

Appendix R1.10

Paleontological Resources

This appendix presents 2 tables that show the available sources of geologic data and generalized potential fossil yield classification classes, as well as 10 maps showing potential fossil yield classification of geology for the Plan Area (one map for each ecoregion subarea).

Appendix R1.10 Paleontological Resources

**Table R1.10-1
Available Sources of Geologic Data**

Source	Resolution	Digital Format(s)	DRECP Coverage	Comments
2010 Geologic Map of California (Jennings 1977 Update)	1:750,000	PDF GIS (Vector)	Full	There are 66 unique geologic units in this dataset. Forty-eight of them are represented within the Plan Area. This dataset differentiates older alluvium from younger units.
Geologic Atlas of California - 1958-1969	1:250,000	PDF GIS (KMZ/Raster)	Full	Data consists of georeferenced images of about ten 250K quads covering the Plan Area. Format cannot be used to calculate acres of impact for DRECP.
Regional Geologic Maps - 1981 - Present	1:100,000 – 1:250,000	PDF GIS (KMZ/Raster)	Full	These maps are only available as images and cannot be used to calculate impact acreages.
Geologic Compilation of Quaternary Surficial Deposits in Southern California	1:100,000	PDF GIS (Vector)	Partial	Fourteen out of 38 USGS 30'X60' Quadrangles have been digitized. This dataset contains 1,024 unique geologic units, combined into 40 derivative geologic map units. 37 of them are represented within the Plan Area.
USGS / CGS / Dibblee Foundation	1:24,000 – 1:100,000	PDF GIS (KMZ/Raster)	Partial	There are 636 USGS 7.5' Quadrangles within or partially within the Plan Area. Only a few select areas are available in GIS vector format. See Figure III.10-1.

**Table R1.10-2
Generalized Potential Fossil Yield Classification Classes**

PType	Potential Fossil Yield Classification	PFYC Group	General Lithology	Age	Description
Qrv	1	L/VL	volcanic rocks	Holocene	Recent (Holocene) volcanic flow rocks; minor pyroclastic deposits.
Qrvp	1	L/VL	volcanic rocks	Holocene	Recent (Holocene) pyroclastic and volcanic mudflow deposits.
Q	3	M/U	marine and nonmarine (continental) sedimentary rocks	Pleistocene-Holocene	Alluvium, lake, playa, and terrace deposits; unconsolidated and semi-consolidated. Mostly nonmarine, but includes marine deposits near the coast.

**Table R1.10-2
Generalized Potential Fossil Yield Classification Classes**

PTYPE	Potential Fossil Yield Classification	PFYC Group	General Lithology	Age	Description
Qs	2-3	M/U	marine and nonmarine (continental) sedimentary rocks	Pleistocene-Holocene	Extensive marine and nonmarine sand deposits, generally near the coast or desert playas.
Qg	2	L/VL	nonmarine (continental) sedimentary rocks	Pleistocene-Holocene	Glacial till and moraines. Found at high elevations mostly in the Sierra Nevada and Klamath Mountains.
Qls	2	L/VL	nonmarine (continental) sedimentary rocks	Pleistocene-Holocene	Selected large landslides, such as the Blackhawk Slide on the north side of San Gabriel Mountains; early to late Quaternary.
Qoa	3-4	H/VH	marine and nonmarine (continental) sedimentary rocks	Pleistocene	Older alluvium, lake, playa, and terrace deposits.
Qv	1	L/VL	volcanic rocks	Quaternary	Quaternary volcanic flow rocks; minor pyroclastic deposits.
Qv?	1	L/VL	volcanic rocks	Quaternary	Quaternary volcanic flow rocks; minor pyroclastic deposits.
Qvp	1	L/VL	volcanic rocks	Quaternary	Quaternary pyroclastic and volcanic mudflow deposits.
Qvp?	1	L/VL	volcanic rocks	Quaternary	Quaternary pyroclastic and volcanic mudflow deposits.
QPc	3-4	H/VH	nonmarine (continental) sedimentary rocks	Pliocene-Pleistocene	Pliocene and/or Pleistocene sandstone, shale, and gravel deposits; mostly loosely consolidated.
P	3-4	H/VH	marine sedimentary rocks	Pliocene	Sandstone, siltstone, shale, and conglomerate; mostly moderately consolidated.
M	3-4	H/VH	marine sedimentary rocks	Miocene	Sandstone, shale, siltstone, conglomerate, and breccia; moderately to well consolidated.
Mc	3-4	H/VH	nonmarine (continental) sedimentary rocks	Miocene	Sandstone, shale, conglomerate, and fanglomerate; moderately to well consolidated.
O	3-4	H/VH	marine sedimentary rocks	Oligocene	Sandstone, shale, conglomerate; mostly well consolidated.
Oc	3-4	H/VH	nonmarine (continental) sedimentary rocks	Oligocene	Sandstone, shale, and conglomerate; mostly well consolidated.
Oc?	3-4	H/VH	nonmarine (continental) sedimentary rocks	Oligocene	Sandstone, shale, and conglomerate; mostly well consolidated.
E	3	M/U	marine sedimentary rocks	Eocene	Shale, sandstone, conglomerate, minor limestone; mostly well consolidated.

