologic contacts for correlation to seismic sections.

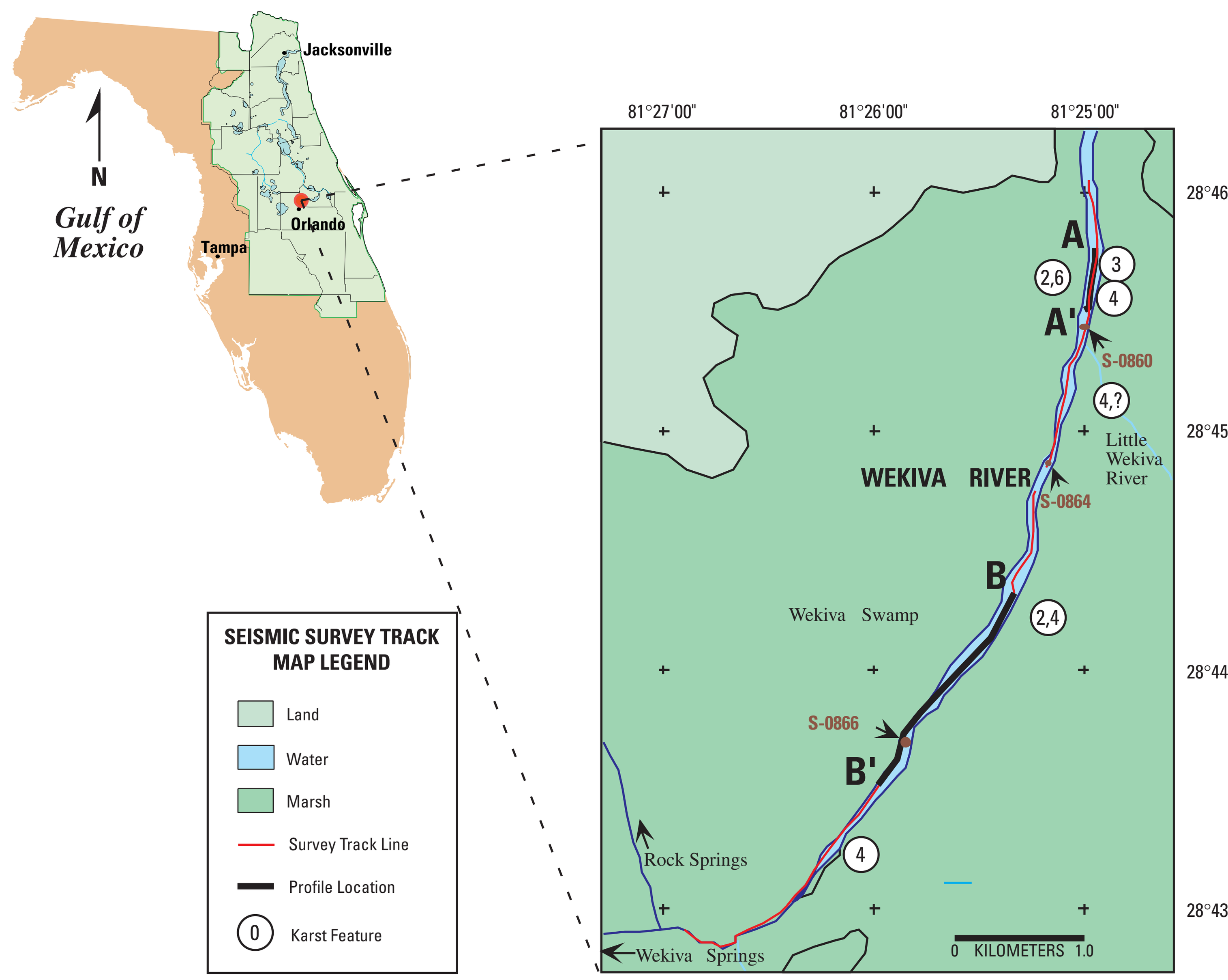




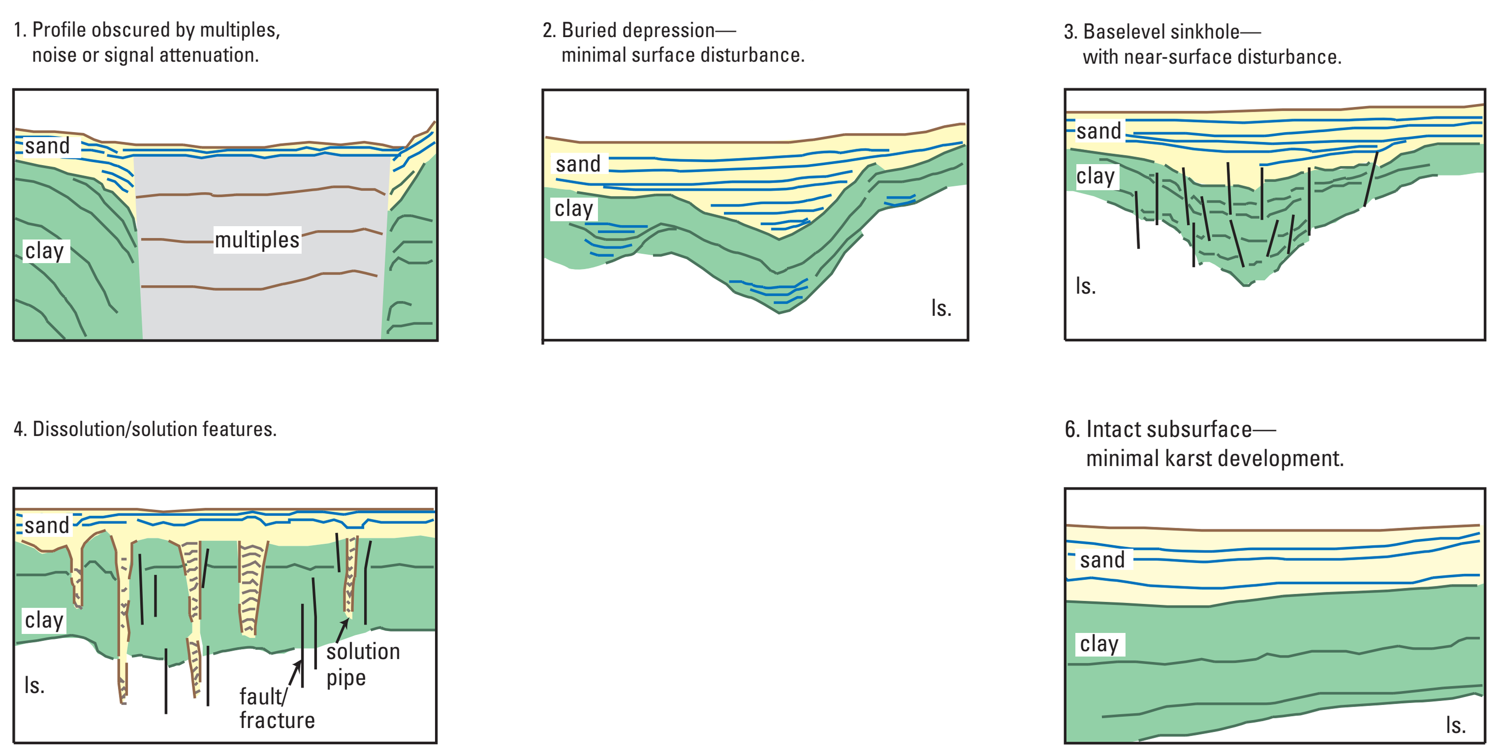
E

WEKIVA RIVER

SEMINOLE COUNTY, FLORIDA



EXPLANATION



Introduction

The Wekiva River is a northward flowing (exotic) river defining the Seminole/Orange/Lake county lines. The river occupies the solution valley of the St. Johns Offset (see Index Map Section E, p. 31) within the Central Lakes District (Brooks and Merrit, 1981; Merrit, 1981). Wekiva River drains the lowlands of the Offset, but is sourced by the high magnitude discharge springs located along the Apopka Upland to the south. Rock Spring, Wekiva Spring and Spring Lake source the Wekiva and Little Wekiva Rivers. The river flows through the Wekiva Swamp, incises an unnamed highland which supports a highway and the town of Wekiva and empties into the St. Johns River at the Seminole-Volusia border enhanced the broad valley through which the Wekiva, St. Johns and Oklawaha Rivers flow. The flood plain is near sea level, as well as the potentiometric surface of the Floridan aquifer. The area is characterized by numerous lakes which are at or slightly above the potentiometric surface of the Floridan aquifer. Surficial drainage is internal and water is stored in the surficial aquifer within thick sands and gravels that comprise the near surface in the area. During recharge and discharge conditions, breaches through the underlying sandy clays of the Hawthorn Group may provide a direct hydrologic connection with the Floridan aquifer.

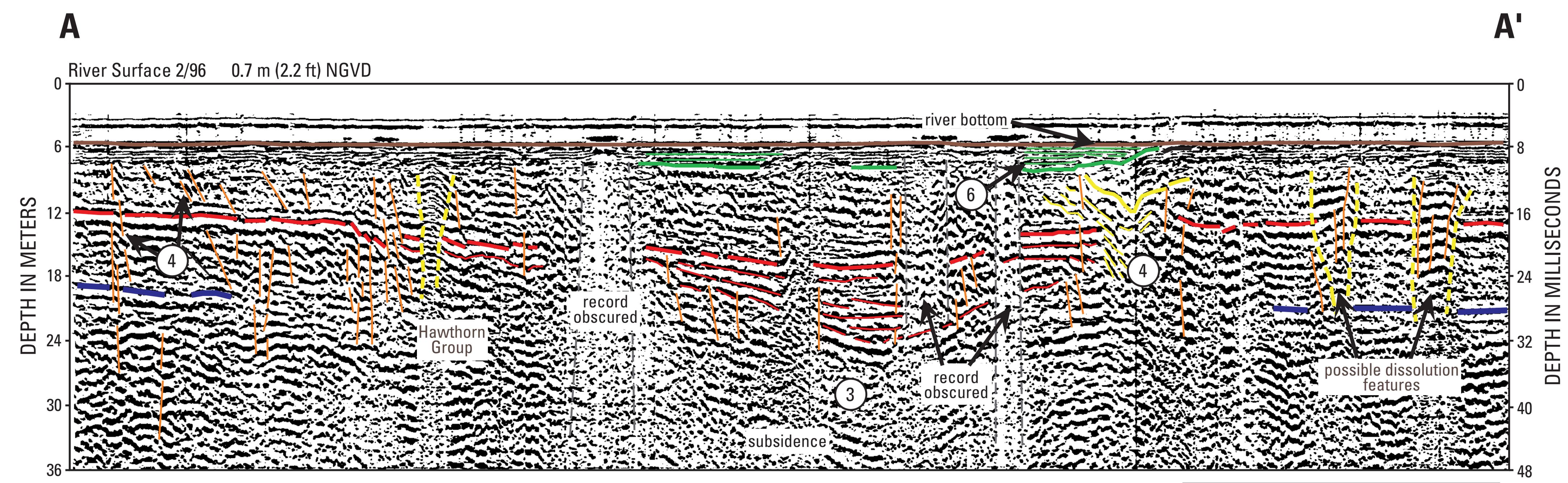
Subsurface Characterization

As often encountered during surveys of rivers in this area, the data quality is generally poor. The common problem is the rivers are shallow and acoustic echoes from the river banks add to noise in the signal which obscure any subsurface features. Profiles A-A' and B-B' are two examples where some subsurface features can be seen. Profile A-A' shows a subsurface depression at depth that has been filled, similar to a type 3 karst feature. Throughout the profile several type 4 dissolution features appear to be present. Horizontal reflectors at the nearsurface (green lines) may represent more recent fill. Profile B-B' exhibits a persistent reflector (blue line) throughout the profile that may represent a horizon within the Hawthorn Group or the contact between the Group and overlying undifferentiated sands and clays. The left side of the profile shows an area of disturbance in the subsurface, where type 4 dissolution features may be present. These features are characterized as distinct parallel and sub-parallel reflectors with a higher amplitude than the surrounding material and may represent filled solution pipes. It appears that some subsidence has occurred with subsequent fill to the present day river bottom, however, the discontinuities at depth do not reach the present day river bottom and may not affect the more recent fill.

