

# **IOWA SHELF PROVINCE (052)**

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## **INTRODUCTION**

The Iowa Shelf Province, comprising 58,400 sq mi, includes 14 southeastern Minnesota counties and all of the State of Iowa except 12 counties in the southwest corner. The latter 12 counties are included in the Forest City Basin Province. Surface bedrock in the Iowa Shelf Province is primarily of Paleozoic age, with Cretaceous rocks restricted to an area in western and northwestern Iowa. Most of the bedrock in the Iowa Shelf Province is now covered by unconsolidated glacial and post-glacial debris.

The only known hydrocarbons found came from a single now-abandoned well, Flynn P-1, in Washington County, southeastern Iowa. This well produced approximately 400 BO from Middle Ordovician (Champlainian) rocks. Despite the fact that no commercial quantities of oil or gas were discovered in the Iowa Shelf province, the presence of this bona fide "oil show" in the Flynn P-1 well, in addition to other supporting evidence, warranted consideration of the Middle Ordovician rocks as one of the hypothetical plays to be assessed. The other hypothetical play identified was the Precambrian Midcontinent Rift System (5101) play which is discussed under the Superior Province (051).

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## CONVENTIONAL PLAY

### 5201. MIDDLE ORDOVICIAN PLAY (HYPOTHETICAL)

**Description:** The area of the hypothetical Middle Ordovician Play in the Iowa Shelf Province is the area underlain by Middle Ordovician rocks, which includes all the province except for small areas in northwestern Iowa and southeastern Minnesota. On the Iowa Shelf, Middle Ordovician rocks are comprised, in ascending order, of Ancel, Platteville, and Galena Groups (Willman and others, 1967; Willman and Buschbach, 1975). The Middle Ordovician Play in the Iowa Shelf Province is based on: (1) current commercial hydrocarbon production from age equivalent rocks in adjacent provinces; (2) prior minor oil production (Flynn P-1 well) from Middle Ordovician rocks on the Iowa shelf; (3) presence of good to excellent hydrocarbon source rocks within the Middle Ordovician section, and (4) presence of potential sandstone and porous dolomite reservoirs.

**Reservoirs:** Potential reservoir rocks, with good to excellent porosity, are recognized in the Middle Ordovician St. Peter Sandstone (5-600 ft thick) and carbonate units in the Galena Group (0-140 ft thick) in Iowa (Howell, 1922; Willman and others, 1967). On the negative side, in the northern and eastern parts of Iowa, the St. Peter is an aquifer and any hydrocarbons that might have migrated into it have been flushed out by fresh ground waters.

**Source rocks:** Potential hydrocarbon source rocks occur at several zones within the Middle Ordovician section (Hatch, 1988; Hatch and others, 1985, 1986, 1987, and 1991; and Jacobson and others, 1988). Organic-rich shale interbeds occur in the St. Peter Sandstone (Ancel Group), Glenwood Formation (Ancel Group), Quimbys Mill Formation (Platteville Group), and Guttenburg Formation (Galena Group). Total organic carbon contents of these Middle Ordovician source rocks range from 0.13 to 43.3 percent with a median value at 7.9 percent; genetic potentials range from <0.2 to 470 mg HC/g rock with a median value of 49 mg HC/g rock (Hatch, 1988). Thermal maturity of organic matter in these rocks on the Iowa Shelf ranges from immature to marginally mature. Such maturities, in general, are not conducive to generate and expel commercial quantities of petroleum.

**Traps:** Both structural and stratigraphic traps are possible on the Iowa shelf. The most prominent structural features are the series of domes and anticlines termed the Thurman-Redfield structural zone, which extend from Fremont County (southwestern corner of Iowa) northeast to Hardin County (central Iowa). All of this structural zone

coincides with or parallels the eastern boundary of the Midcontinent rift. Numerous other structural features (anticlines, domes, and synclines) of smaller areal extent have been mapped. These features were formed during the folding which began in the Mississippian and continued into the Pennsylvanian (Adler and others, 1971).

The only documented example of a stratigraphic trap on the Iowa shelf is in the Keota Dome field, where facies in the Pecatonica Dolomite changes from pure carbonate to sandy carbonate (Adler and others, 1971).

**Exploration status:** This is a purely hypothetical play. No commercial hydrocarbons have been encountered in the Iowa Shelf Province. Drilling depths are generally less than 2,000 ft.

**Resource potential:** This is a very high risk play. The low maturity of the source rocks and shallow depths of reservoirs, which are readily subject to ground water flushing, give the Middle Ordovician sequence of rocks a play probability (probability of occurrence of an undiscovered accumulation of at least 1 MMBO or 6 BCFG) of 0.06.

## **UNCONVENTIONAL PLAYS**

There are no unconventional plays described in this province report. However, unconventional plays listed in the surrounding provinces may include parts of this province. Individual unconventional plays are usually discussed under the province in which the play is principally located.

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