**Table R1.10-2
 Generalized Potential Fossil Yield Classification Classes**

PType	Potential Fossil Yield Classification	PFYC Group	General Lithology	Age	Description
Ec	3	M/U	nonmarine (continental) sedimentary rocks	Eocene	Sandstone, shale, conglomerate; moderately to well consolidated.
E-Ep	3	M/U	marine sedimentary rocks	Eocene-Paleocene	Units E and Ep, undifferentiated.
Ep	3	M/U	marine sedimentary rocks	Paleocene	Sandstone, shale, and conglomerate; mostly well consolidated.
grCz	1	L/VL	plutonic rocks	Tertiary	Cenozoic (Tertiary) granitic rocks - quartz monzonite, quartz latite, and minor monzonite, granodiorite, and granite; found in the Kingston, Panamint, Amargosa, and Greenwater Ranges in southeastern California.
Tc	3-4	H/VH	nonmarine (continental) sedimentary rocks	Tertiary	Undivided Tertiary sandstone, shale, conglomerate, breccia, and ancient lake deposits.
Ti	1	L/VL	volcanic rocks	Tertiary	Tertiary intrusive rocks; mostly shallow (hypabyssal) plugs and dikes.
Tv	2	L/VL	volcanic rocks	Tertiary	Tertiary volcanic flow rocks; minor pyroclastic deposits
Tvp	2	L/VL	volcanic rocks	Tertiary	Tertiary pyroclastic and volcanic mudflow deposits.
Ku-Ep	3	M/U	marine sedimentary and metasedimentary rocks	Paleocene-Cretaceous	Units Ep and Ku, undifferentiated.
TK	3	M/U	marine sedimentary and metasedimentary rocks	Tertiary-Cretaceous	Sandstone, shale, and minor conglomerate in coastal belt of northwestern California; included by some in Franciscan Complex. Previously considered Cretaceous, but now known to contain early Tertiary microfossils in places.
M+KJfs	2-3	M/U	marine sedimentary and metasedimentary rocks	Tertiary-Cretaceous	Units M and KJfs, undifferentiated
m	2	L/VL	mixed rocks	pre-Cenozoic	Undivided pre-Cenozoic metasedimentary and metavolcanic rocks of great variety. Mostly slate, quartzite, hornfels, chert, phyllite, mylonite, schist, gneiss, and minor marble.
mv	1	L/VL	metavolcanic rocks	pre-Cenozoic	Undivided pre-Cenozoic metavolcanic rocks. Includes latite, dacite, tuff, and greenstone; commonly schistose.

**Table R1.10-2
 Generalized Potential Fossil Yield Classification Classes**

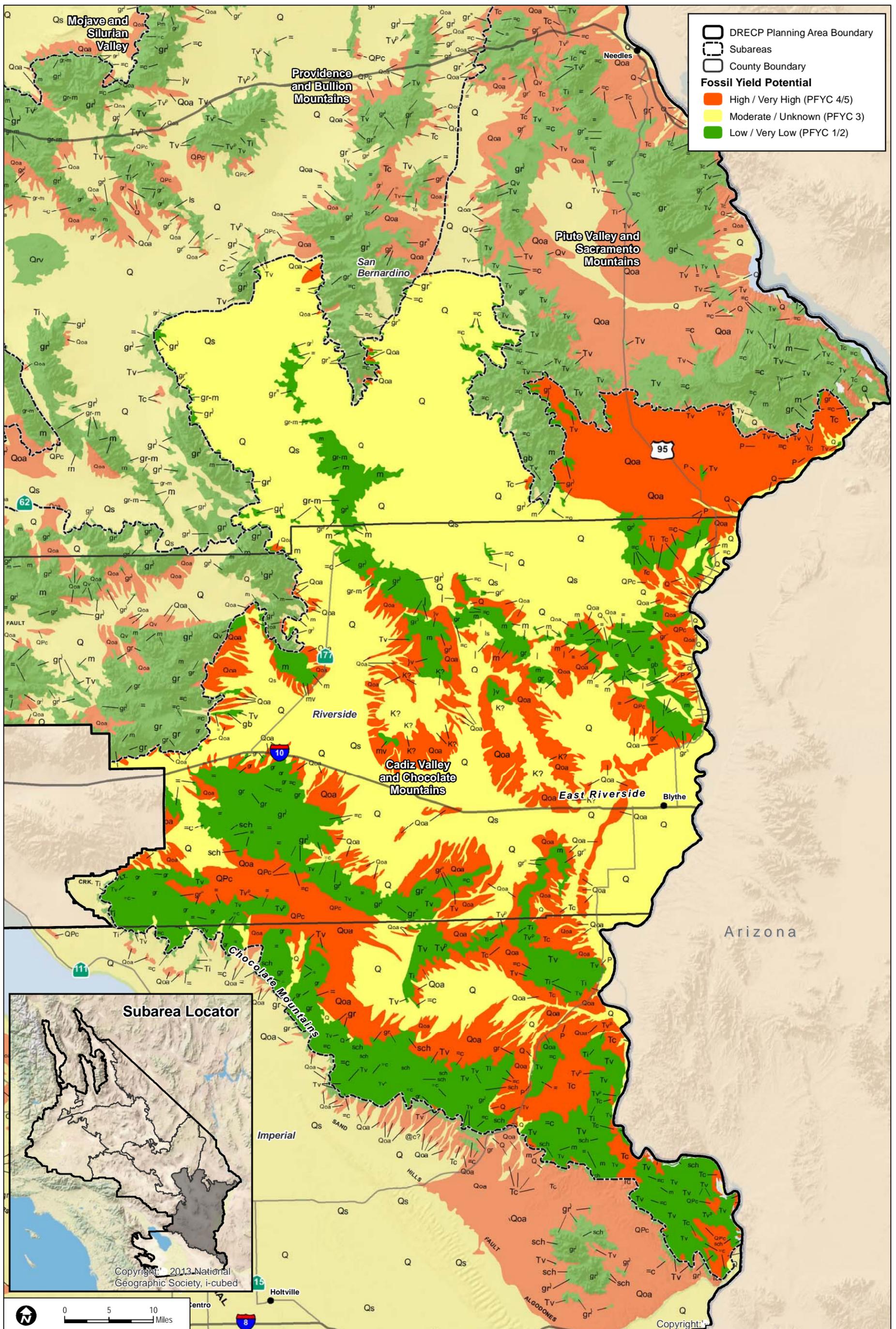
PType	Potential Fossil Yield Classification	PFYC Group	General Lithology	Age	Description
Ku	3	M/U	marine sedimentary and metasedimentary rocks	Upper Cretaceous	Upper Cretaceous sandstone, shale, and conglomerate.
Kl	3	M/U	marine sedimentary and metasedimentary rocks	Lower Cretaceous	Lower Cretaceous sandstone, shale, and conglomerate.
K	3	M/U	marine sedimentary and metasedimentary rocks	Cretaceous	Undivided Cretaceous sandstone, shale, and conglomerate; minor nonmarine rocks in Peninsular Ranges.
KJf	3	M/U	marine sedimentary and metasedimentary rocks	Cretaceous-Jurassic	Franciscan Complex: Cretaceous and Jurassic sandstone with smaller amounts of shale, chert, limestone, and conglomerate. Includes Franciscan melange, except where separated - see KJfm.
KJfm	3	M/U	marine sedimentary and metasedimentary rocks	Cretaceous-Jurassic	Melange of fragmented and sheared Franciscan Complex rocks.
KJfs	3	M/U	marine sedimentary and metasedimentary rocks	Cretaceous-Jurassic	Blueschist and semi-schist of Franciscan Complex.
J	3	M/U	marine sedimentary and metasedimentary rocks	Jurassic	Shale, sandstone, minor conglomerate, chert, slate, limestone; minor pyroclastic rocks.
Tr	3-4	H/VH	marine sedimentary and metasedimentary rocks	Triassic	Shale, conglomerate, limestone and dolomite, sandstone, slate, hornfels, quartzite; minor pyroclastic rocks.
gb	1	L/VL	plutonic rocks	Mesozoic	Gabbro and dark dioritic rocks; chiefly Mesozoic.
grMz	1	L/VL	plutonic rocks	Mesozoic	Mesozoic granite, quartz monzonite, granodiorite, and quartz diorite.
um	1	L/VL	plutonic rocks	Mesozoic	Ultramafic rocks, mostly serpentine. Minor peridotite, gabbro, and diabase; chiefly Mesozoic.
Mzv	1	L/VL	metavolcanic rocks	Mesozoic	Undivided Mesozoic volcanic and meta-volcanic rocks. Andesite and rhyolite flow rocks, greenstone, volcanic breccia and other pyroclastic rocks; in part strongly metamorphosed. Includes volcanic rocks of Franciscan Complex: basaltic pillow lava, diabase, greenstone, and minor pyroclastic rocks.

