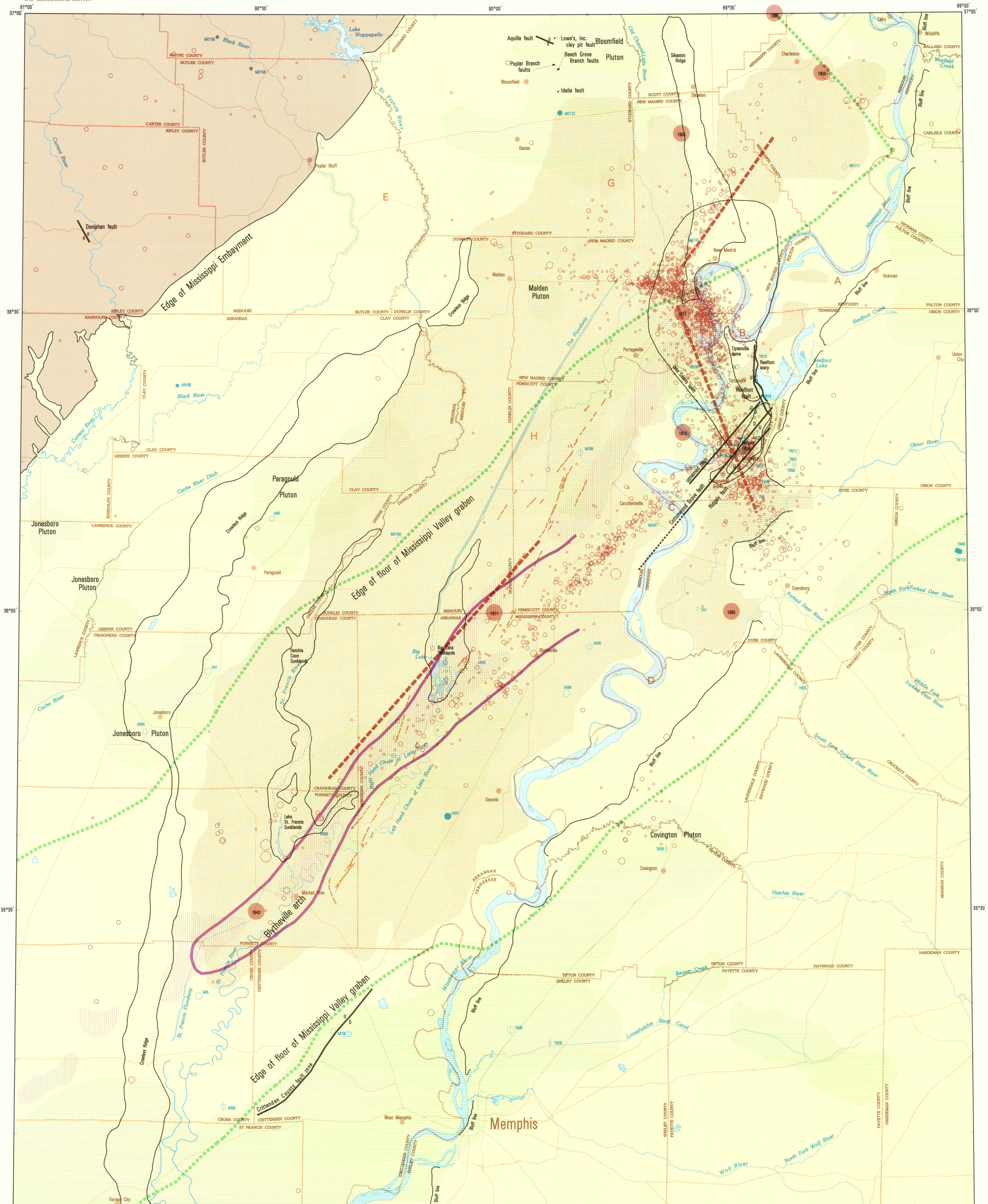

Albers Equal-Area Conic Projection
Standard Parallels 29°31′ and 48°30′

SCALE 1:250 000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Color design by Virginia D. Scott
Graphic design Larry J. Preisendorf
Digital map production by Eugene G. Ellis and Nancy A. Schock
Digital geologic data prepared with ARC/INFO 6.1.1
running under SunOS 4.1.3 on a Unix workstation
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MAP SHOWING SYNOPSIS OF SEISMOTECTONIC FEATURES IN THE VICINITY OF NEW MADRID, MISSOURI

