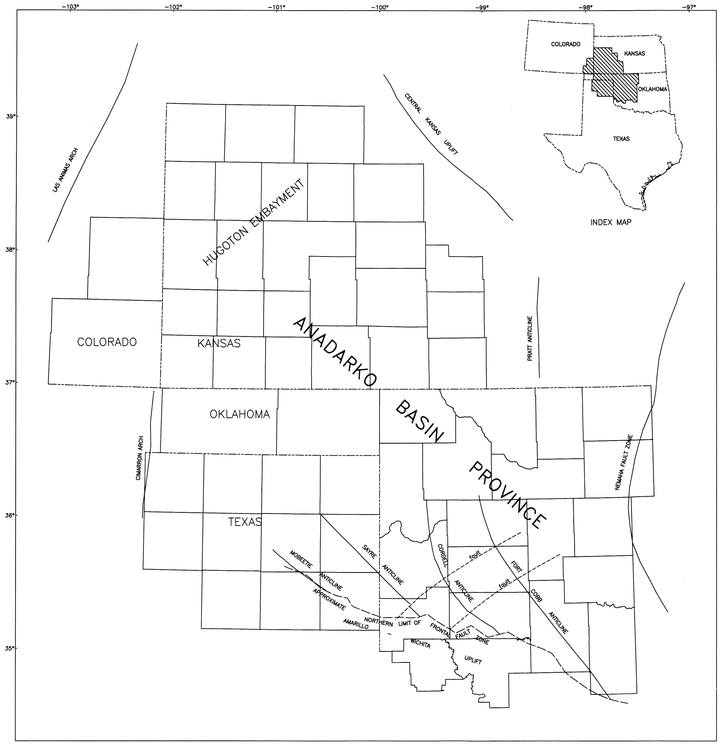
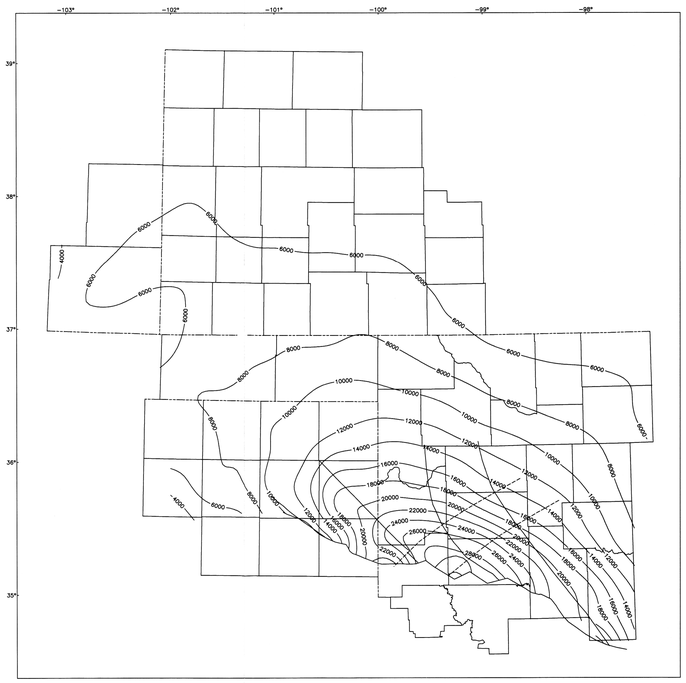
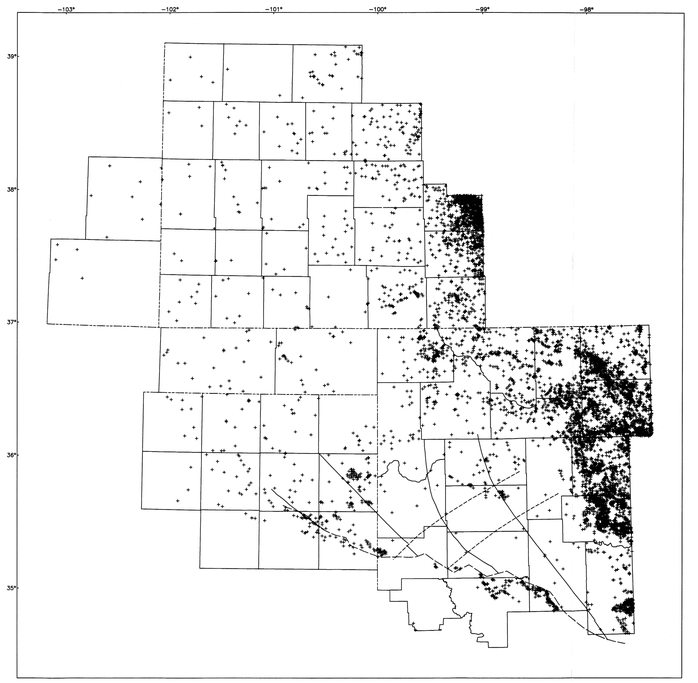


