

## Upper Upper Miocene Progradational Play

### UM3 P1, #1161

#### *Cristellaria "K" and Robulus "E"/Bigenerina "A"*

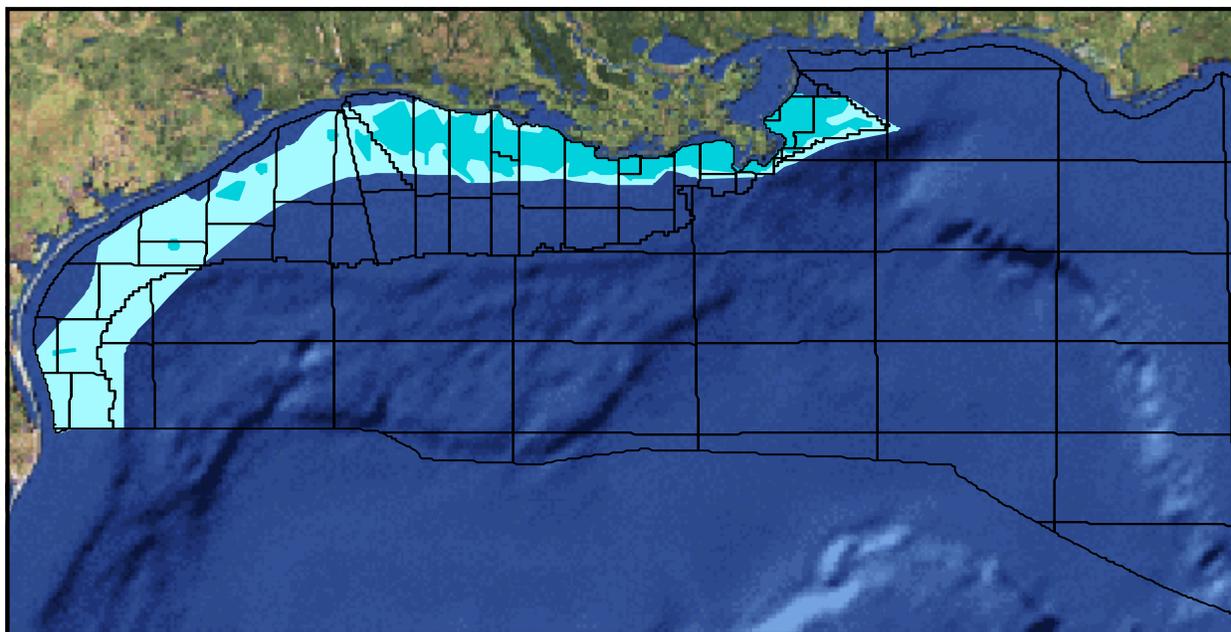


Figure 212. UM3 P1 map showing location of play. Play limit shown in light cyan; hydrocarbon limit shown in dark cyan.

## Overview

The Upper Upper Miocene Progradational Play (UM3 P1) contains the second largest amount of reserves of any GOM play (Figure 2), with 12,209.353 Bcfg and 2,421.294 MMbo (4,593.777 MMBOE) in 1,067 sands in 174 fields. Comparing all 65 GOM plays, UM3 P1 ranks first in oil reserves (16%) and third in gas reserves (7%). Additionally, comparing the 13 progradational plays, UM3 P1 ranks first in oil reserves (29%) and third in gas reserves (11%). The play extends continuously across the modern GOM shelf from the South Padre Island to Destin Dome Area (Figure 212).

## Description

UM3 P1 is defined by (1) a progradational depositional style representing major regressive episodes in which sediments outbuild onto the shelf and slope and (2) the UM-2 and UM-3 Chronozones, the tops of which are defined by the *Cristellaria "K"* and *Robulus "E"/Bigenerina "A"* biozones, respectively (Figure 8).

UM3 P1 extends continuously across the modern GOM shelf from the South Padre Island Area offshore Texas to the west-central Destin Dome Area east of the modern Mississippi River Delta (Figure 212). In the Texas offshore, hydrocarbons have only been encountered in a few, small, discontinuous clusters. However, in the Louisiana offshore, hydrocarbon discoveries are numerous and extend in a continuous band across the entire modern shelf to the Main Pass Area.

UM3 P1 sands supplied by the South Brazos Delta System (Morton et al., 1985) in the Texas offshore are thinner, significantly fewer, and much less well developed than the UM3 P1 sands supplied by ancestral Mississippi River Deltas in the Louisiana offshore. This is a result of less clastic influx to the offshore Texas area than to the offshore Louisiana area during UM3 time because major depocenters were located offshore of southeastern Louisiana (Curtis, 1970). Also, upper Miocene sediments offshore Texas have been buried only 2,000-6,000 ft, which may result in thermal immaturity and lack of appreciable hydrocarbon generation (Morton et al., 1985).