**Table R1.10-2
 Generalized Potential Fossil Yield Classification Classes**

PTYPE	Potential Fossil Yield Classification	PFYC Group	General Lithology	Age	Description
grPz	1	L/VL	plutonic rocks	Paleozoic and Permo-Triassic	Paleozoic and Permo-Triassic granitic rocks in the San Gabriel and Klamath Mountains.
sch	1-2	L/VL	marine sedimentary and metasedimentary rocks	Paleozoic or Mesozoic	Schists of various types; mostly Paleozoic or Mesozoic age; some Precambrian.
ls	3	M/U	marine sedimentary and metasedimentary rocks	Paleozoic or Mesozoic	Limestone, dolomite, and marble whose age is uncertain but probably Paleozoic or Mesozoic.
Pm	2-3	M/U	marine sedimentary and metasedimentary rocks	Permian	Shale, conglomerate, limestone and dolomite, sandstone, slate, hornfels, quartzite; minor pyroclastic rocks.
C	3	M/U	marine sedimentary and metasedimentary rocks	Carboniferous	Shale, sandstone, conglomerate, limestone, dolomite, chert, hornfels, marble, quartzite; in part pyroclastic rocks.
D	3	M/U	marine sedimentary and metasedimentary rocks	Devonian	Limestone and dolomite, sandstone and shale; in part tuffaceous.
SO	2	L/VL	marine sedimentary and metasedimentary rocks	Silurian-Ordovician	Sandstone, shale, conglomerate, chert, slate, quartzite, hornfels, marble, dolomite, phyllite; some greenstone.
Ca	3	M/U	marine sedimentary and metasedimentary rocks	Cambrian	Sandstone, shale, limestone, dolomite, chert, quartzite, and phyllite; includes some rocks that are possibly Precambrian.
Pz	2-3	M/U	marine sedimentary and metasedimentary rocks	Paleozoic	Undivided Paleozoic metasedimentary rocks. Includes slate, sandstone, shale, chert, conglomerate, limestone, dolomite, marble, phyllite, schist, hornfels, and quartzite.
Pzv	1	L/VL	metavolcanic rocks	Paleozoic	Undivided Paleozoic metavolcanic rocks. Mostly flows, breccia, and tuff, including greenstone, diabase and pillow lavas; minor interbedded sedimentary rocks.
gr	1	L/VL	plutonic rocks	Mesozoic to pre-Cambrian	Undated granitic rocks.
gr-m	1-2	L/VL	mixed rocks	Mesozoic to pre-Cambrian	Granitic and metamorphic rocks, mostly gneiss and other metamorphic rocks injected by granitic rocks. Mesozoic to Precambrian.

**Table R1.10-2
 Generalized Potential Fossil Yield Classification Classes**

PTYPE	Potential Fossil Yield Classification	PFYC Group	General Lithology	Age	Description
pC	2	L/VL	marine sedimentary and metasedimentary rocks	pre-Cambrian	Conglomerate, shale, sandstone, limestone, dolomite, marble, gneiss, hornfels, and quartzite; may be Paleozoic in part.
pCc	2	L/VL	mixed rocks	pre-Cambrian	Complex of Precambrian igneous and metamorphic rocks. Mostly gneiss and schist intruded by igneous rocks; may be Mesozoic in part.
grpC	1	L/VL	plutonic rocks	pre-Cambrian	Precambrian granite, syenite, anorthosite, and gabbroic rocks in the San Gabriel Mountains; also various Precambrian plutonic rocks elsewhere in southeastern California.

