

Appendix to Chapter 1

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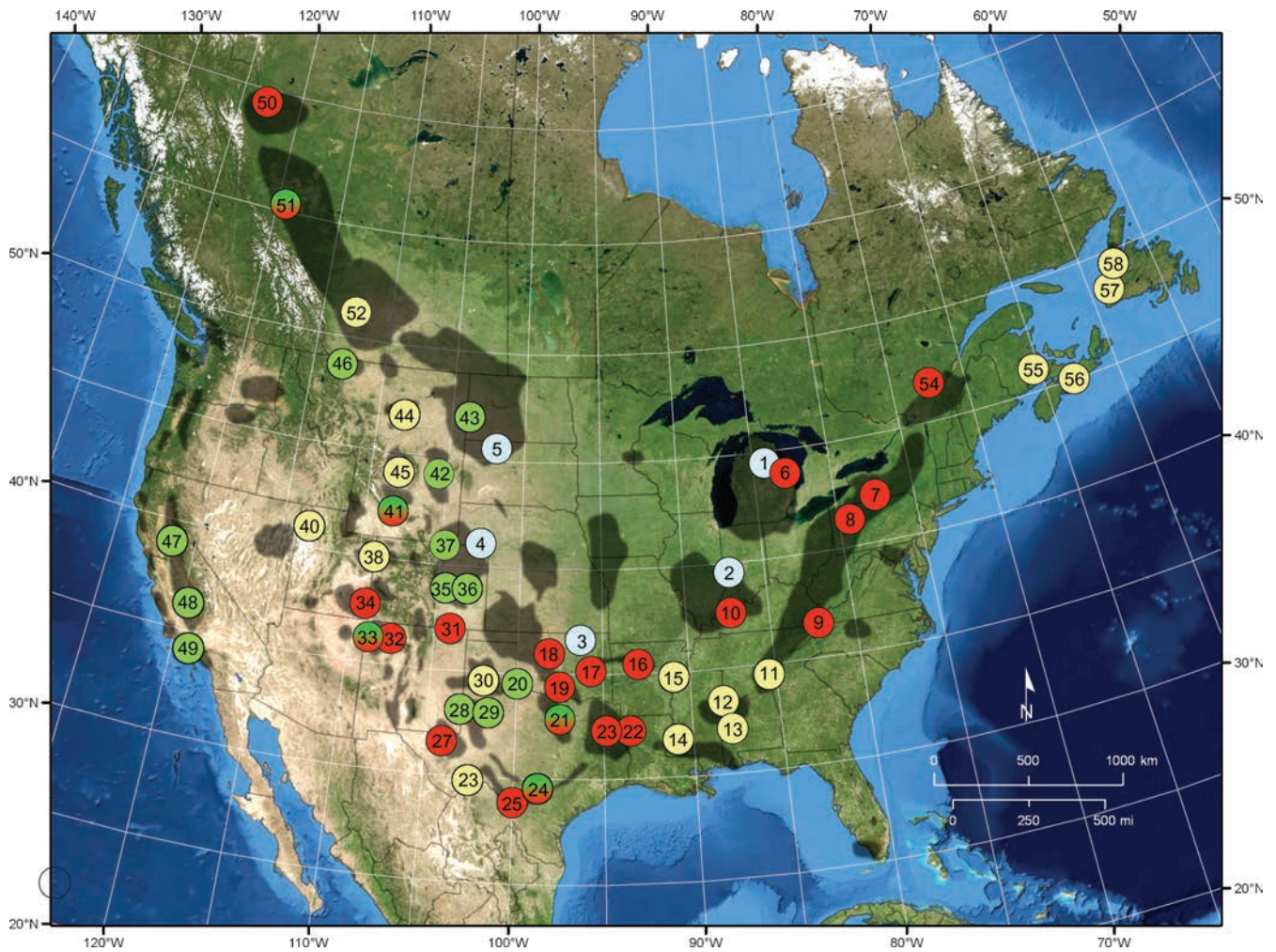


FIGURE 1. Shale resource systems in North America. See Table 1 for key.