In the Louisiana offshore, UM3 P1 deposits prograded significantly basinward from those of the older Lower Upper Miocene Progradational Play (UM1 P1), especially in the West Cameron through Eugene Island and Main Pass Areas.

## Play Limits

In an updip direction, UM3 P1 deposits grade into the sediments of the Upper Upper Miocene Aggradational (UM3 A1) and Upper Upper Miocene Retrogradational (UM3 R1) Plays or extend onshore. UM3 P1 continues to the southwest into onshore Texas and Mexican national waters. To the northeast, the play is limited by the deposits of the Upper Upper Miocene Aggradational/Progradational Play (UM3 AP1) overlying the lower Cretaceous carbonate shelf. UM3 P1 deposits grade into the sediments of the Upper Upper Miocene Fan 1 (UM3 F1) and Upper Upper Miocene Fan 2 (UM3 F2) Plays in a downdip direction.

## Depositional Style

UM3 P1 is characterized by sediments deposited predominantly on the UM3 shelf, with less common, generally finer-grained sediments deposited on the UM3 upper slope. These sediments represent major regressive episodes in which outbuilding of both the shelf and the slope occur. The UM3 progradational interval varies from less than 50 to more than 7,700 ft in thickness, with net sand thicknesses as much as approximately 1,500 ft.

The 29 reservoir sands of the offshore Texas area formed mainly as shelf blanket sands and delta fringe sands in the distal portions of prograding deltaic lobes or offshore bars. Most of these sands have a coarsening-upward log character, but some fining-upward sands are also present in the overall prograding section. Many of these sands are thin and poorly developed because of a low influx of clastic detritus in the offshore Texas area during UM3 time. The paucity of clastic detritus led to the deposition of thick shale intervals without sand. Thus, many UM3 progradational sands in the Texas offshore have not been prolific producing reservoirs. In fact, in the South Padre Island and Mustang Island Areas, the progradational facies is present but not productive.

The 1,038 reservoir sands of the offshore Louisiana area formed mainly as delta fringe sands, channel/levee complexes, and distributary mouth bars. These facies exhibit upward-coarsening (delta

fringe and distributary mouth bars) and blocky to upward-fining (channel/levee) log signatures. The thickest sand-dominated intervals probably represent stacked facies of multiple episodes of delta-lobe switching and progradation. Shelf blanket sands and delta slump deposits are also present, but less common. These deposits are often characterized by isolated, prominent, and subdued spiky log patterns. The central offshore Louisiana area was the locus of the main UM3 deltaic depocenter resulting in abundant, well-developed, thick sands.

## Structural Style

The majority of the fields in this play are structurally associated with anticlines, normal faults, and salt diapirs—shallow, intermediate, and deep depths—with hydrocarbons trapped on diapir flanks or in sediments draped over diapir tops. Other fields are structurally associated with growth fault anticlines, while some fields contain hydrocarbon accumulations trapped by permeability barriers and updip pinchouts or facies changes.

## Quantitative Attributes

On the basis of reserves calculations, UM3 P1 contains 53% oil and 47% gas. The 1,067 sands in the play comprise 2,766 reservoirs, of which 1,194 are nonassociated gas, 1,289 are undersaturated oil, and 283 are saturated oil. Proved reserves are estimated at 12,207.491 Bcfg and 2,421.294 MMbo (4,593.445 MMBOE) in 1,065 sands in 172 fields (Table 99). Unproved reserves are estimated at 1.862 Bcfg (0.331 MMBOE) in 2 sands in 2 fields. These proved plus unproved reserves account for 74% of the reserves for the UM3 Chronozone.

Of all 65 GOM plays, UM3 P1 ranks first in oil production (20%) and third in gas production (8%). Cumulative production from UM3 P1 totals 10,525.084 Bcfg and 2,183.159 MMbo (4,055.950 MMBOE) from 1,035 sands in 169 fields. UM3 P1 production accounts for 90% of the UM3 Chronozone's total production. Remaining proved reserves

	No. of Sands	Oil (MMbbl)	Gas (Bcf)	BOE (MMbbl)
Proved	1,065	2,421.294	12,207.491	4,593.445
Cum. production	1,035	2,183.159	10,525.084	4,055.950
Remaining proved	541	238.135	1,682.407	537.495
Unproved	2	<0.001	1.862	0.331

Table 99. UM3 P1 reserves and cumulative production.

in the play are 1,682.407 Bcfg and 238.135 MMbo (537.495 MMBOE) in 541 sands in 120 fields.

Table 100 summarizes that water depths of the fields in UM3 P1 range from 9-339 ft, and play interval discovery depths vary from 1,725-17,925 ft, sub-sea. Additionally, porosity and water saturation range from 15-37% and 16-80%, respectively.