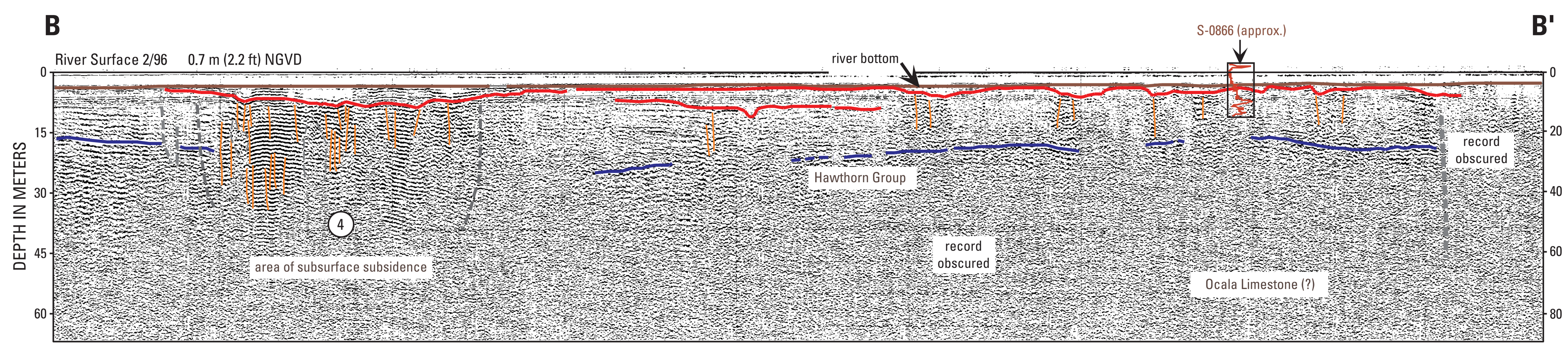
The natural gamma log cross section A-A' shown on the Index Map Section E shows the elevation of the top of the Ocala Limestone in wells OR0652 (-40 m [-130 ft] NGVD) and L-0037B (-43 m [-140 ft] NGVD), below resolvable depth in the seismic records. The areas of disturbance seen in the profiles may represent areas of subsidence within the Hawthorn Group as it accommodates dissolution in the underlying limestone. The gamma log cross sections show how variable the sand and clay units within the Hawthorn Group and overlying undifferentiated sediments are. Peaks in the gamma logs are not laterally continuous and the thickness varies considerably.

An additional cross section comes from three wells drilled on the small islands in the Wekiva River (gamma log profile E-E', Index Map Section E, p. 31). Again, the variability within the post-Tertiary units is apparent, note the high peak in well S-0866 at 3 m (9 ft) NGVD. One mile north in well S-0864, this peak is completely missing as are all of the other clay rich beds in S-0866. The log for S-0864 shows 17 m (55 ft) of clean material, probably sand, below which is a clay unit that may correlate with the blue line in profile B-B' and represent the top of the Hawthorn Group. The gamma peaks in well S-0866 show that the Hawthorn Group may extend to about -6 m (-20 ft) to -8 m (-25 ft) NGVD. These logs probably do not represent the total drilled depth of the wells since they do not penetrate the Ocala Limestone, yet surface flow and water quality are indicative of the Floridan aquifer. Depth to the Ocala is inferred to be at about -32 m (-105 ft) NGVD (~44 milliseconds), beyond the resolvable depth in the seismic profiles in this area.

E



Vertical Exaggeration 7:1 Not corrected for velocity variations. Horizons are colored to show structure, not correlation.



Vertical Exaggeration 5:1 Not corrected for velocity variations. Horizons are colored to show structure, not correlation.

Subsurface Characterizations of Selected Water Bodies in the St. Johns River Water Management District, Northeast Florida

Jack L. Kindinger[1], Jeffrey B. Davis[2], and James G. Flocks[1]
2000

[1] Center for Coastal Geology and Regional Marine Studies
U.S. Geological Survey
St.. Petersburg, Florida 33701

[2] St. Johns River Water Management District
Palatka, Florida 32178

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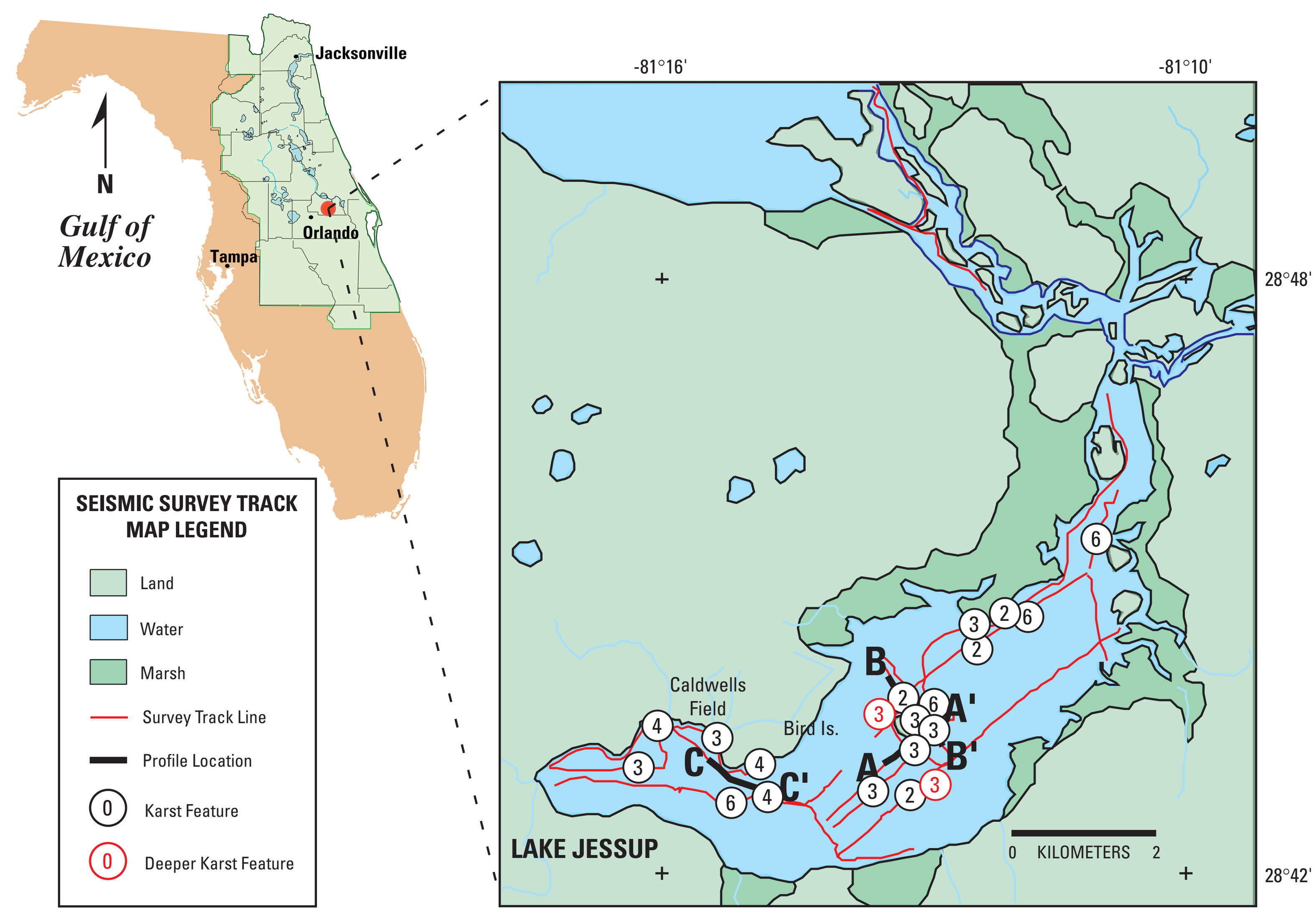
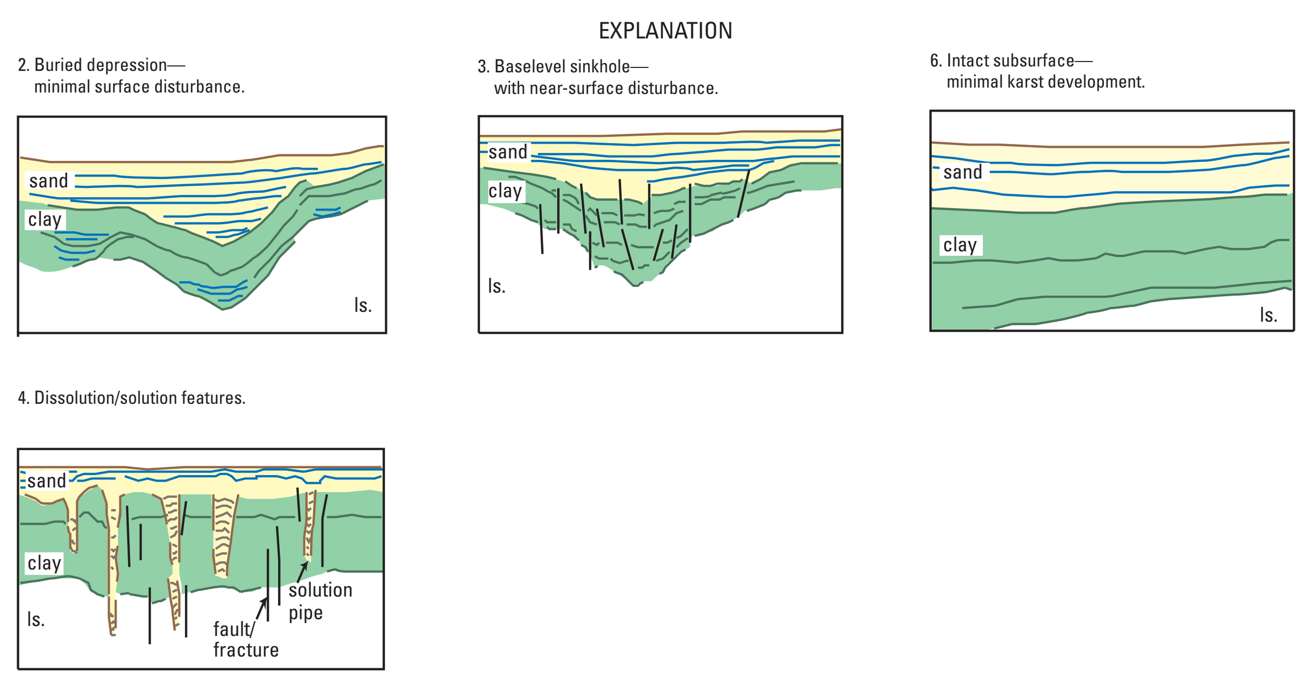
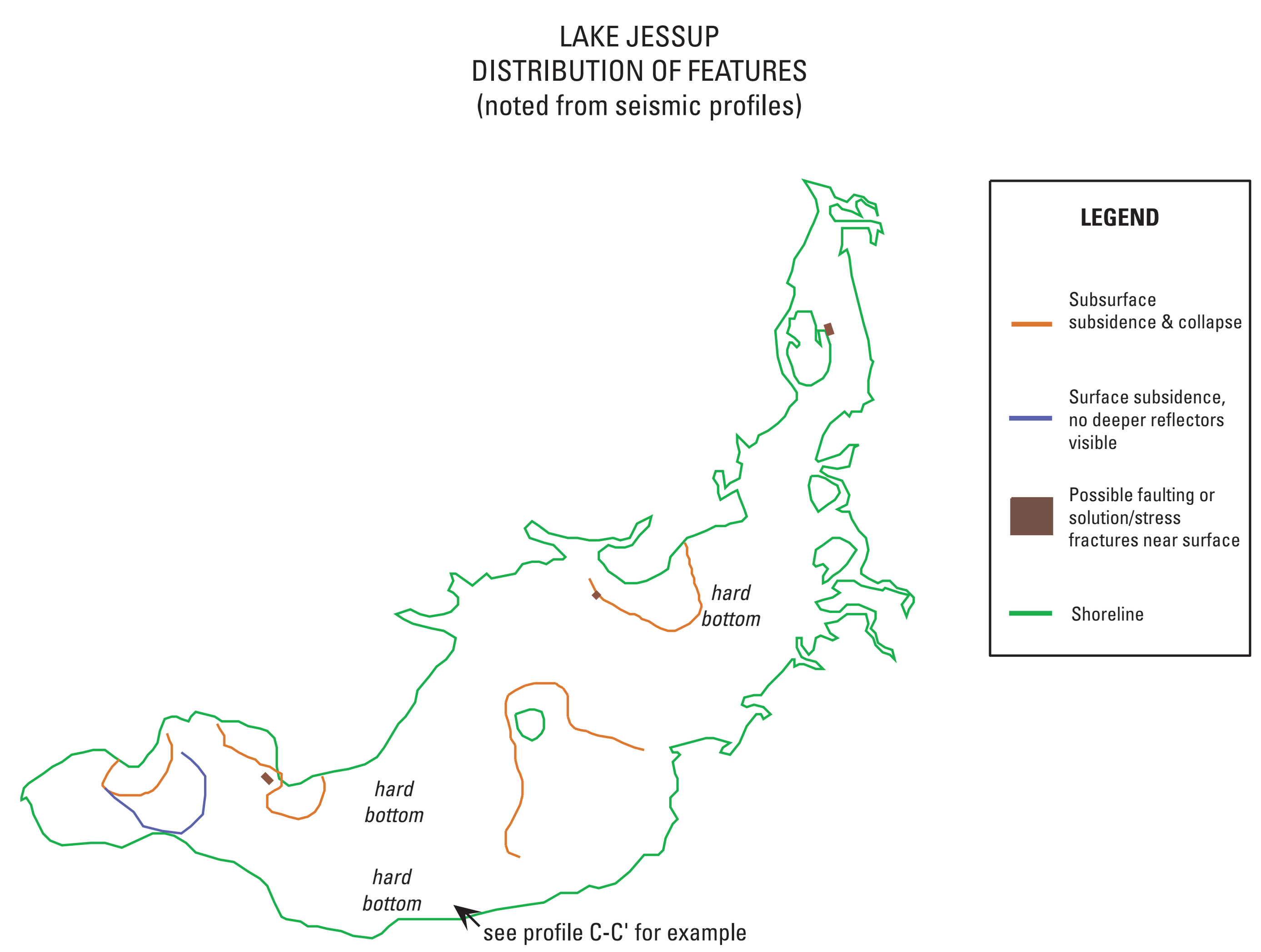