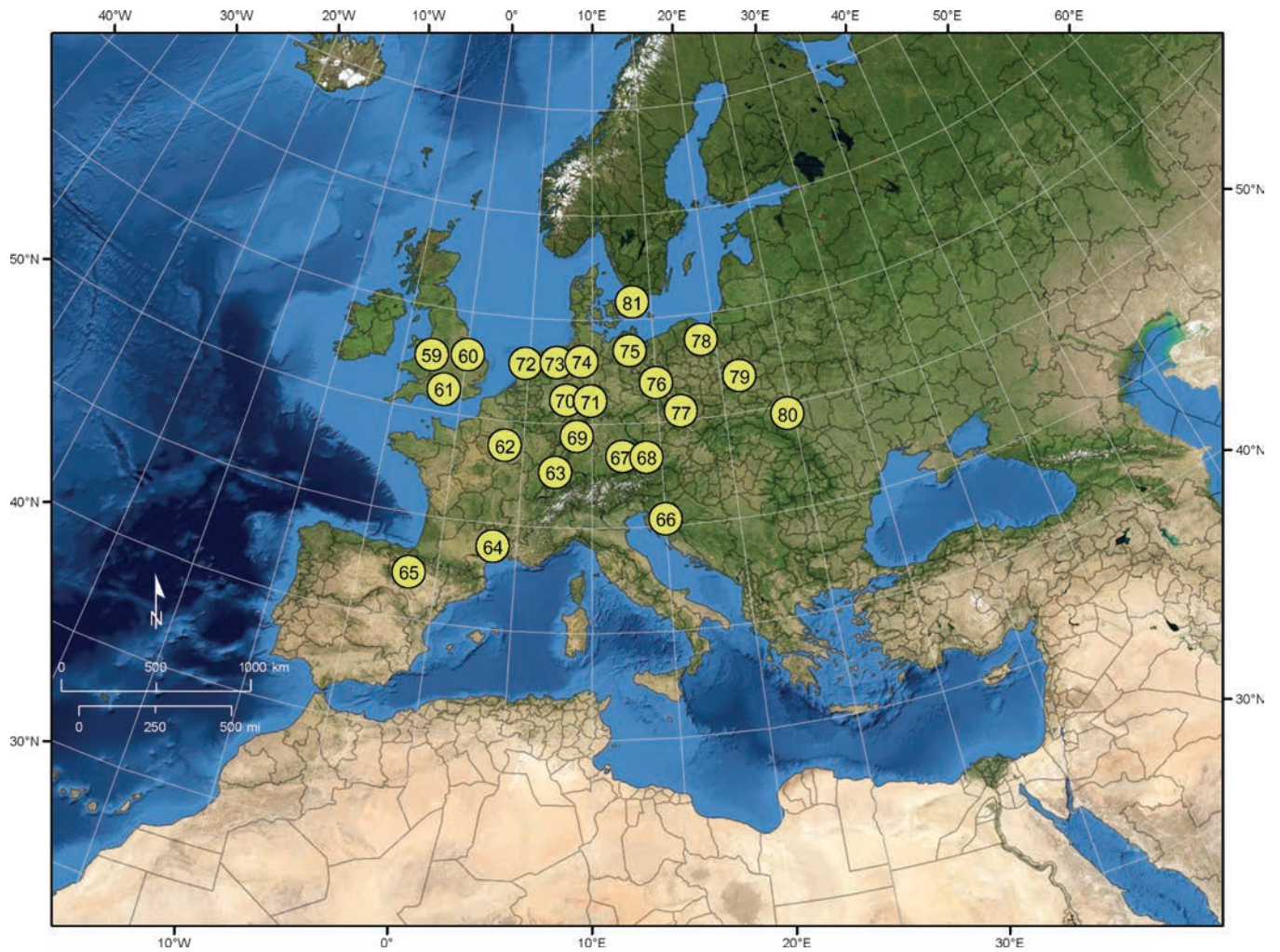


FIGURE 2. Shale resource plays in Europe. See Table 1 for key.