By
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1995

EXPLANATION

Earthquakes and selected surficial effects

Epicenter of instrumentally located earthquakes

- Magnitude less than 2.0
- Magnitude 2.0-2.9
- Magnitude 3.0-3.9
- Magnitude greater than 4.0

Epicenter of historical earthquake—Showing date of earthquake with moment magnitude of at least 5.0

Sand blows—Deposits from 1811-12 earthquakes cover more than 1 percent of ground

Energy release centers—Alignment of centers from 1811-12 earthquakes as inferred from properties and distributions of sand blows

Bootheel lineament—Elements of lineament as interpreted from aerial photographs

Embayment strata—Exposed within Mississippi embayment. Mostly Quaternary age, some Tertiary or Cretaceous age

Paleozoic rocks—Exposed outside Mississippi embayment. Mostly Ordovician age

Areas of anomalies based on fluvial geomorphology

Fault—Dotted where inferred. Movement shown where known; U, upthrown side; D, downthrown side

Selected drill-holes

- Depth less than 4,000 ft
- Depth 4,000-8,000 ft
- Depth exceeds 8,000 ft

Mafic plutons or intrusive complex—Inferred from combined analyses of gravity and aeromagnetic data

Nonmagnetic axial gravity high within Mississippi Valley graben

Blytheville arch—Inferred from seismic-reflection data

Edge of floor of Mississippi Valley graben—Inferred from aeromagnetic data

Road—Limited access, primary, or secondary

Geomorphic feature—Named linear feature or border of named topographic high or low

INTRODUCTION

Much research has been conducted during the past 20 years in the vicinity of New Madrid, Mo., an area that centers near the sites of three great earthquakes that occurred during the winter of 1811–12 (Fuller, 1912; Nuttli, 1973). These earthquakes and continuing subsequent seismicity make the region the most seismically active area in the United States east of the Rocky Mountains. ... This is one of a series of seismotectonic maps of the New Madrid area in southeast Missouri and adjacent parts of Arkansas, Kentucky, and Tennessee whose purpose is to help assess the seismic hazards in the area. Because all of the seismotectonic data cannot be shown legibly on a single map, a series of maps that group different types of related information have been prepared (table 1). This seismotectonic map shows geologic and geophysical information selected from the maps listed in table 1 to provide a framework of seismicity, its geologic effects, and local geologic structure.

SEISMICITY AND EARTHQUAKE EFFECTS

Earthquakes shown on the map as open red circles were recorded by the local seismic network from July 1974 through June 1991 (Taylor and others, 1991). ...

STRUCTURE OF THE MISSISSIPPI VALLEY GRABEN

The structure of the Mississippi Valley graben is defined mostly by geophysical data. ...

ACKNOWLEDGEMENTS

The map and text benefitted from suggestions by Anthony Crone, Stephen Hartzell, and S.J. Kreyneker. We thank the scores of people who contributed to and improved the previously published maps from which we selected the information shown here. We acknowledge and appreciate the ARC/INFO assistance provided by Michael A. Crane, Ben Kelly, Randy Anderson, and Carl L. Rich.