LAKE JESSUP
SEMINOLE COUNTY, FLORIDA

Introduction

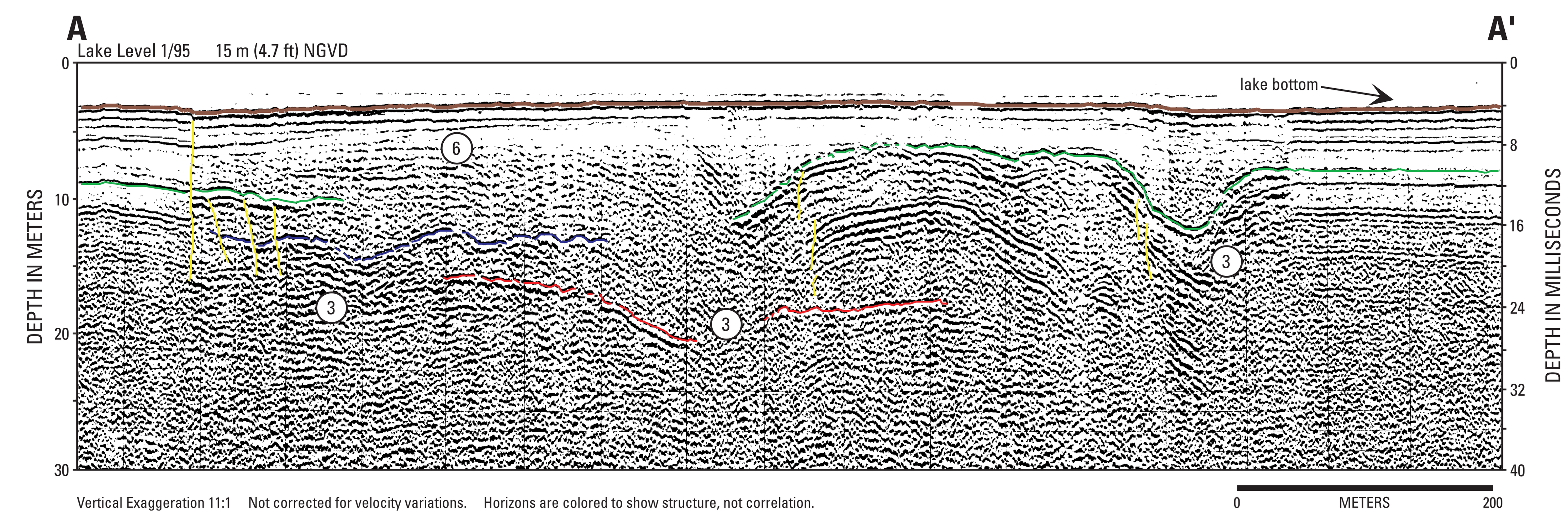
Lake Jessup joins the St. Johns River system between Lakes Harney and Monroe, in Seminole county. The lake occupies the broad solution valley of the St. Johns Offset (Books, 1981). Lake elevation at the time of the seismic survey was about 1.4 m (4.7 ft) NGVD. Lake Jessup is irregular in shape, covering about 40 sq km with about 65 km (40 mi) of shoreline. The irregular shoreline of Lake Jessup exemplifies the differences between lakes which occupy dissolution and incised valleys with those that are a single subsidence type lake such as Kingsley Lake (page 9). Low-lying marshland of the solution valley surround much of the lake to the north and east, with higher ground approaching from the south.