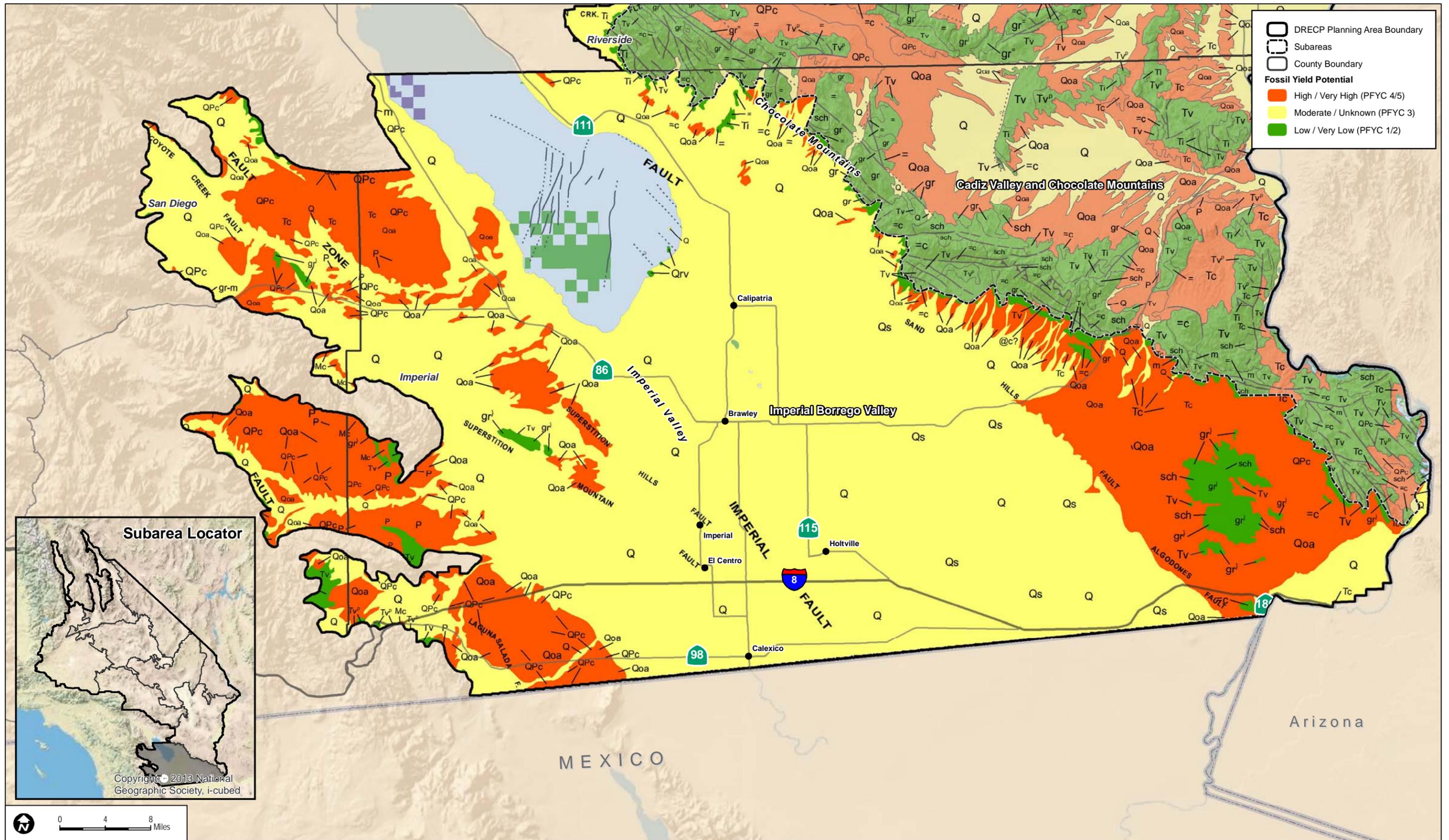


Sources: ESRI (2014); CEC (2013); BLM (2013); CDFW (2013); USFWS (2013); CA Department of Geology (2010)

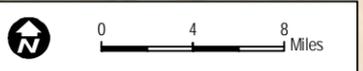
FIGURE R1.10-1

Potential Fossil Yield Classification of Geology - Cadiz Valley and Chocolate Mountains Subarea

Desert Renewable Energy Conservation Plan (DRECP)



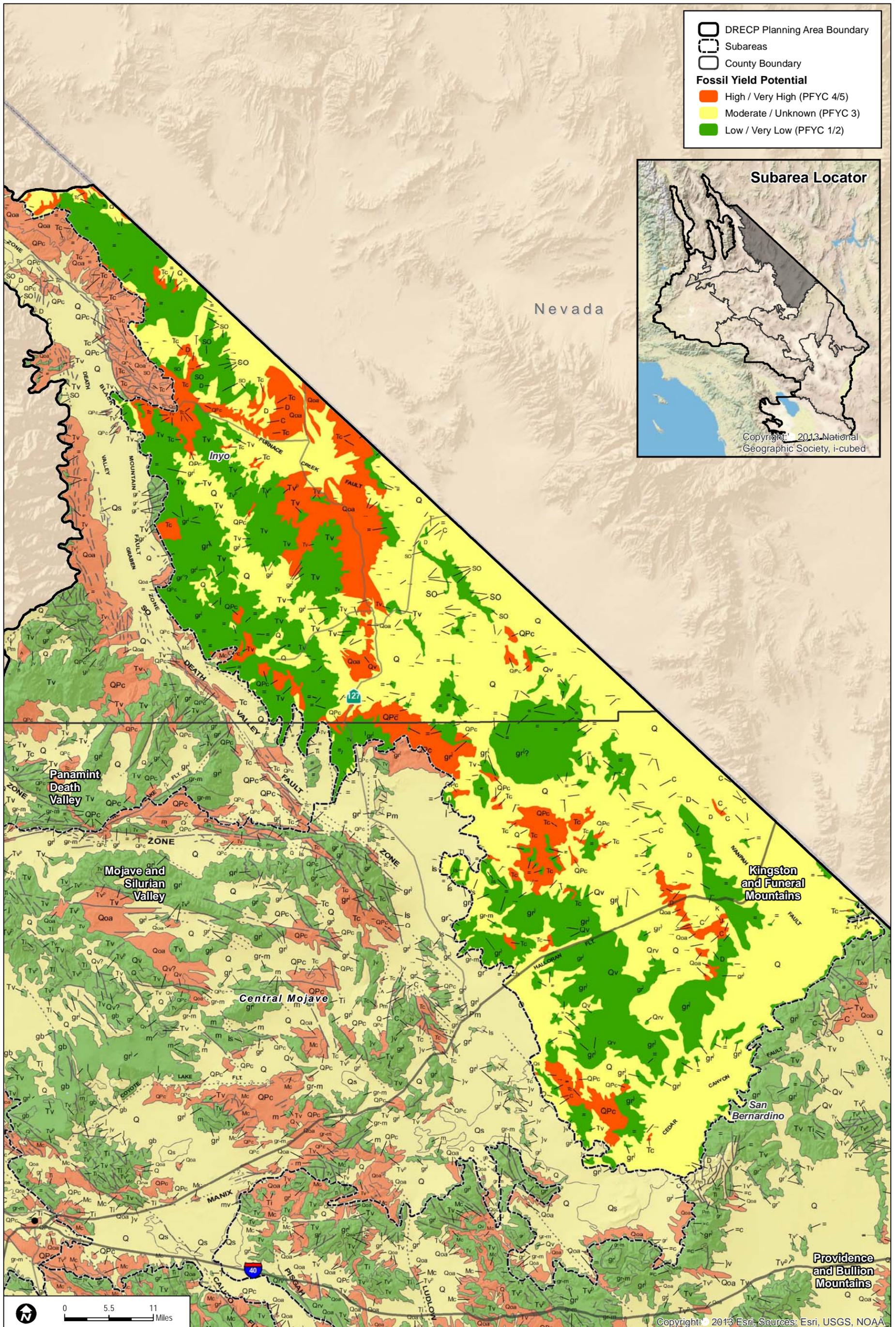
DRECP Planning Area Boundary
 Subareas
 County Boundary
Fossil Yield Potential
 High / Very High (PFYC 4/5)
 Moderate / Unknown (PFYC 3)
 Low / Very Low (PFYC 1/2)