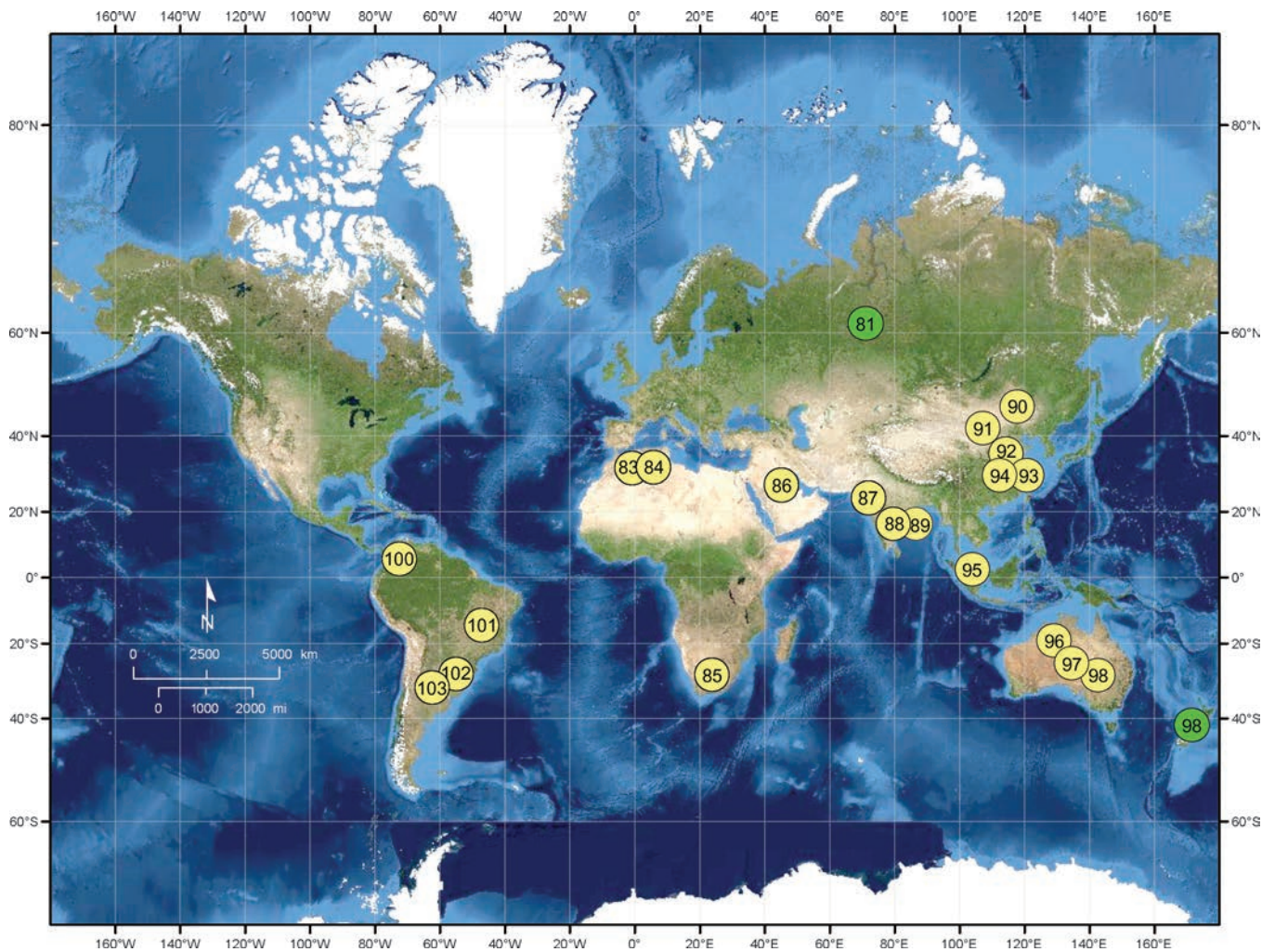


FIGURE 3. Global shale resource plays excluding North America and Europe. See Table 1 for key.

Table 1. Key to North America, Europe, and worldwide maps showing various shale resource systems.