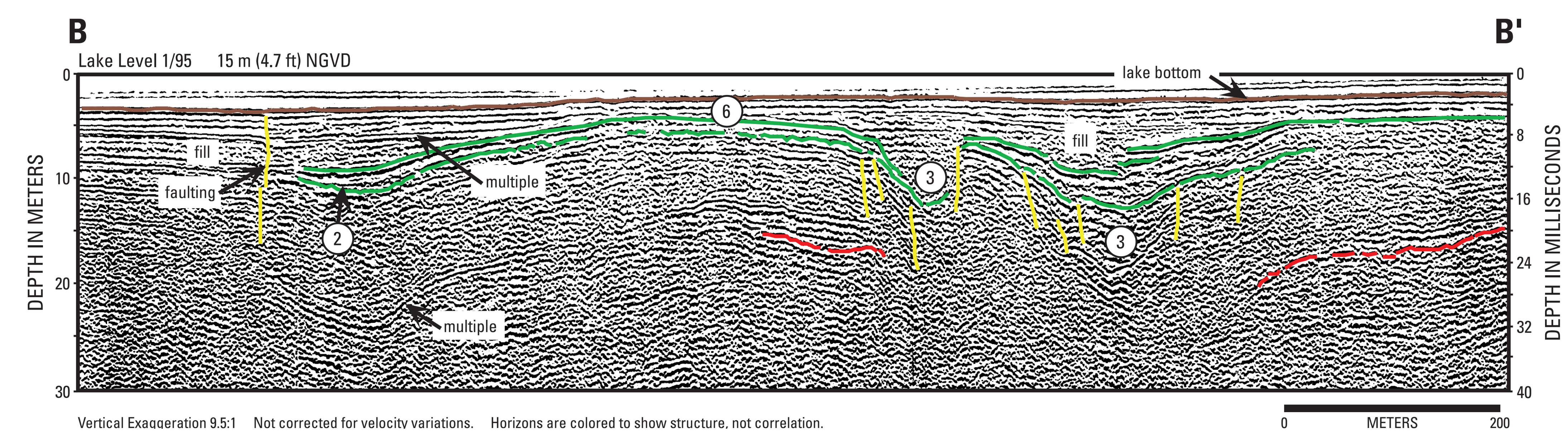
Subsurface Characterization

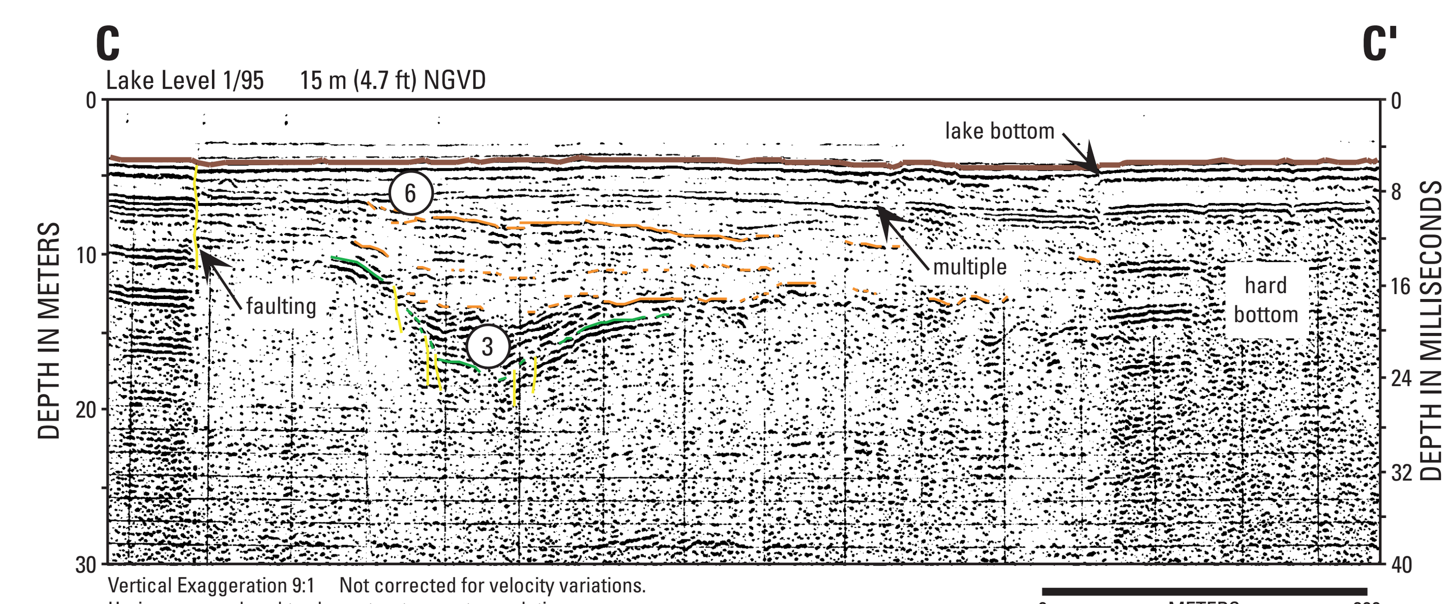
Seismic profiles from Lake Jessup show a high occurrence of subsidence. Areas of subsurface discontinuities predominate in two areas of the lake, around Caldwells Field and Bird Island (see index map). The area around Bird Island shows subsidence extending deep into the subsurface (Profiles A-A' and B-B'), with a discontinuous strong reflector at about 16 m (52.5 ft, red). Gamma logs indicate the top of the Ocala Limestone to be at about 24 m (79 ft) below mean sea level, in close approximation to this reflector. Collapse in the Ocala results in subsequent subsidence in the shallower sediments, shown by the green reflectors in example profiles. These sediments are the competent sands and clays of the Hawthorn Group. Accommodation-related stress fractures and slumping are also apparent around the areas of subsidence. Low-angle to horizontal reflectors within the depressions (B-B'), along with a chaotic signal (A-A'), indicate differing processes of fill; with modes of transport ranging from fluvial to gravity (collapse) driven. The subsurface structure may be responsible for the presence and location of Bird Island. Profiles A-A' and B-B' show a structural high in the lake bottom created by adjacent areas of subsidence. This rise is translated to the surface where island development could have become pinned to this topographic high.

The area around Caldwells Field shows similar subsidence in the shallow subsurface, but collapse in the deeper reflector is not as apparent (Profile C-C'). The distribution of features map shows the area where surface subsidence in this area occurs. The thickness of the overlying fill appears to be greater and is comprised predominantly of low-angle reflectors. The fill appears to be more extensive than the underlying subsidence and is perhaps associated with the deeper areas of subsidence toward the central part of the lake.

E







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2000

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[2] St. Johns River Water Management District
Palatka, Florida 32178

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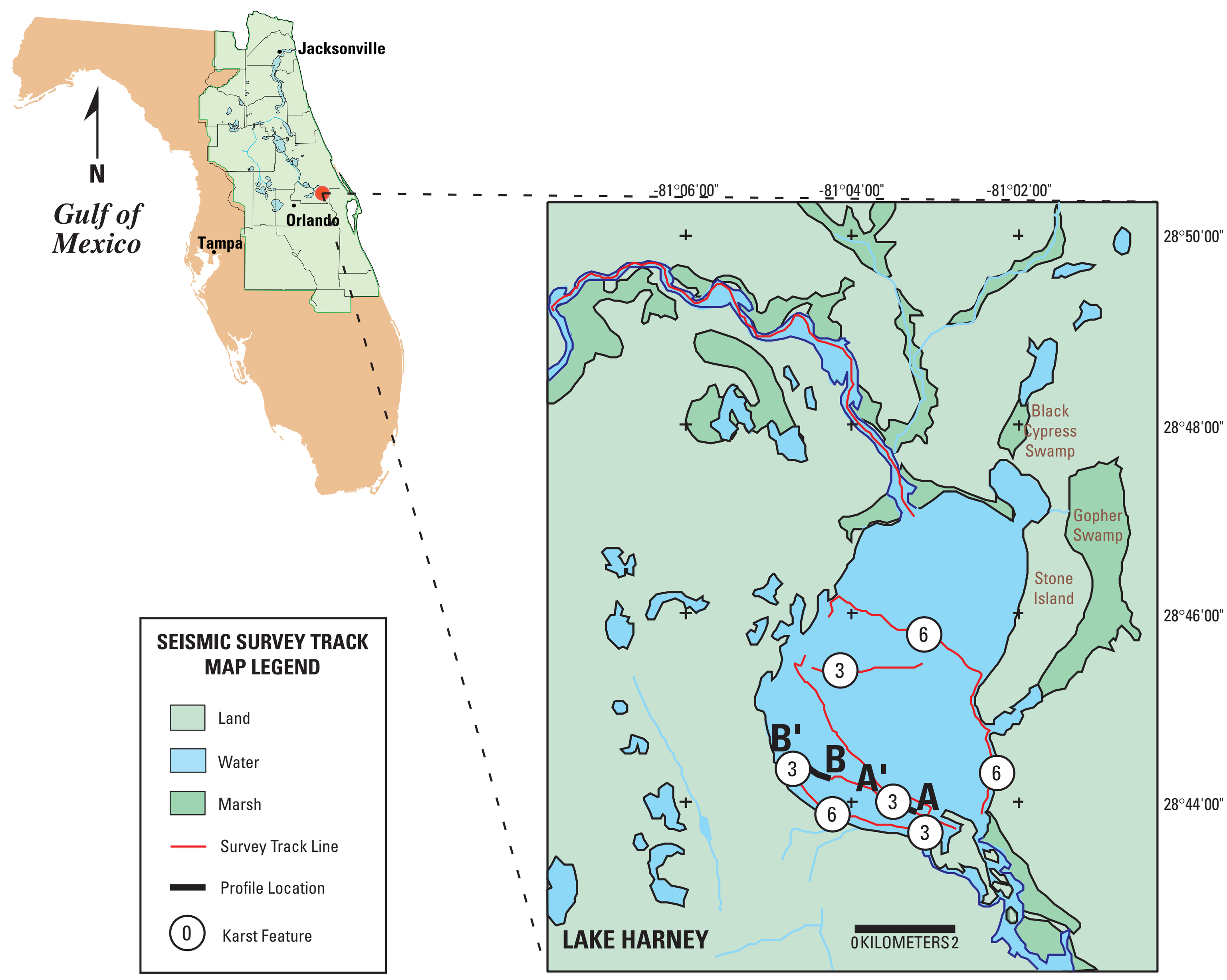
LAKE HARNEY
VOLUSIA/SEMINOLE COUNTY, FLORIDA



Introduction

Lake Harney straddles the Volusia-Seminole county line along the St. Johns River. The lake is part of the St. Johns Wet Prairie of the Eastern Flatwoods District (Brooks and Merrit, 1981). The series of lakes along the St. Johns River in this area occupy valleys previously incised by Late Pleistocene fluvial-lagoonal processes. The area is low-lying and predominantly marshland. Lake elevation at the time of the seismic survey was ~1.8 m (6 ft) NGVD. Gopher Swamp appends to the east, separated from the lake by Stone Island. Black Cypress Swamp is connected to the lake via Underhill Slough to the northeast. The St. Johns River enters Lake Harney from the south and flows out to the north. Lake Harney is roughly oval in shape, with 20 km (12 mi) of shoreline and a surface area of about 24 sq km.