Map A. Anadarko basin province and selected basin-bounding structures (from Barrett, 1963). Major pre-Mississippian anticlines and faults in southern part of province are from Wrobleuski (1967). The boundary between the deep basin and the Amarillo-Wichita uplift is represented by a line showing the approximate northern limit of the mountains-front fault zone. The scale bar is also applicable to maps B-E.



Map B. Depth to top of Viola Group. Contour interval is 2,000 ft. Viola Group rocks exist within the fault zone but because of structural complexity, the contours have been omitted. See map A for explanation of other features on this map.



Map C. Locations of wells reporting Viola Group tops. See map A for explanation of other features on this map.

VIOLA GROUP

[See sheet 1 for introductory text and references]

The Middle to Upper Ordovician Viola Group is composed primarily of limestone and dolomite (Merriam, 1963; Brown and Banta, 1993). Detailed work by Cole (1975) shows the Viola absent from the northernmost part of the province in west-central Kansas. However, recent drilling indicates that, except for some of the extreme western edges, the Viola is present virtually throughout the province (map A). Thickness of the Viola ranges from truncation along the western edge of the province to as much as 1,000 ft in the deep basin.

Almost 7,000 wells with reported Viola top penetrations are used to construct map B—drilling depth to the top of the Viola. Although some wells that penetrate the Viola may not be included in this map, the patterns of drilling shown here are believed to reflect the present-day status of exploration. Map C shows an area within the Amarillo-Wichita uplift where the top of the Viola has not been identified. The Viola may be present in this limited area, but because of the large vertical offsets over small horizontal distances and the complex structural nature of this area, depth contours are not shown south of the line showing the "approximate northern limit of the frontal fault zone" (map A), which separates the Amarillo-Wichita uplift from the deep Anadarko basin. Like the Arbuckle and the Simpson, few penetrations in the Viola exist in the deep Anadarko basin (map C). Therefore, depths to the top of the Viola in the deep basin were estimated from reported drilling tops and thicknesses of the Hunton Group. Map C is intended only as a rough approximation of depth to the top of the Viola. Viola well penetrations are most dense in the eastern part of the province along and west of the Nemaha uplift, and along the northeast province boundary south of the Central Kansas uplift and the Pratt anticline—a drilling pattern similar to that exhibited by the Arbuckle and Simpson Groups. This drilling pattern reflects the relative success of petroleum discoveries along the western flanks of the Nemaha and Central Kansas uplifts, as compared to the greater Anadarko basin. The underlying Simpson and Arbuckle Groups along these uplifts have also been profitable targets, and are not extremely deep.

Production from Viola reservoirs in the province (map D) is limited. Only five fields (map E) have an estimated ultimate recovery of at least 1 million barrels (MMBO) of oil, and only one field has at least 6 billion cubic feet of gas (BCFG). One trap type, a faulted anticline, was recorded for a Viola reservoir in the Yellowstone field. The pattern of production in the Viola and the location of major petroleum accumulations are similar to that of the drilling intensity. That is, the pattern of production is concentrated along the eastern and northeastern boundaries of the province. Production from Viola reservoirs has been reported from more than 160 wells in the province. Most of these wells are in 66 named fields; some producing wells are not assigned to fields.