<i>No.</i>	<i>Formation</i>	<i>Basin</i>	<i>Age</i>	<i>Location</i>	<i>Objective</i>	<i>Deposition</i>
1	Antrim	Michigan	Devonian	Michigan	BG	Marine
2	New Albany	Illinois	Devonian	Indiana	BG	Marine
3	Woodford	Cherokee	Devonian	Oklahoma	BG	Marine
4	Niobrara	Denver	Cretaceous	Nebraska	BG	Marine
5	Gammon	Williston	Cretaceous	South Dakota	BG	Marine
6	Collingwood	Michigan	Ordovician	Miami, Ohio	SG	Marine
7	Utica	Appalachian	Ordovician	New York, Pennsylvania, Ohio	SG	Marine
8	Marcellus	Appalachian	Devonian	New York, Pennsylvania, Ohio, West Virginia	HSG/SO	Marine
9	Chattanooga	Appalachian	Devonian	Tennessee	SG	Marine
10	New Albany	Illinois	Devonian	Illinois, Indiana, Kentucky	SG	Marine
11	Conasauga	Appalachian	Cambrian	Alabama	SG	Marine
12	Floyd/Neal	Black Warrior	Mississippian	Alabama, Mississippi	XSG	Marine
13	Chattanooga	Gulf Coast Salt Basin	Devonian	Alabama	SG	Marine
14	Tuscaloosa	Tuscaloosa trend	Cretaceous	Mississippi	SO	Marine
15	Fayetteville	Mississippi Embayment	Mississippian	Arkansas	XSG	Marine
16	Fayetteville	Arkoma	Mississippian	Arkansas	SG	Marine
17	Woodford/Caney	Arkoma	Devonian/Mississippian	Oklahoma	SG	Marine
18	Woodford	Anadarko (Cana)	Devonian	Oklahoma	SG/SO	Marine
19	Woodford	Ardmore	Devonian	Oklahoma	SG/SO	Marine
20	Barnett	Hollis-Hardeman	Mississippian	Oklahoma, Texas	SG	Marine
21	Barnett	Fort Worth	Mississippian	Texas	SG/SO	Marine
22	Bossier	East Texas–North Louisiana Salt	Upper Jurassic (Tithonian)	Texas, Los Angeles	SG	Marine
23	Haynesville	East Texas–North Louisiana Salt	Upper Jurassic (Kimmeridgian)	Texas, Los Angeles	SG	Marine
24	Eagle Ford	Austin Chalk trend	Cretaceous	Texas	HSG/SO	Marine
25	Pearsall	Maverick	Cretaceous	Texas	SG	Marine
26	Barnett	Marfa	Mississippian	Texas	SG	Marine
27	Woodford, Barnett, Atoka	Delaware	Devonian/Mississippian /Pennsylvanian	Texas	SG, P-SO	Marine
28	Bone Springs/Avalon/Leonard	Permian	Permian	Texas, New Mexico	SO	Marine
29	Wolfcamp	Permian	Permian	Texas, New Mexico	SO	Marine
30	Bend	Palo Duro	Pennsylvanian	Texas	XSG	Marine
31	Pierre	Raton	Cretaceous	New Mexico, Colorado	SG	Marine

Table 1. (cont.).

<i>No.</i>	<i>Formation</i>	<i>Basin</i>	<i>Age</i>	<i>Location</i>	<i>Objective</i>	<i>Deposition</i>
32	Lewis	San Juan	Cretaceous	New Mexico, Utah	HSG	Marine
33	Mancos	San Juan	Cretaceous	New Mexico, Utah	SG/SO	Marine
34	Gothic, Hovenweep, Cane Creek	Paradox	Permian	Utah	SG	Marine
35	Pierre	Denver	Upper Cretaceous		fSO	Marine
36	Cherokee/Atoka	Denver	Pennsylvanian	Colorado	SO	Marine
37	Niobrara	Denver	Cretaceous	Colorado, Wyoming	HSO	Marine
38	Mancos	Piceance/Uinta	Cretaceous	Colorado, Utah	SG	Marine
39	Baxter	Vermillion	Cretaceous	Wyoming	SG	Marine
40	Manning Canyon/ Chainman	Basin and Range/Oquirrh	Upper Mississippian/ lowermost Pennsylvanian	Utah	SG	Marine
41	Waltman	Wind River	Paleocene	Wyoming	SG/SO	Lacustrine
42	Mowry	Big Horn	Cretaceous	Wyoming	SO	Marine
43	Bakken	Williston	Upper Devonian/Late Mississippian	Montana, North Dakota, Alberta, Canada	HSO	Marine
44	Heath	Central Montana trough	Mississippian	Montana	P-SO	Marine
45	Cody/Mowry	Big Horn	Cretaceous	Wyoming	P-SO	Marine
46	Bakken/Exshaw	Western Canada	Devonian	Montana, Alberta, Canada	SO	Marine
47	Antelope	San Joaquin	Miocene	California	SO	Marine
48	McLure	San Joaquin	Miocene	California	SO	Marine
49	Monterey	Santa Maria	Miocene	California	fSO	Marine
50	Muskwa	Horn River	Devonian	Canada	SG	Marine
51	Montney	Western Canada	Triassic	Canada	HSG/SO	Marine
52	Duvernay/Ireton	East Shale, western Canada	Upper Devonian	Alberta, Canada	SO	Marine
53	Bakken	Williston	Devonian	Canada	HSO	Marine
54	Utica	Quebec	Ordovician	Canada	SG	Marine
55	Frederick Brook	Maritimes/Moncton sub.	Late Carboniferous	New Brunswick, Canada	P-SG	Lacustrine
56	Horton Bluff	Windsor	Devonian–Lower Mississippian	Nova Scotia, Canada	P-SG	Lacustrine
57	Green Point	Maritimes/Elgin sub.	Cambrian–Ordovician	Newfoundland, Labrador, Canada	P-SG	Lacustrine
58	Rocky Brook	Maritimes/Deer Lake sub.	Mississippian	New Brunswick, Canada	P-SG	Lacustrine
59	Bowland/Holywell	Cheshire	Namurian (Mississippian)	North West England	P-SG-SO	Marine
60	Dinantian shales	Midlands	Namurian (Mississippian)	North East England	P-SG-SO	Marine
61	Liassic shales/Kimmeridge	Weald	Upper Jurassic	South England	SO	Marine
62	Toarcian	Paris	Upper Jurassic	France	HSO	Marine
63	Autunian shale	Lodeve	Late Permian	France	P-SG	Lacustrine
64	Devonian shale	Ales (Bassin d'Ales)	Devonian	South France	P-SG	Marine