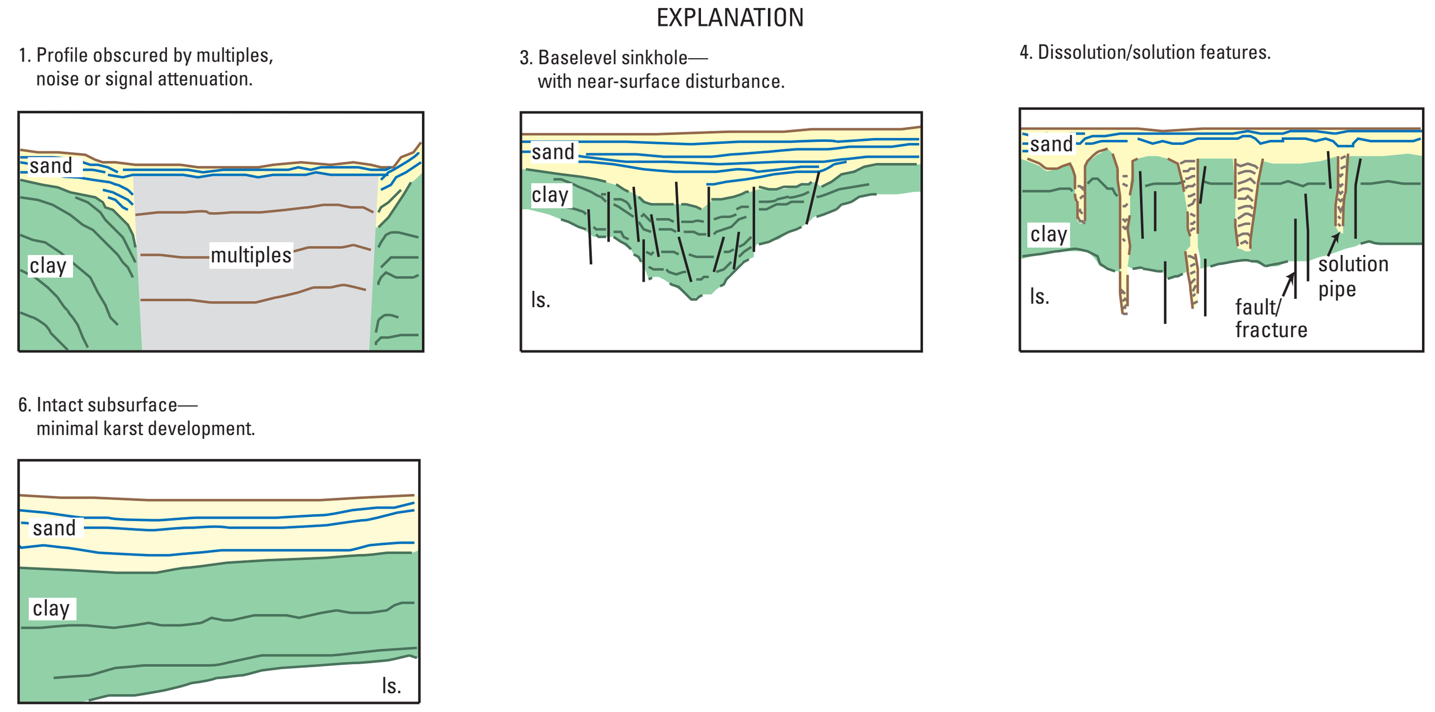
Subsurface Characterization

Seismic profiles from Lake Harney show a good example of subsurface karst imaging (profile A-A', B-B'). Profile A-A' shows a deep reflective surface (red line) with apparent subsidence. This feature is similar to a type 3 feature described in the explanation. This subsidence influences the integrity of the overlying strata, as shown in subsequent collapse across another reflective surface (blue line). Profile B-B' shows another deep collapse structure (red line). Within this subsidence, horizontal reflectors onlap the steeper sides of the structure. This may represent fluvial or aeolian infilling of the depression. This type of infilling may have also occurred in the shallower depression shown in Profile A-A', as evidenced by the patterned texture of the acoustic signal from the overlying material. This pattern could represent foresets or cross-bedding, as opposed to collapse-type infilling, which typically returns a noisier or chaotic signal. Comparison of the deeper subsidence structures between profiles A-A' and B-B' may provide insight into the timing relationships between collapse in the host rock and subsidence in the overburden. The deeper structure in profile A-A' does not appear to have the infilling seen in the B-B' subsidence. Also, the overburden in profile A-A' appears to be more disrupted than that overlying the subsidence in profile B-B'. The infilling might indicate that the deeper subsidence seen in profile B-B' may be a relic sinkhole that was aerially exposed and filled prior to accumulation of the overburden. The structure in profile A-A' represents a continued subsidence, controlled by the deeper featured. The disruption in the overburden in A-A' further supports continued subsidence, whereas the overburden in profile
B-B' appears to be undisturbed.

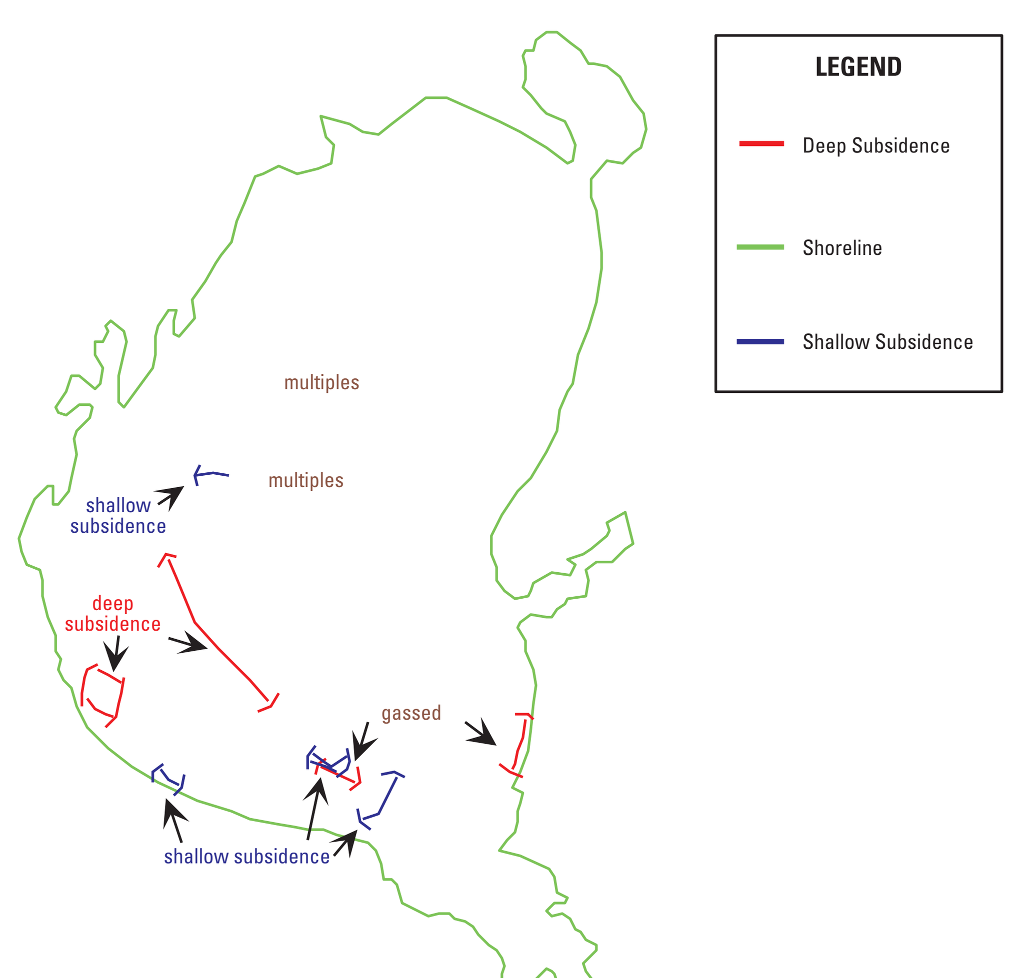
Gamma logs to the west of Lake Harney show the top of the Ocala Limestone at about 12 m below mean sea level along the southern portion of the lake (see Index Map E, p. 31). This depth correlates well with the red reflectors seen in the profiles. The deep structures may represent collapse in the Ocala. Likewise, the blue reflectors in the profiles may represent material in the Hawthorn Group. High angle reflectors (orange and gold) may represent stress in the overburden and indicate breaches through the otherwise impermeable Hawthorn sediments.