Sources: ESRI (2014); CEC (2013); BLM (2013); CDFW (2013); USFWS (2013); CA Department of Geology (2010)

FIGURE R1.10-2

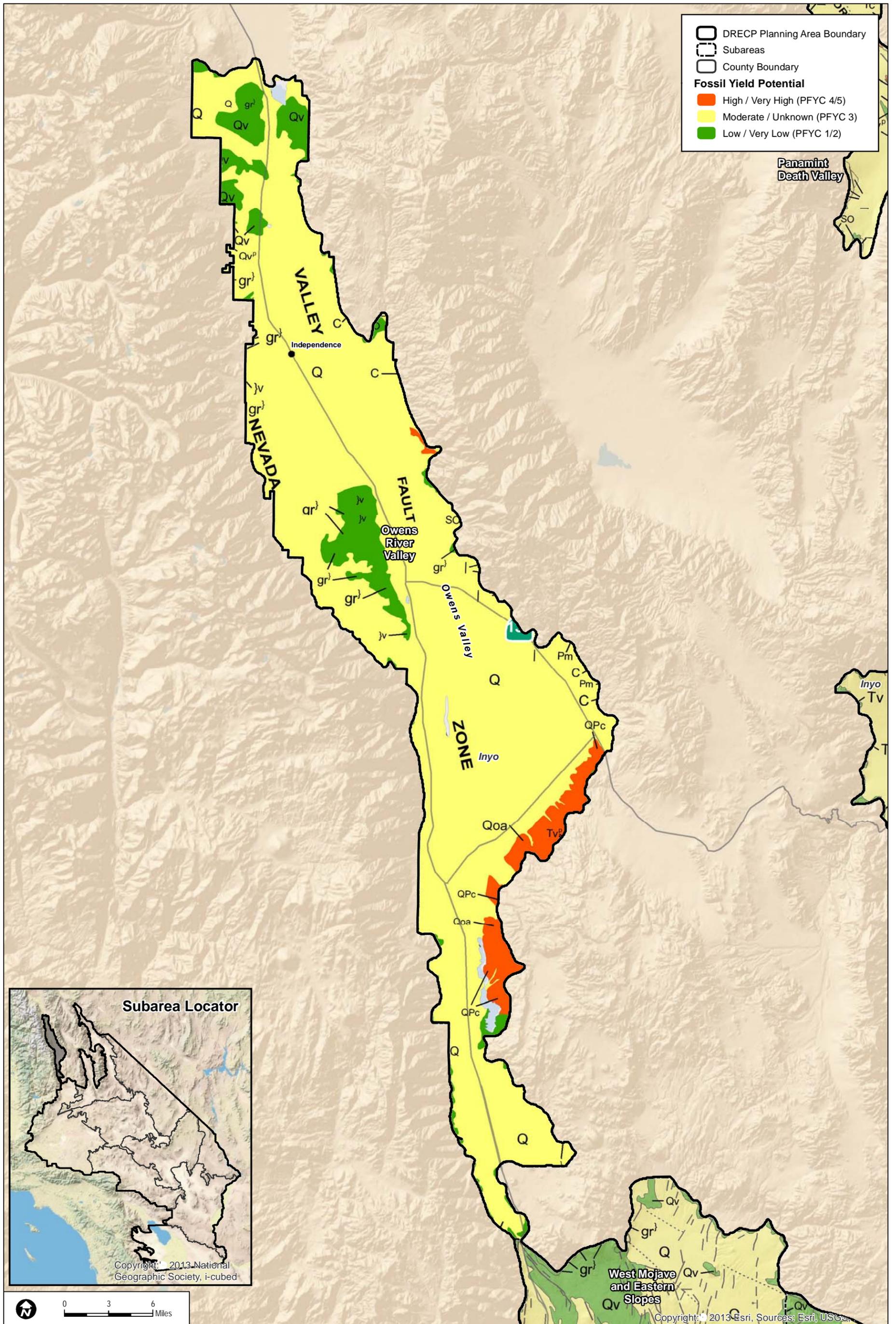
Potential Fossil Yield Classification of Geology - Imperial Borrego Valley Subarea



Sources: ESRI (2014); CEC (2013); BLM (2013); CDFW (2013); USFWS (2013); CA Department of Geology (2010)