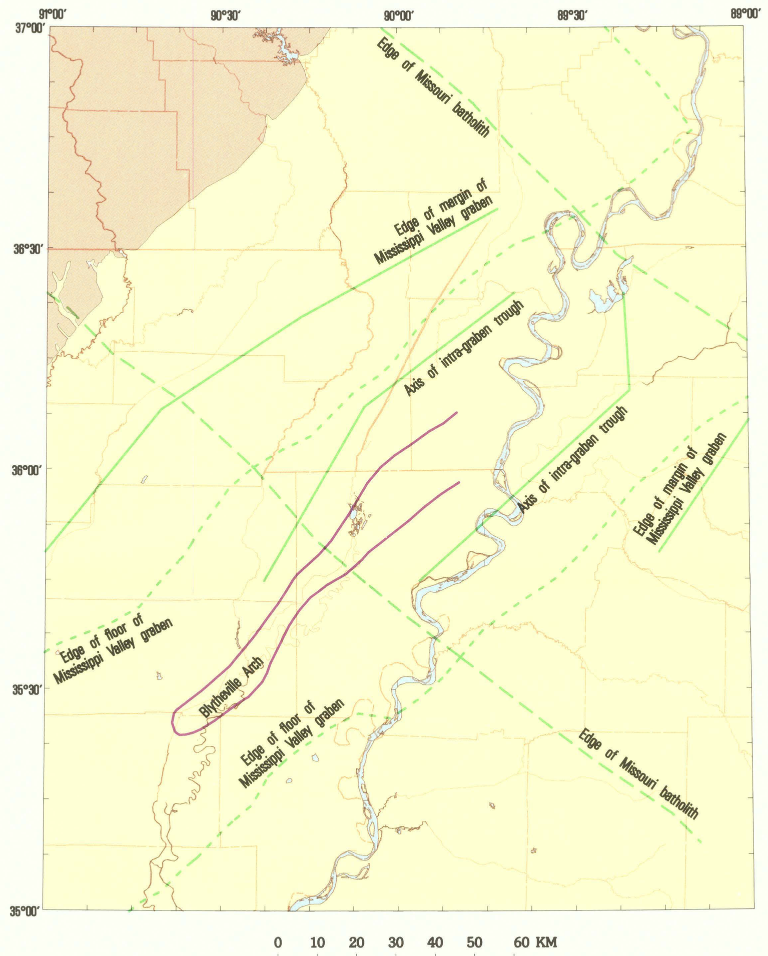


Figure 1. Large structures in Paleozoic sedimentary rocks and shallow basement in the vicinity of New Madrid, Mo. Paleozoic rocks (pink) are exposed outside the Mississippi embayment; post-Paleozoic strata (yellow) are exposed within the embayment. Solid green lines inferred from magnetotelluric data. Purple line inferred from seismic-reflection data. Dashed lines inferred from gravity data (long dash, Missouri batholith) and aeromagnetic data (short dash, graben floor). Ends of lines defined by limit of data.

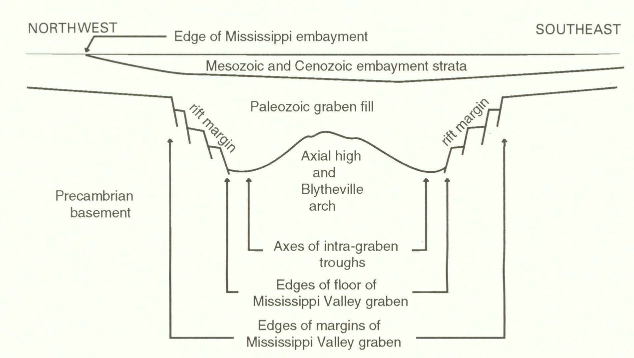
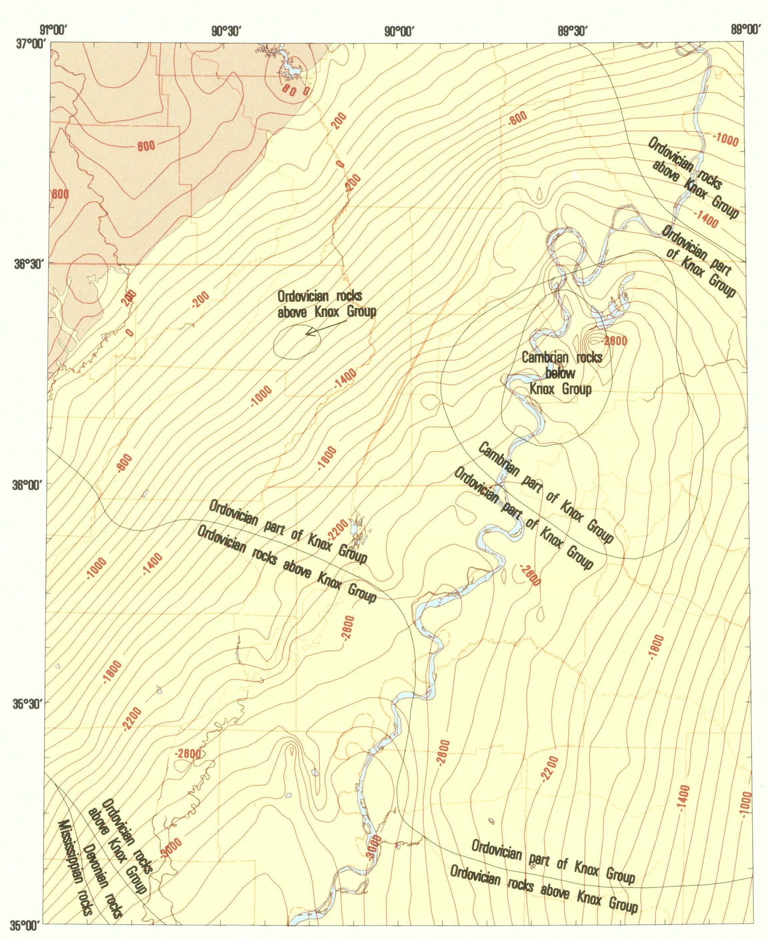