Brown and Banta (1993) discuss some of the reservoir features of an accumulation in Pratt and Barber Counties, Kansas, at the Jem field just outside of the eastern province boundary. They report that production is related to thinning of the Viola, which they attribute to post-depositional dissolution and collapse. Permeability is reported as low overall, but significantly higher in the thin residual cherty parts of the Viola. Although not documented in their 1993 study, Brown and Banta suggest that natural fractures are likely pathways for water movement and dissolution within the Viola. The association between major structural features and reservoir enhancement suggests that vast parts of the province away from such features may not be productive. However, karstification of the Viola, as a result of subaerial exposure, may be likely in areas where the Hunton Group and the Maquoketa Shale (in the Hugoton embayment) or Sylvan Shale have been eroded. Thus, some relatively unexplored areas may also have enhanced reservoir properties.

Probable source rocks for Viola reservoirs are Simpson shale, which is mature or post-mature (with respect to oil generation) in much of the province. This judgement is based on the proximity and position (below) of Simpson rocks with respect to the Viola, and on the source rock potential and thermal maturity of the Simpson. Burruss and Hatch (1989) presented analyses of toluene concentrations in crude oils in the Anadarko basin and interpreted the loss of toluene with increasing distance from the basin depocenter as evidence for long distance migration. If this interpretation is correct, the low levels of thermal maturity for Simpson Group rocks in northern parts of the province may not be a serious limitation for the presence of Simpson-derived petroleum. Wavrek (1992) presented data supporting a Viola source for oils found in Viola reservoirs in the nearby Southern Oklahoma aulacogen. No reports on source rock-potential specifically for the Viola, or on correlation of Viola petroleum with a particular source rock in the greater Anadarko basin, are available.

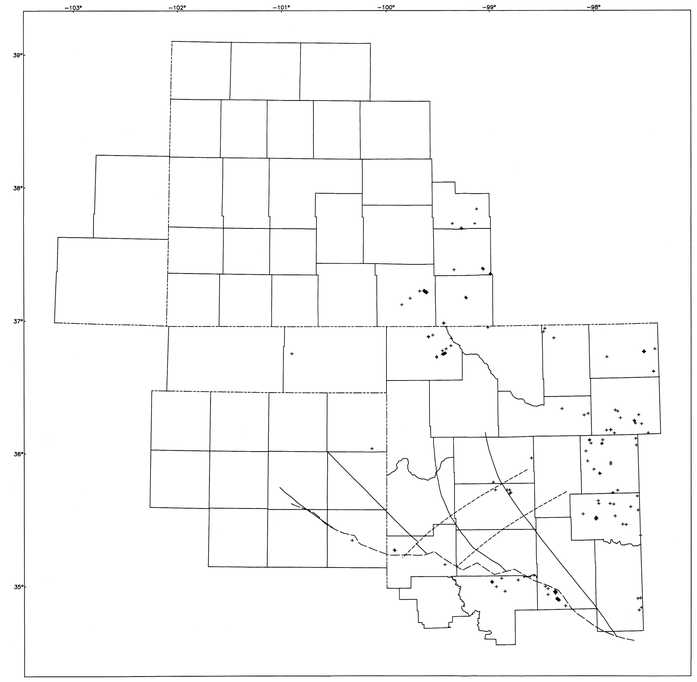
Table 1. Selected data for oil accumulations greater than 1 million barrels and gas accumulations greater than 6 billion cubic feet in Viola Group reservoirs.

FIELD NAME	FIELD NUMBER	RESERVOIR LITHOLOGY	RESERVOIR DEPTH(ft)	MAJOR PRODUCT	ESTIMATED ULTIMATE RECOVERY CODE*
BOX RANCH	1	LIMESTONE	6000	OIL	a
CUSTER CITY, NORTH	2	LIMESTONE	15037	GAS	b
LOVEDALE	3		7320	GAS	a
TABLER, EAST	4	LIMESTONE	13080	GAS	c
UNION CITY	5		11799	GAS	a
YELLOWSTONE	6	LIMESTONE	5842	GAS	a