FIGURE R1.10-3

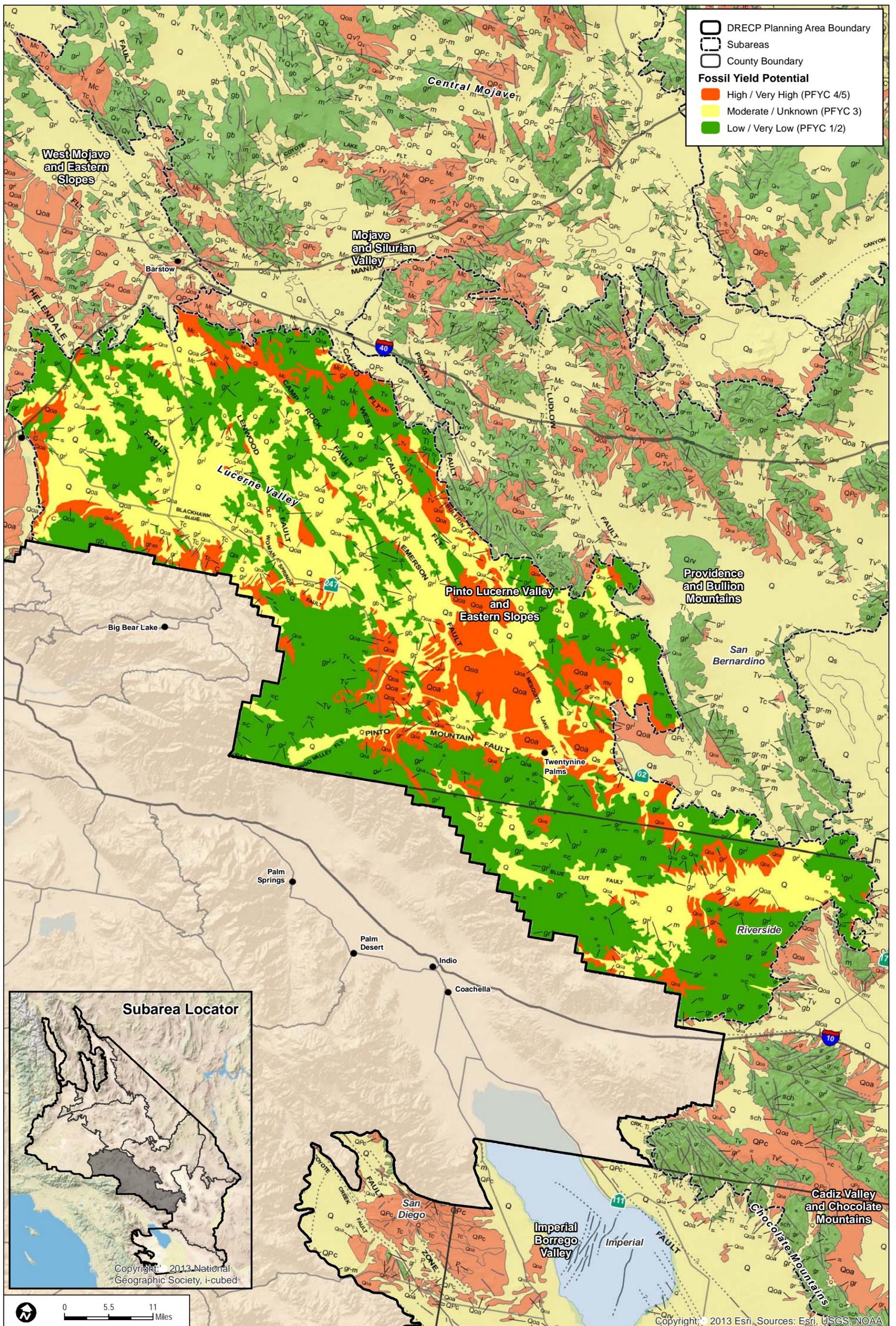
Potential Fossil Yield Classification of Geology - Kingston and Funeral Mountains Subarea



Sources: ESRI (2014); CEC (2013); BLM (2013); CDFW (2013); USFWS (2013); CA Department of Geology (2010)