1,067 Sands	Min	Mean	Max
Water depth (ft)	9	71	339
Subsea depth (ft)	1,725	9,321	17,925
Reservoirs per sand	1	3	25
Porosity	15%	28%	37%
Water saturation	16%	30%	80%

Table 100. UM3 P1 sand attributes. Values are volume-weighted averages of individual reservoir attributes.

## Exploration History

UM3 P1 has a 51-year history of discoveries (Figure 213). The first sands in the play were discovered in 1948 in the Ship Shoal 72 and Vermilion 71 Fields. The maximum number of sands discovered in any year occurred in 1957 with 75 sands from 16 fields, adding the maximum yearly reserves of 681.126 MMBOE. Sand discoveries averaged about 24 per year until 1986. Since then, the sand discovery average dropped to about 13 per year.

The largest sand in the play was discovered in 1957 in the Bay Marchand 2 Field and contains an estimated 101.379 MMBOE (Figure 214). No sand containing more than 50 MMBOE has been discovered since 1963. The mean sand size for the play is 4.305 MMBOE. Since the first Atlas database cutoff of January 1, 1995, 53 sands have been discov-

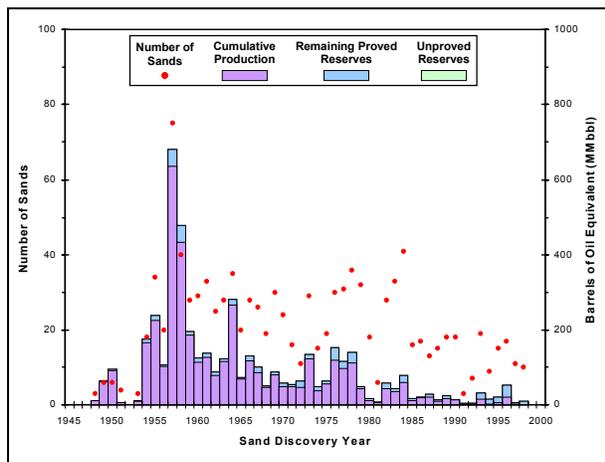


Figure 213. UM3 P1 exploration history graph showing reserves and number of sands discovered by year.

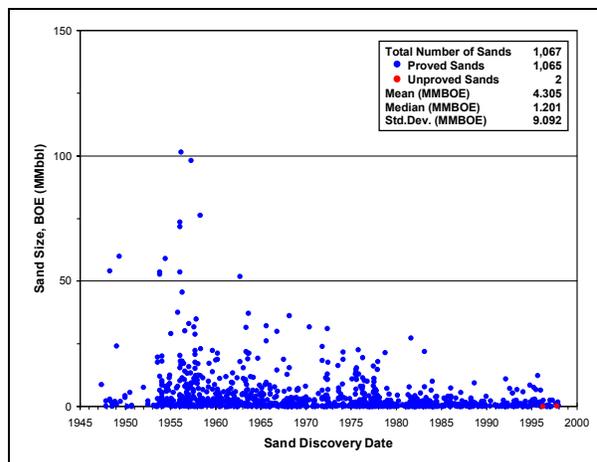


Figure 214. UM3 P1 sand discovery graph showing the size of sands discovered by year.

ered, the largest of which is estimated to contain 12.298 MMBOE.

## Production History

UM3 P1 has a 49-year history of production (Figure 215). Oil production began in 1950 and increased steadily during the 1950's and 1960's. Oil production peaked in 1971, and has since declined steadily to less than half that peak value. Gas production began in 1951 and reached peak levels in the early-1970's. Since then, gas production has fluctuated near peak levels.

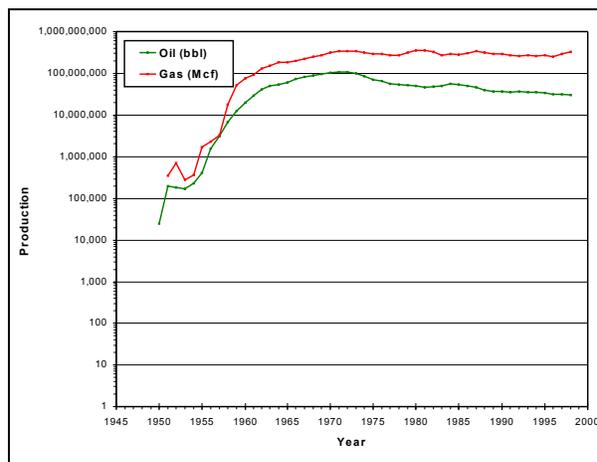


Figure 215. UM3 P1 production graph showing oil and gas production by year.