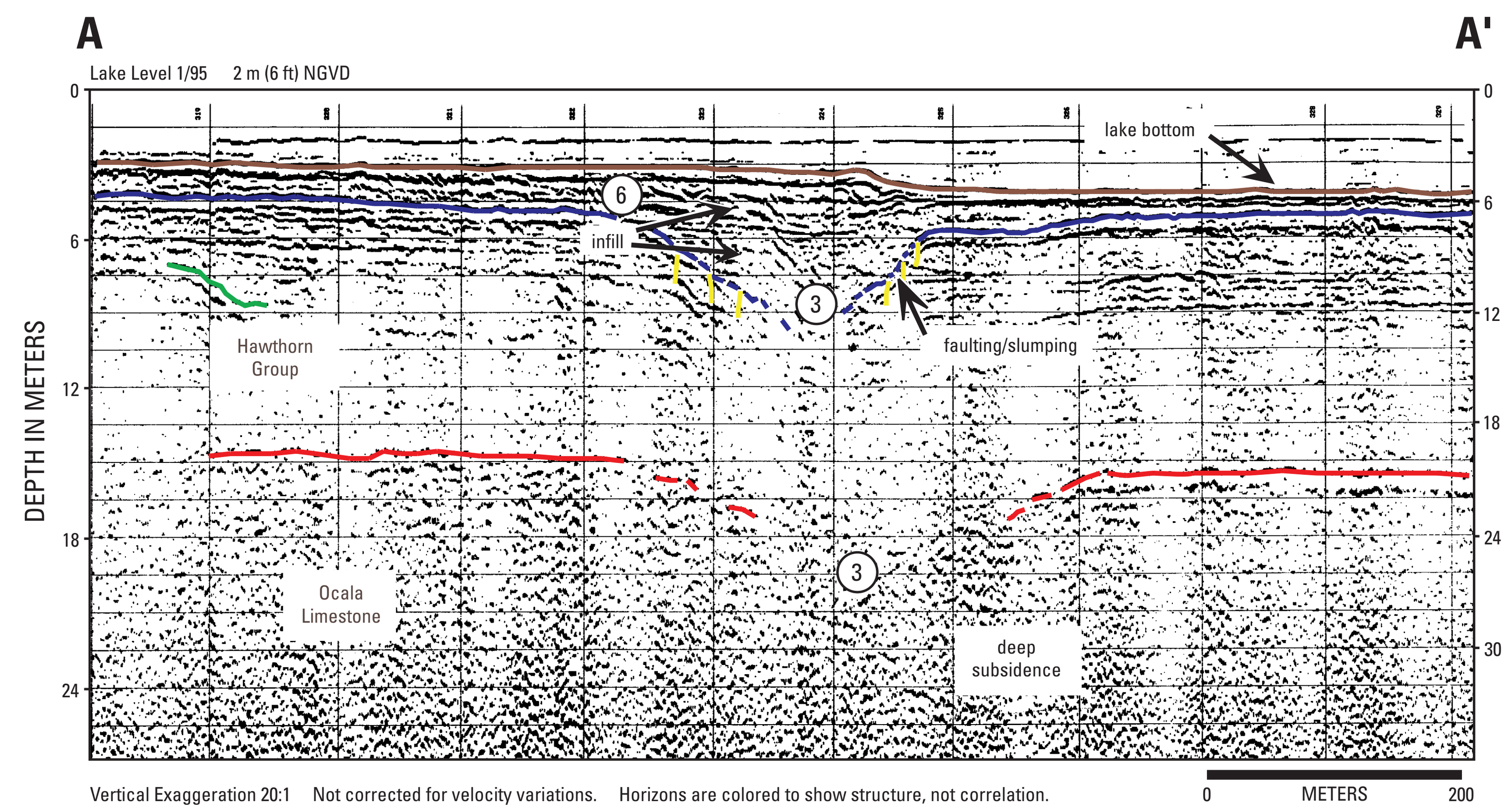
E

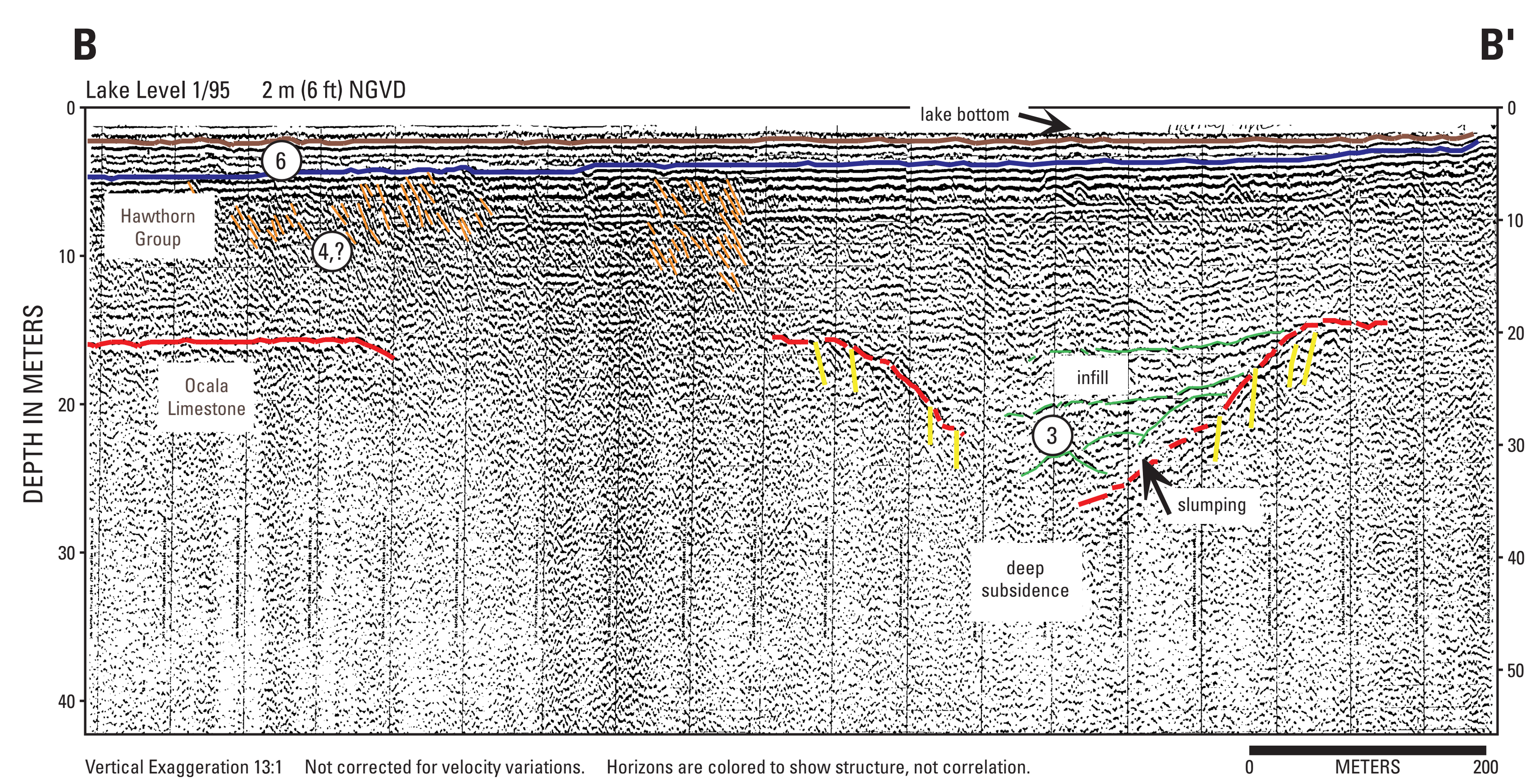
EXPLANATION



LAKE HARNEY
DISTRIBUTION OF FEATURES
(noted from seismic profiles)







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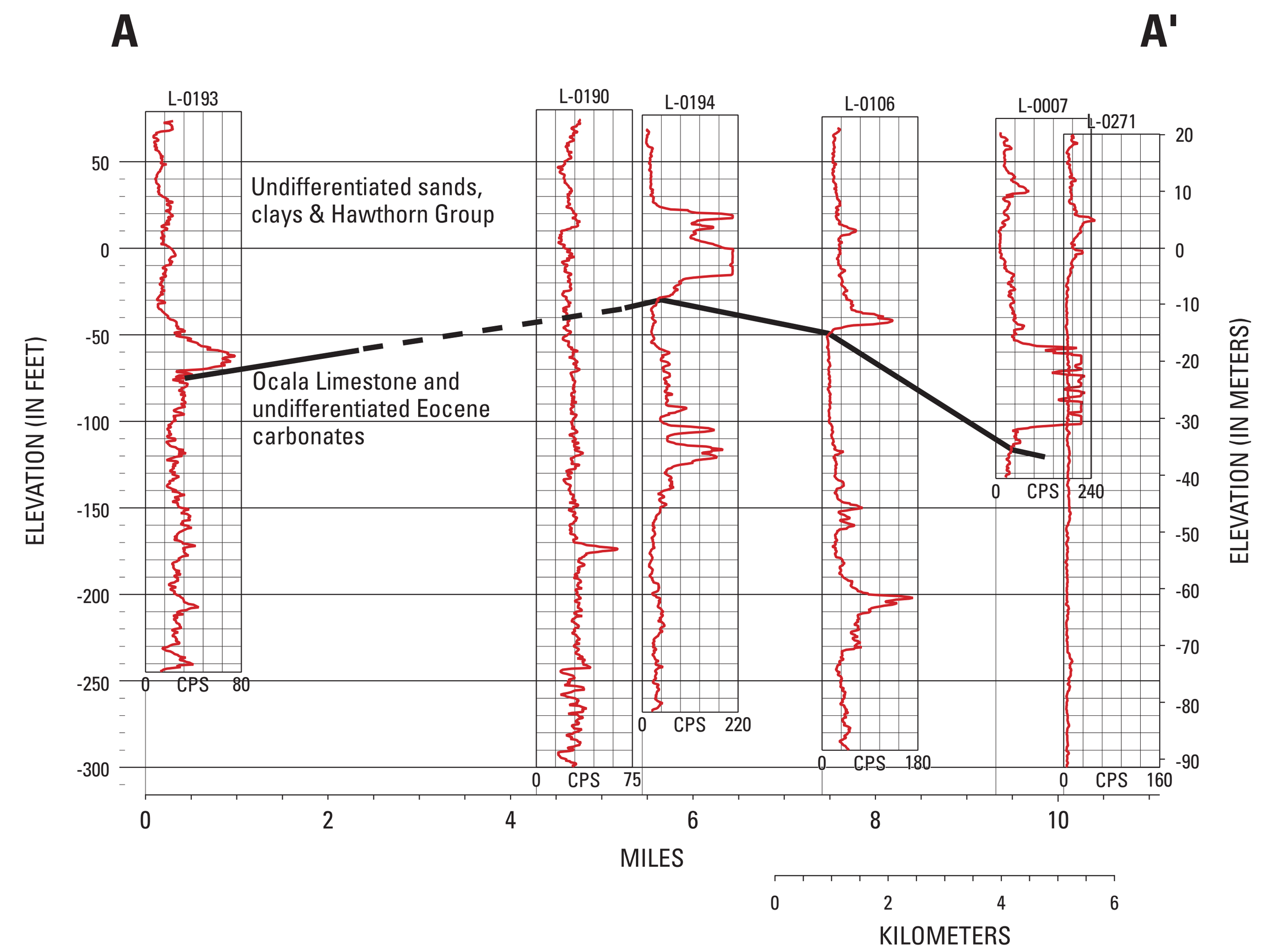
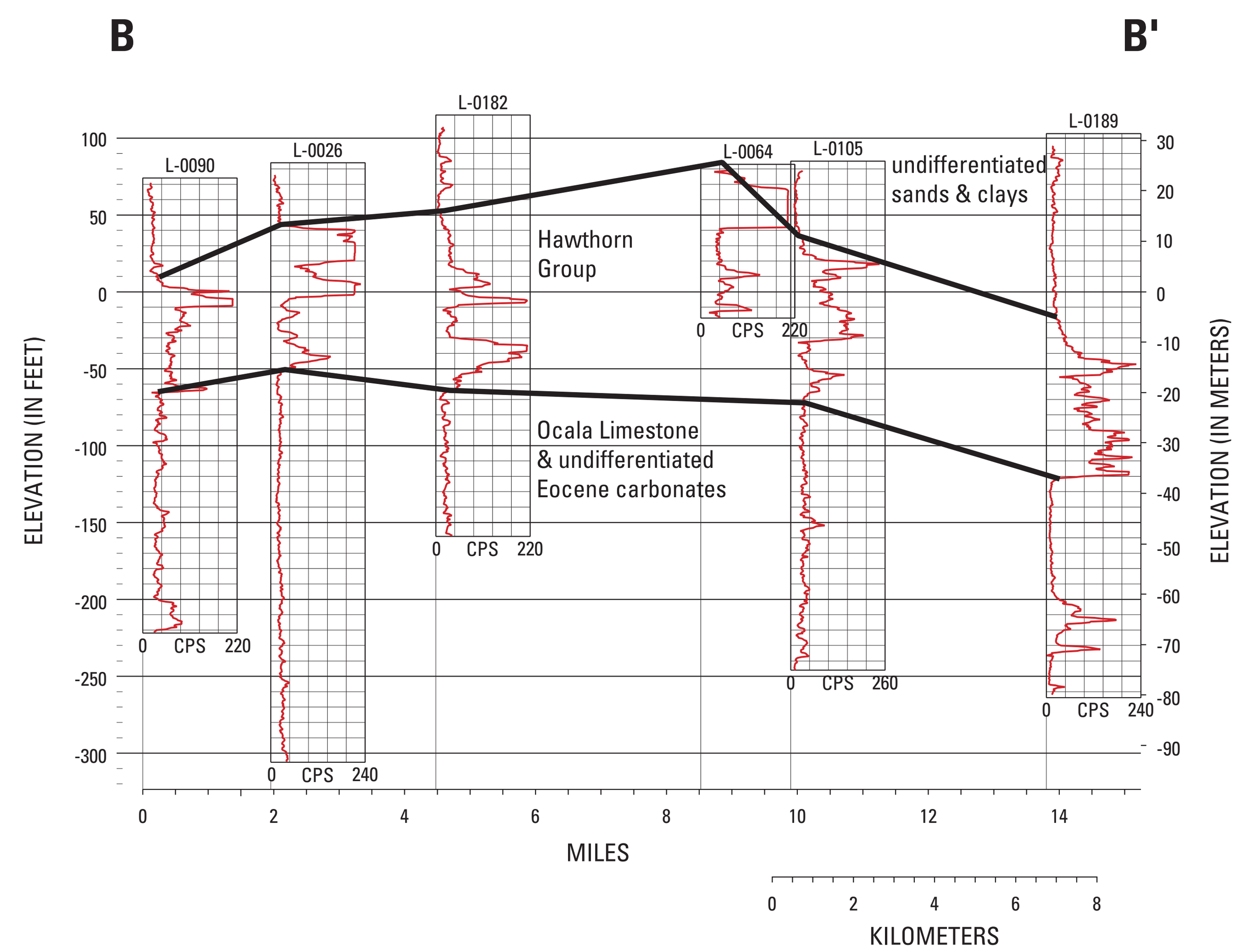
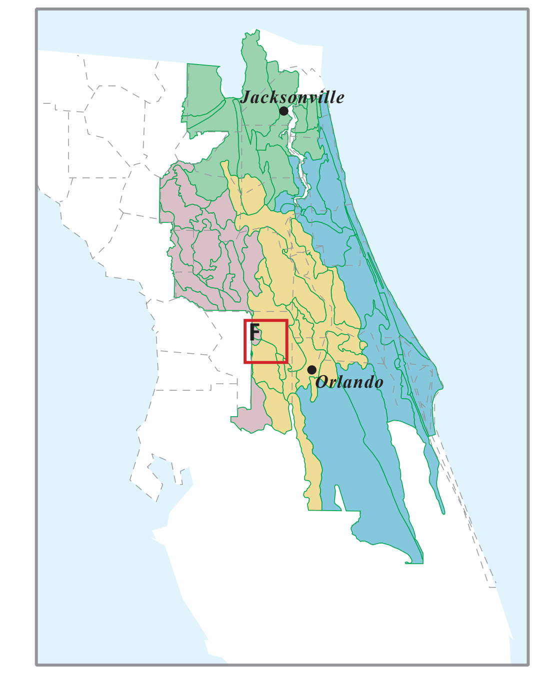
INDEX MAP AND GAMMA LOG