FIGURE R1.10-5

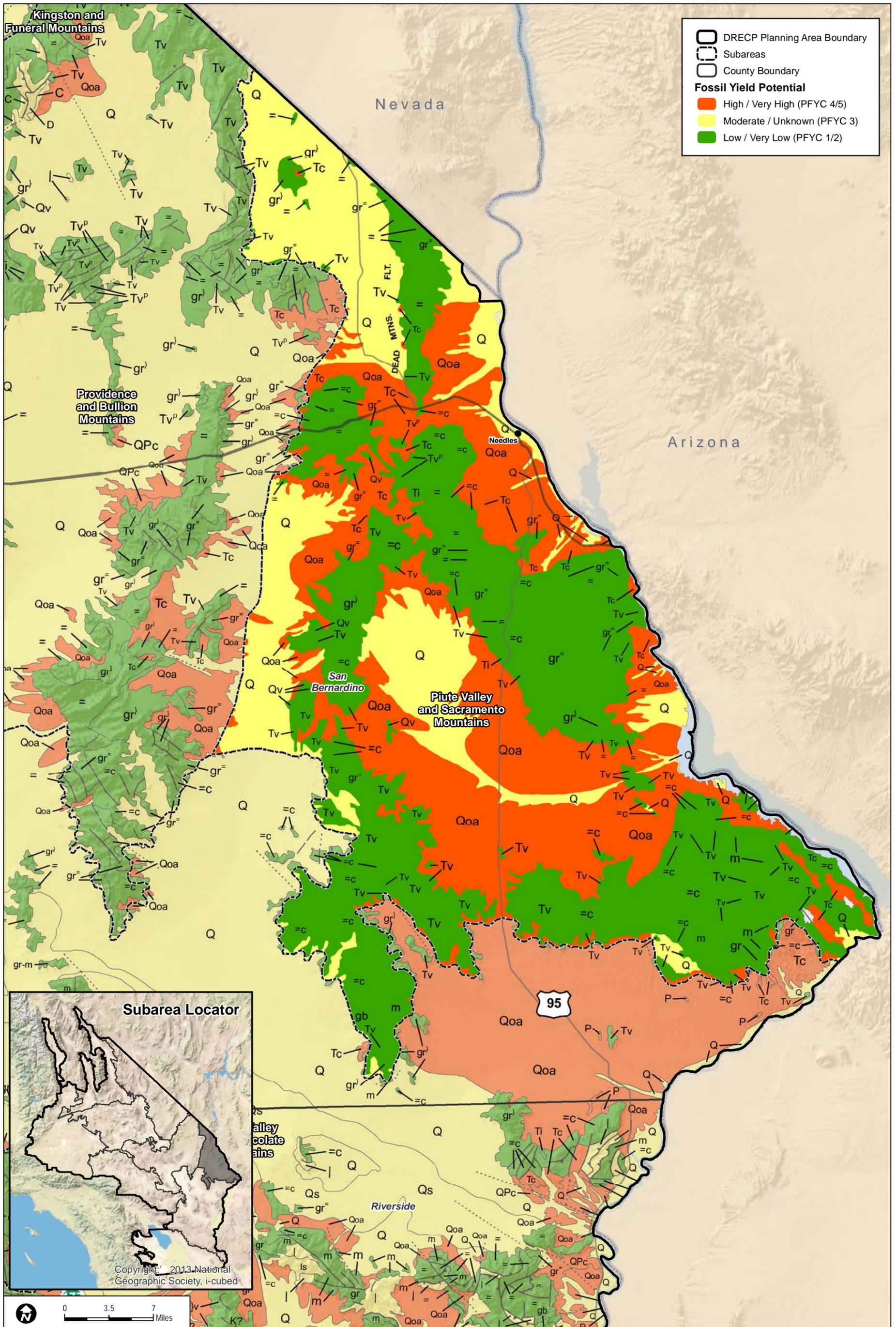
Potential Fossil Yield Classification of Geology - Owens River Valley Subarea



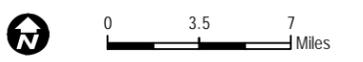
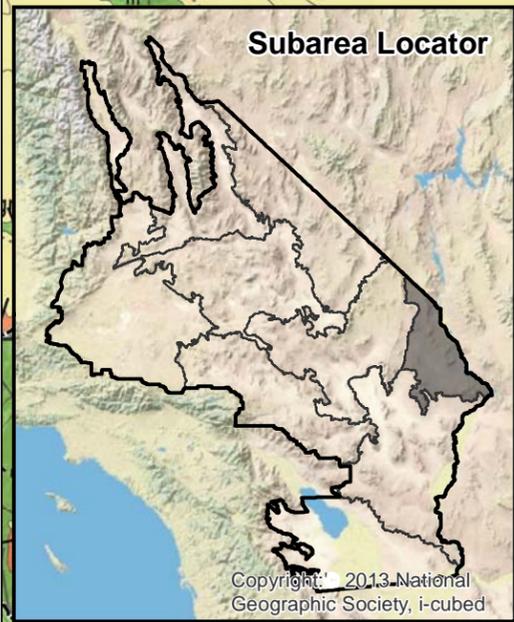
Sources: ESRI (2014); CEC (2013); BLM (2013); CDFW (2013); USFWS (2013); CA Department of Geology (2010)

FIGURE R1.10-7

Potential Fossil Yield Classification of Geology - Pinto Lucerne Valley and Eastern Slopes Subarea



DRECP Planning Area Boundary
 Subareas
 County Boundary
Fossil Yield Potential
 High / Very High (PFYC 4/5)
 Moderate / Unknown (PFYC 3)
 Low / Very Low (PFYC 1/2)



Sources: ESRI (2014); CEC (2013); BLM (2013); CDFW (2013); USFWS (2013); CA Department of Geology (2010)

FIGURE R1.10-8

Potential Fossil Yield Classification of Geology - Piute Valley and Sacramento Mountains Subarea