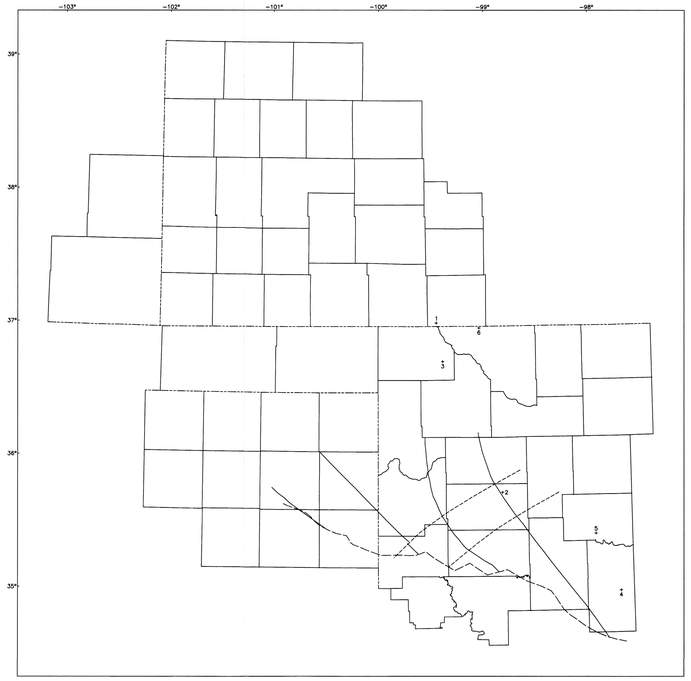
* See Table 2 for key to letter codes

Table 2. Letter codes for estimated ultimate recoveries

MILLIONS OF BARRELS (OIL)	CODE	BILLIONS OF CUBIC FEET (GAS)	CODE
1 to 4	a	6 to 24	a
>4 to16	b	>24 to 96	b
>16 to 64	c	>96 to 384	c
>64 to 256	d	>384 to 1536	d
>256 to 1024	e	>1536 to 6144	e
>1024	f	>6144	f



Map D. Locations of wells reporting Viola Group petroleum production. See map A for explanation of other features on this map.



Map E. Locations of fields that have major Viola Group petroleum production. Field locations are approximate centerpoints and do not reflect the areal extent of the accumulation. Field names and field-size codes (estimated ultimate recovery) associated with field numbers are shown in table 1. Explanation of field-size codes is shown in table 2. See map A for explanation of other features on this map.

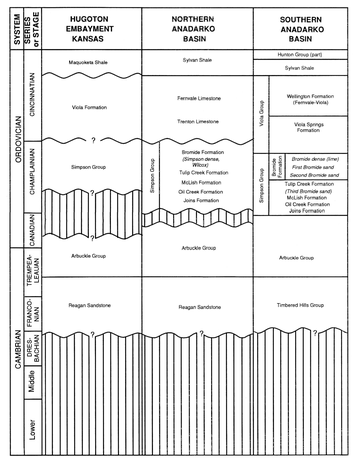
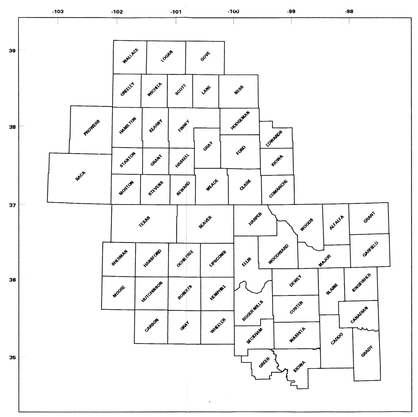


Figure 1. Generalized Cambrian and Ordovician surface and subsurface stratigraphic section for the Anadarko basin province. Italics indicate informal names. Modified from Bebout and others (1993).



INDEX MAP SHOWING ANADARKO BASIN PROVINCE AND COUNTIES WITHIN PROVINCE

VIOLA GROUP

MAPS SHOWING PETROLEUM EXPLORATION INTENSITY AND PRODUCTION IN MAJOR CAMBRIAN TO ORDOVICIAN RESERVOIR ROCKS IN THE ANADARKO BASIN

By
Mitch Henry and Tim Hester

1996

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