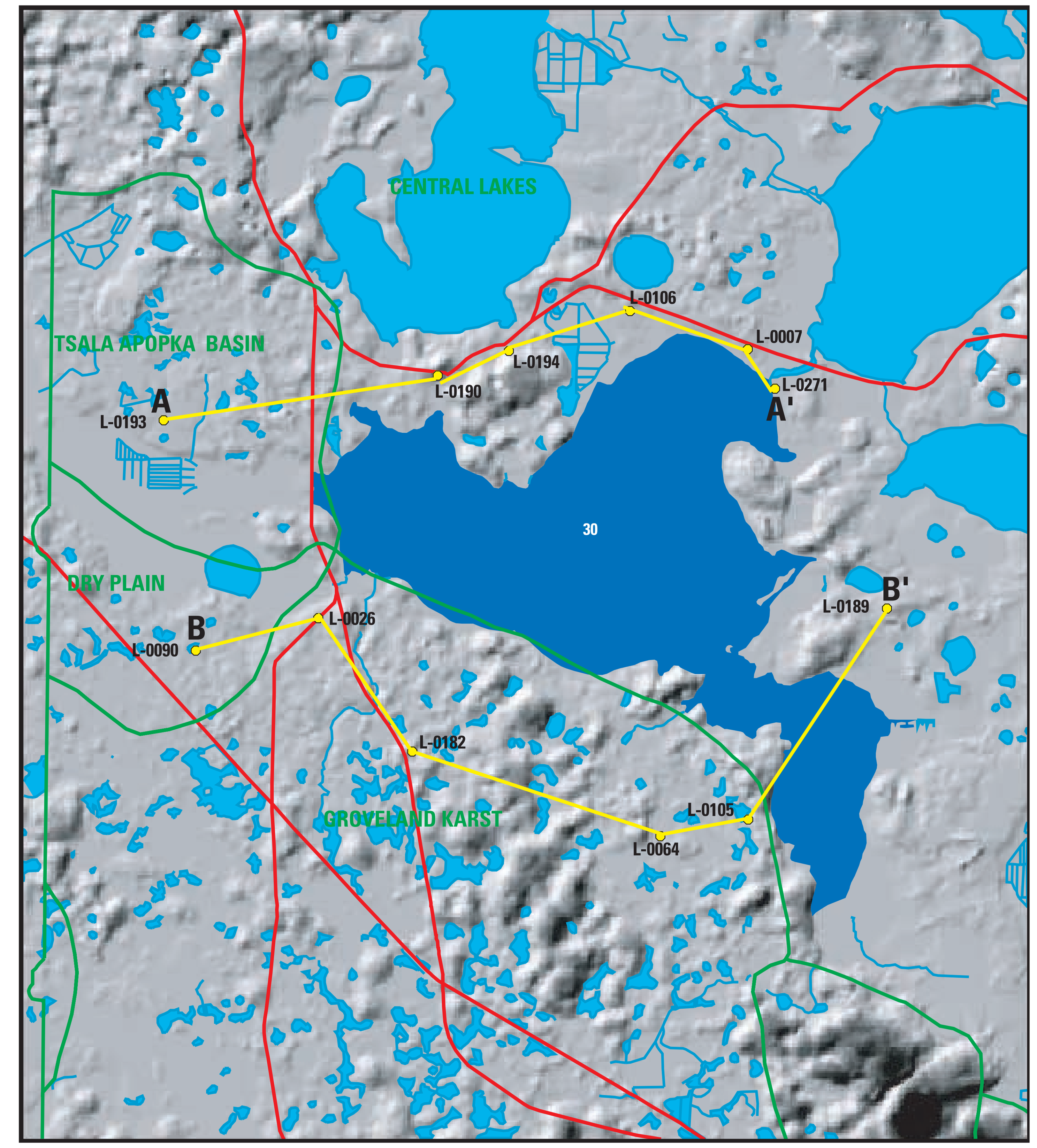
CROSS-SECTIONS, SECTION F

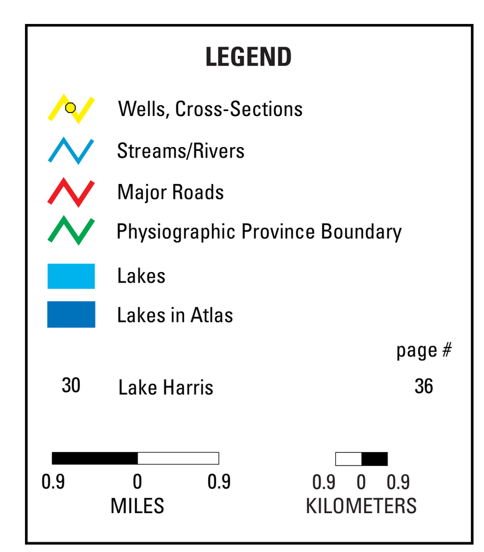






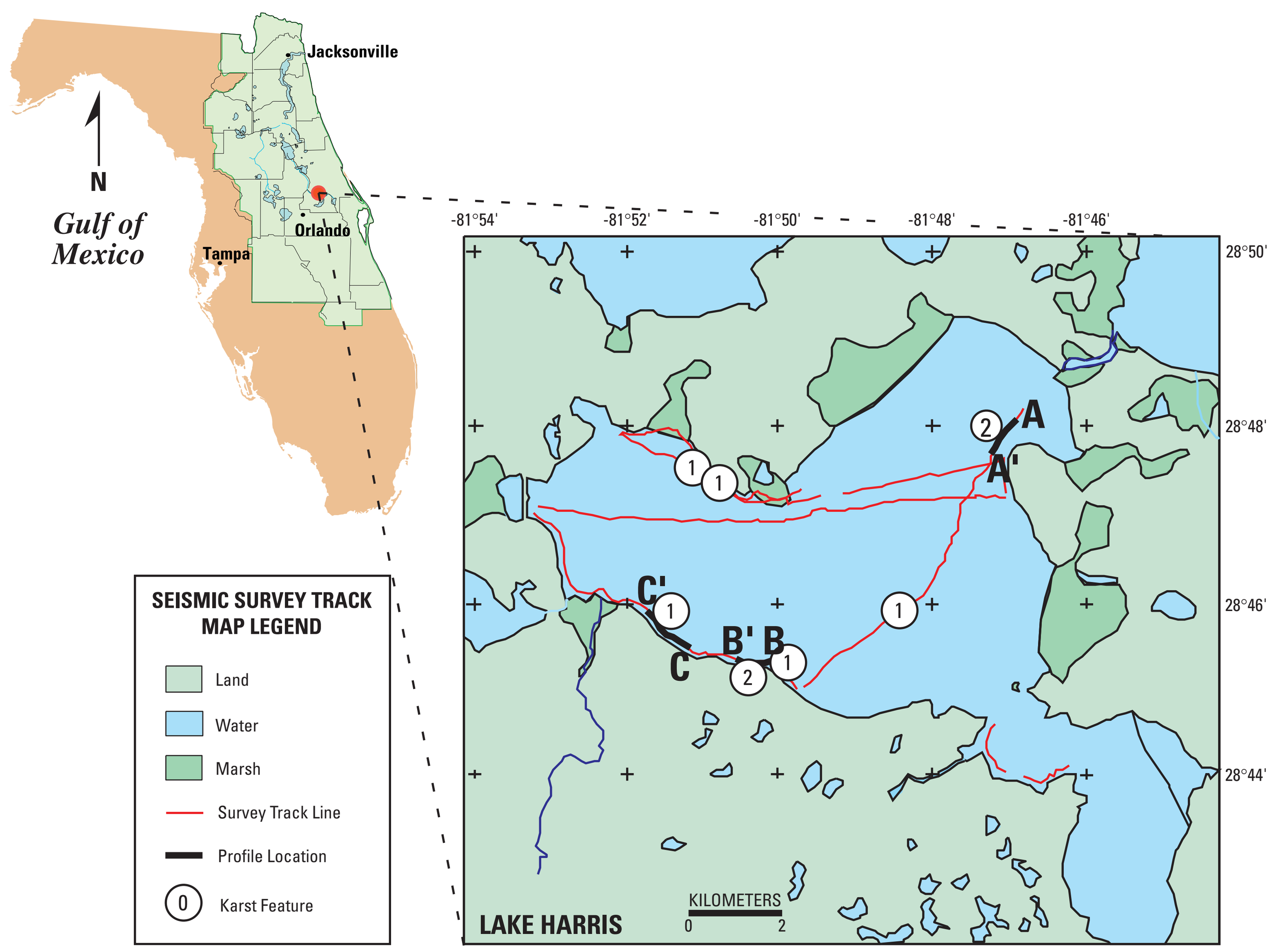
Location of survey area right (red square). Shaded relief map below showing physiographic regions, and location of wells and gamma log cross-section. Gamma Log cross-sections (left) show geologic contacts for correlation to seismic sections.





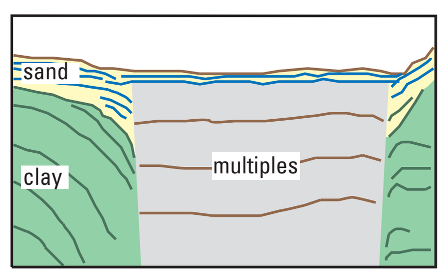
F

LAKE HARRIS
LAKE COUNTY, FLORIDA

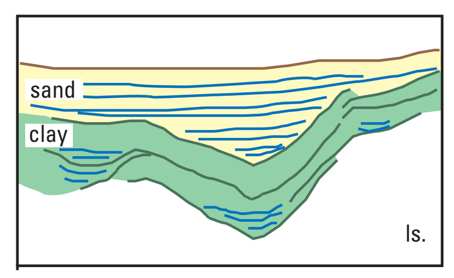


EXPLANATION

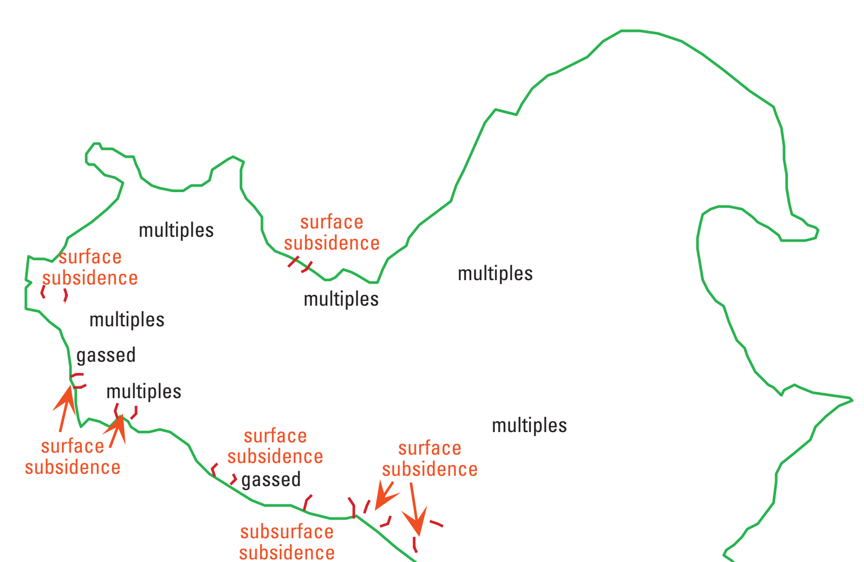
1. Profile obscured by multiples, noise or signal attenuation.