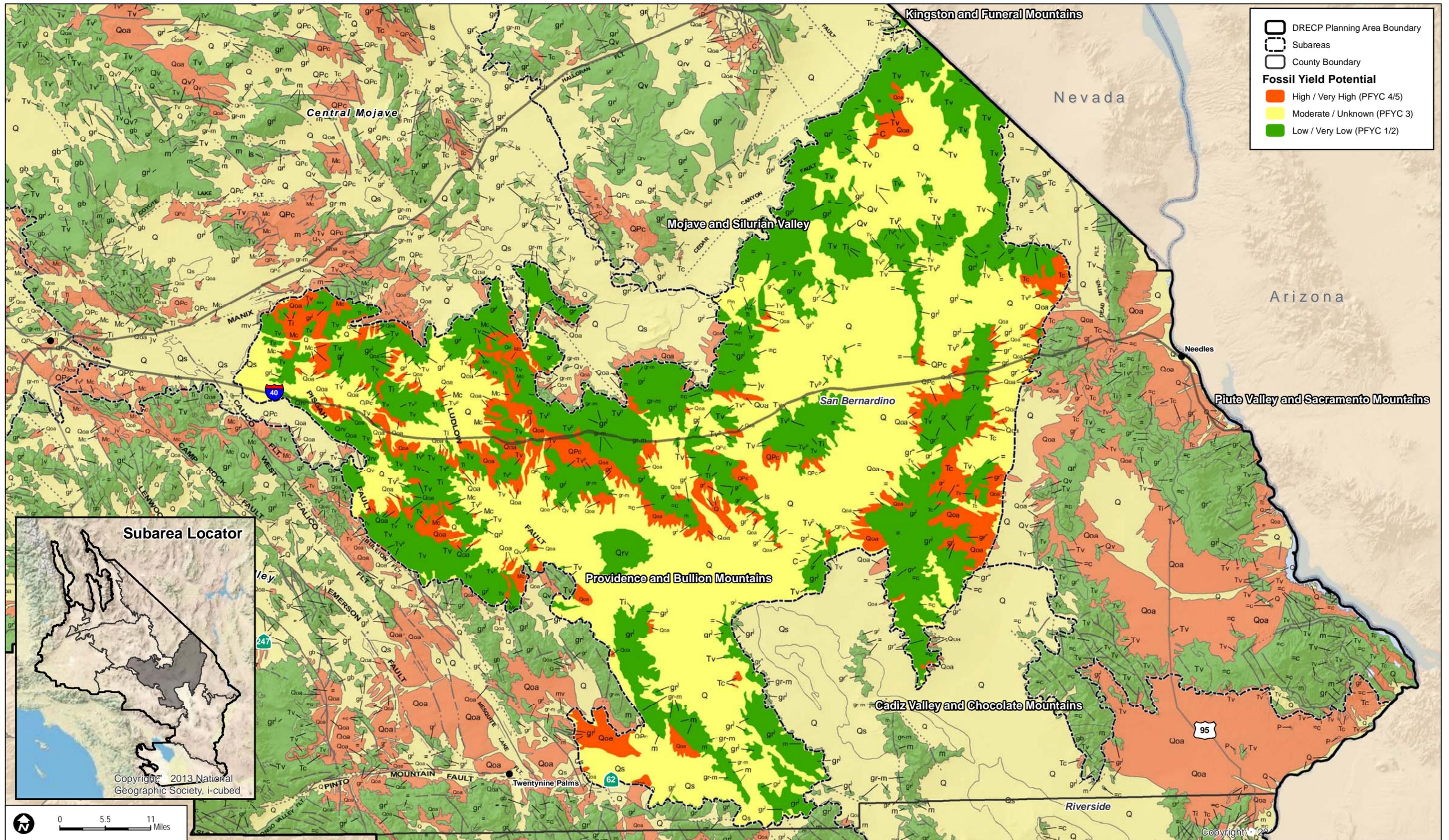
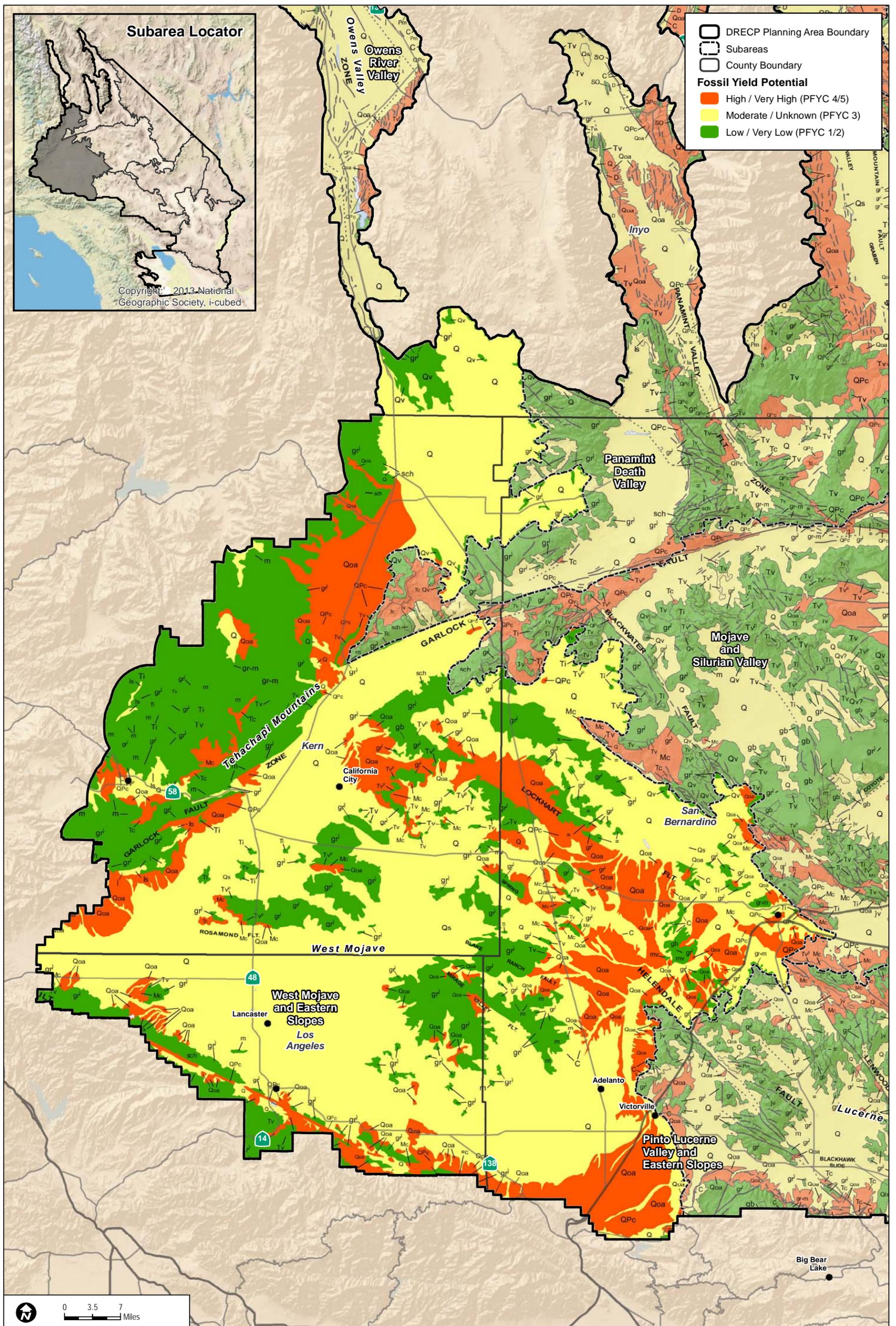


FIGURE R1.10-9
Potential Fossil Yield Classification of Geology - Providence and Bullion Mountains Subarea



Sources: ESRI (2014); CEC (2013); BLM (2013); CDFW (2013); USFWS (2013); CA Department of Geology (2010)

FIGURE R1.10-10

Potential Fossil Yield Classification of Geology - West Mojave and Eastern Slopes Subarea