Figure 2. Schematic cross section of Mississippi Valley graben. Section is generalized and corresponds to no specific profile on map. From Wheeler, Rhea, and Dart (1994).



EXPLANATION

Embayment strata—Exposed within Mississippi embayment. Mostly Quaternary age, some Tertiary or Cretaceous age

Paleozoic rocks—Exposed outside Mississippi embayment. Mostly Ordovician age

Structure contours—Drawn on post-Paleozoic unconformity beneath embayment strata, on smoothed topography atop exposed Paleozoic rocks. Contour interval 100 ft; datum sea level (R.L. Dart, written commun., 1993)

Subcrop contact—Identified in Paleozoic rocks beneath post-Paleozoic unconformity from drill-hole data (R.L. Dart, written commun.,1993)

Figure 3. Structure of the post-Paleozoic unconformity showing (1) the southwest-plunging syncline (red contours) which postdates the Paleozoic-Mesozoic erosional surface; and (2) subcrop contacts (black lines). These define the uplifted Pascola Arch. The subsurface dome on the crest of the arch near the label Cambrian rocks below Knox Group coincides with the surficial extent of the Lake County uplift (Russ, 1982) and with the area of intense seismicity between New Madrid, Mo., and Dyersburg, Tenn.

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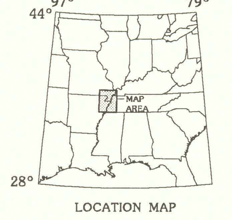
Table 1. *Additional data compiled in the vicinity of New Madrid, Mo., as part of this study and published separately as companion maps*

Map topic (citation)	Additional data shown on cited map
Seismicity and sand blows (Rhea and others, 1994)	Seismograph and accelerograph locations Contours of P-wave velocity in upper crust Single-earthquake focal mechanisms Stress orientations from focal mechanisms and well-bore breakouts
Large structures interpreted from geophysical data (Rhea and Wheeler, 1994a)	Plutons and intrusive complexes inferred from aeromagnetic data and plutons inferred from gravity data (three data sets combined on map) Dense cores in plutons inferred from gravity data Structure contours atop magnetic basement or intrusive rocks Contours of depth to and thickness of anomalous lower crust
Geophysical profile and modeling lines (Rhea and Wheeler, 1994b)	Vibroseis, Mini-Sosie, river airgun, and COCORP seismic-reflection profile lines Gravity profile and modeling lines Aeromagnetic modeling lines Magnetotelluric sounding points and modeling lines
Structure of the Mississippi Valley graben (Wheeler, Rhea, and Dart, 1994)	Contours of radon concentrations in soil gas
Surficial and hydrologic features (Wheeler and Rhea, 1994)	Bootheel lineament interpreted from Landsat images Global Positioning System survey monuments Five centerlines of the Mississippi River, 1765 to present Anomalies in ground water properties Trenches dug in search of pre-1811 liquefaction or deformation Earthquake-induced landslides along bluff line at east edge of Mississippi River flood plain Pre-1811 course of Reel Foot River draining Reelfoot Lake into Mississippi River

Table 2. *Historical earthquakes with moment magnitude of 5.0 or greater*

[Source Johnston (in press)]

Date mo.da.year	M	Lat N.	Long W.
12.16.1811	8.2	36.0	90.0
01.23.1812	8.1	36.3	89.6
02.07.1812	8.3	36.5	89.6
01.05.1843	6.5	35.5	90.5
08.17.1865	5.2	36.0	89.5
10.31.1895	6.8	37.0	89.4
11.04.1903	5.0	36.9	89.3
08.22.1905	5.0	36.8	89.6



LOCATION MAP

CONVERSION FACTORS

Multiply	By	To obtain
centimeters (cm)	0.3937	inches (in)
meters (m)	3.281	feet (ft)
kilometers (km)	0.6214	miles (mi)