2. Buried depression—minimal surface disturbance.



LAKE HARNEY
DISTRIBUTION OF FEATURES
(noted from seismic profiles)



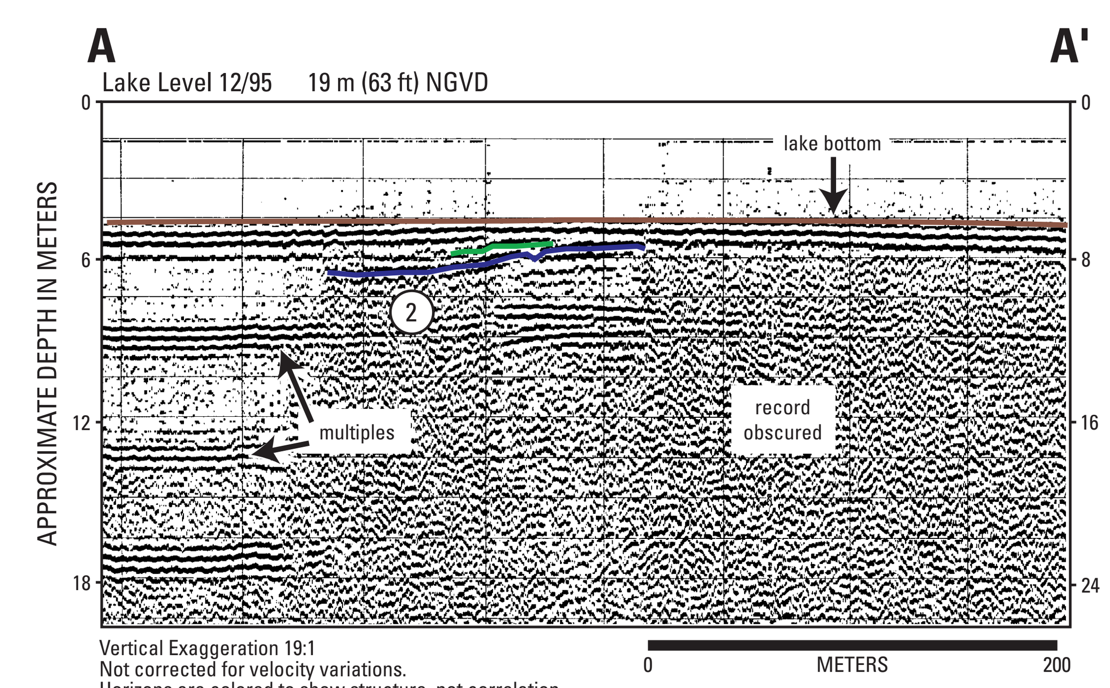
Introduction

Lake Harris is part of a chain of lakes that comprise the Central Lakes region of the Central Lakes District. The county name, Lake, further attests to the predominance of the water-table lakes in this area. The district is characterized as sand hill karst with solution basins (Brooks and Merrit, 1981). In this area the Hawthorn Group pinches out onto the Ocala Limestone. Lake Harris has an irregular shape, covering 73 sq km with about 62 km (38 mi) of shoreline. The lake narrows to Little Lake Harris to the south and Lake Denham to the west. Dead River joins the lake with Lake Eustis to the northeast. Sand hills with numerous small lakes within their interstices trend southeastward from the southern shore.

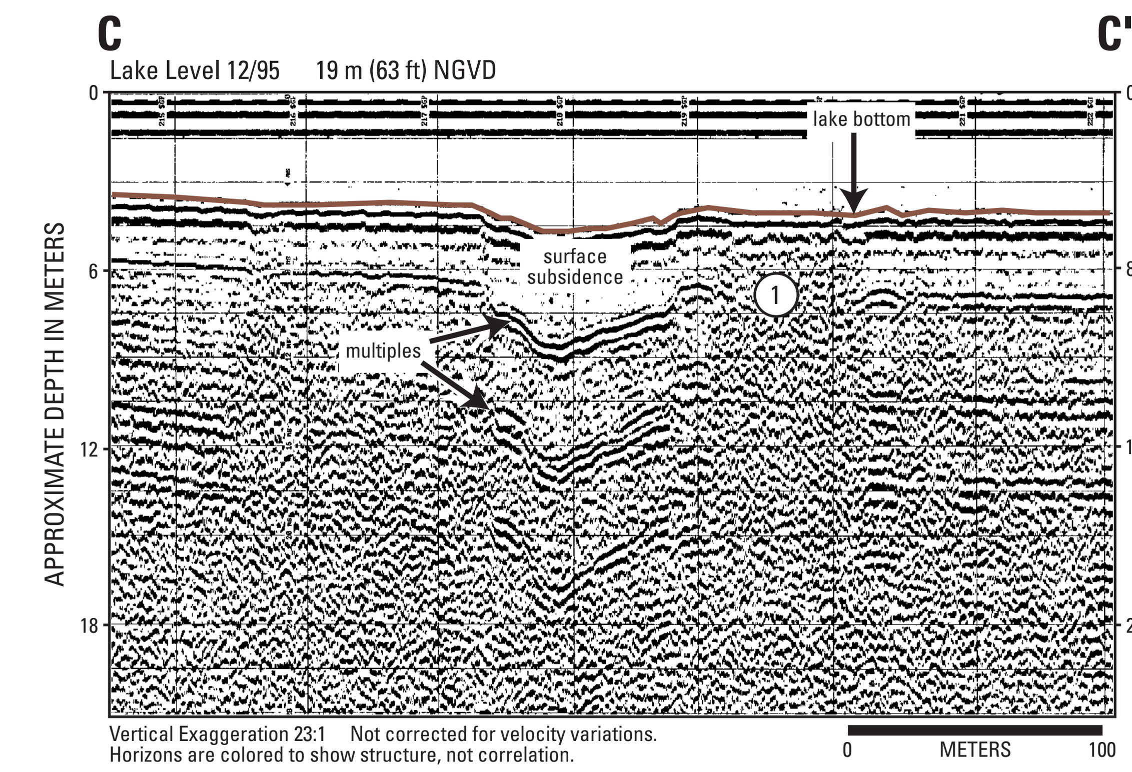
Subsurface Characterization

Multiples persist in the seismic profiles throughout the central portions of the lake. This is characteristic in lakes where the bottom sediments are hard sands or rock. Not enough data was collected to produce contours of subsurface features, additional data is necessary to provide adequate coverage. Scott (1988), estimates the top of the Hawthorn Group to be greater than 15 m (50 ft) above mean sea level in a nearby core. Lake level at the time of the survey was 19 m (63 ft) NGVD. This would suggest that the lakes that occupy the interstices of the sand hills in this area are floored within the Hawthorn Group, which contains phosphatic sands, limestone and dolomites. In two places the acoustic return is obscured by noise, or 'gassed out' (profile C-C'). This could indicate an accumulation of organic material in the bottom sediments which acts to disperse the signal. Profiles A-A' and B-B' show areas where a reflective horizon can be seen dipping away from the surface. Associated with this is a subsidence depression in the lake bottom. The feature resembles that of a type 2 feature, although little or no infilling is visible in the record. Another possibility is that the dipping horizon could represent a down-faulted or rotated block that has subsided into a large collapse structure at depth. However, multiples and noise obscure the record so that if any deeper, influencing structures are present they are not visible. Gamma logs indicate the top of the Hawthorn Group to be near the surface from seven meters depth to the west of the lake. The blue horizon from the seismic profiles may correlate with this contact (profiles A-A', B-B' and Index Map F, p. 35). Profile C-C' shows an example of small scale lake bottom subsidence within the lake that could be considered an active sink. No influencing features below the subsidence depression can be seen because of the persistent multiples, although dissolution within members of the Hawthorn Group is probably occurring. The subsidences are similar in size to the numerous small sinks visible to the south of the lake and trending to the northwest. It is possible that the lake bottom subsidences represent a lakeward extension of this karst trend.

F



Vertical Exaggeration 19:1
Not corrected for velocity variations.
Horizons are colored to show structure, not correlation.



Vertical Exaggeration 23:1 Not corrected for velocity variations.
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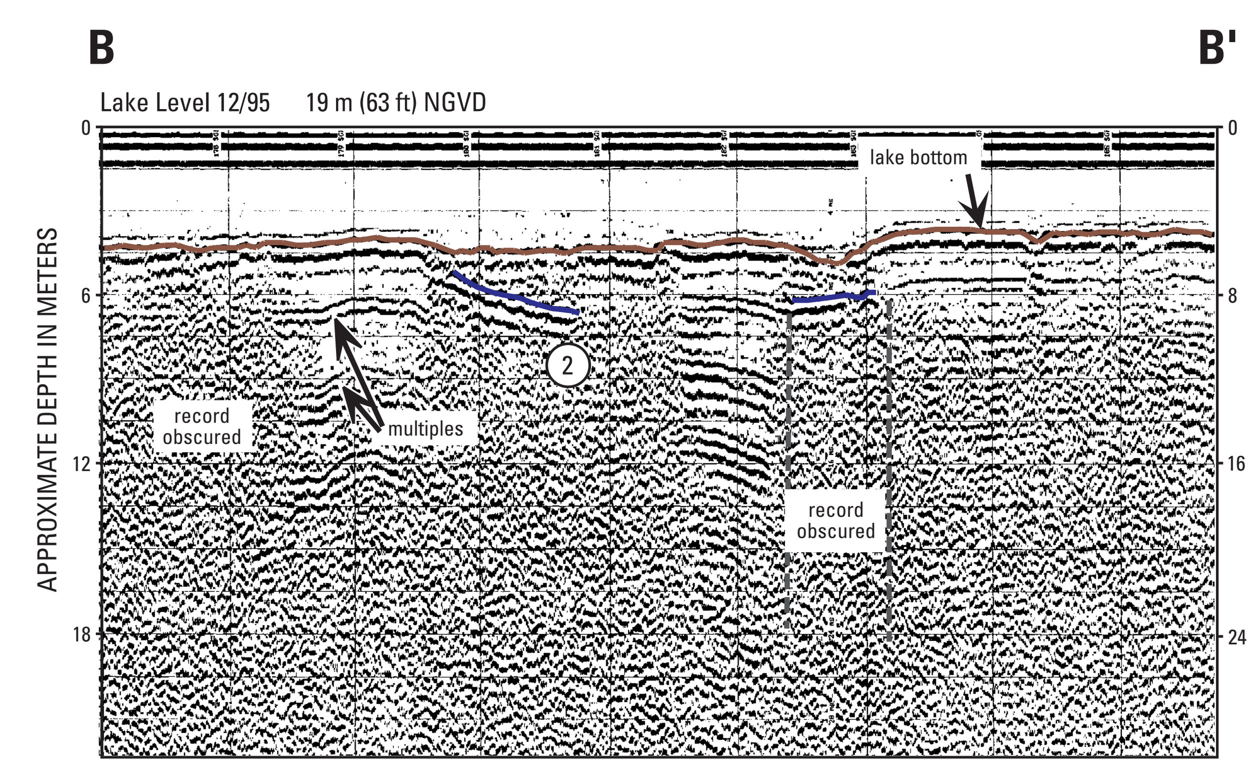

Vertical Exaggeration 10:1 Not corrected for velocity variations.
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