65	Liassic shale	Ebro	Late Jurassic (Liassic)	Spain	P-SG	Marine
66	Miocene shale	Drava Depression	Miocene	Croatia	P-SG	Marine
67	Mikulov	Vienna	Malmian	Austria	P-SG	Marine
68	Posidonia	Molasse	Late Jurassic	Austria	P-SG	Marine
69	Permo-carboniferous shales	Bodensee trough	Permian/Carboniferous	South Germany	P-SG	Lacustrine
70	Wealden	Northwest German/ Lower Saxony	Late Cretaceous	Germany	P-SG-SO	Marine
71	Posidonia	Northwest German/ Lower Saxony	Late Jurassic	Germany	P-SG-SO	Marine
72	Epen	Anglo-Dutch	Namurian (Mississippian)	Netherlands	P-SG	Marine
73	Namurian shale	Northwest German	Namurian (Upper Mississippian/ Late Pennsylvanian)	Northwest Germany	P-SG	Marine
74	Kellwasser shale	Northwest German	Upper Devonian	North Germany	P-SG	Marine
75	Visean shale	Northeast German-Polish	Visean	Northeast Germany	P-SG	Marine
76	Zechstein	South Permian	Permian	Germany, Poland	P-SG	Marine
77	Kulm	Carpathians (Poland)	Carboniferous	Poland	P-SG	Marine
78	Graptolitic shale	Baltic	Late Silurian	Poland	P-SG	Marine
79	Graptolitic shale	Lublin	Late Silurian	Poland	P-SG	Marine
80	Rudov Bed (Late Visean)	Dnieper Donets	Carboniferous	Ukraine	P-SG	Marine
81	Alum	Scania	Cambrian–Ordovician	Sweden, Denmark	P-SG	Marine
82	Bazhenov	West Siberia	Upper Jurassic	Russia	fSO	Marine
83	Paleozoic shales	Berkine	Silurian–Devonian	Algeria	P-SG	Marine
84	Tannezuft	Ghadames	Silurian	Tunisia	P-SG	Marine
85	Whitehill	Karoo	Permian	South Africa	P-SG	Marine
86	Quisaba	Arabian Plat	Silurian	Saudi Arabia	P-SG	Marine
87	Cambay shale	Cambay	Middle Eocene	India	P-SG	Marine
88	Permian shale	Damodar	Permian	India	P-SG	Marine
89	Sylhet/Kopili	Assam-Arakan	Eocene	India	P-SG	Marine
90	Wufeng/Longmaxi	Sichuan	Upper Ordovician/Late Ordovician	China	P-SG	Marine
91	Various shales	Ordos	Jurassic, Triassic, Carboniferous	China	P-SG	Lacustrine
92	Badaowan	Junggar	Jurassic	China	P-SG	Lacustrine
93	Qingshankou	Songliao	Mesozoic	China	P-SO	Lacustrine
94	Mangya Sag	Qaidam	Tertiary	China	P-SO	Lacustrine
95	na	na	na	Indonesia	P-SG	na
96	Kyalla and Velkerri shales	Beetaloo	Mesoproterozoic	Australia	SG	Marine
97	Toolebuc	Galileo	Late Cretaceous	Australia	P-SG	Lacustrine
98	Roseneath	Cooper	Permian	Australia	P-SG	Marine
99	Waipawa and Whangai	East Coast	Upper Paleocene/lower Eocene, Upper Cretaceous/ lower Paleocene	New Zealand	SO	Marine

Table 1. (cont.).

No.	Formation	Basin	Age	Location	Objective	Deposition
100	La Luna	Magdalena	Cretaceous	Colombia	P-SO	Marine
101	Pimenteiras	Parnaiba	Devonian	Brazil	P-SG	Marine
102	Cordobes	Norte	Devonian	Uruguay	P-SO	Marine
103	Vaca Muerta	Neuquin	Upper Jurassic/Lower Cretaceous	Argentina	P-SG-SO	Marine

BG = biogenic shale-gas resource system; SG = shale-gas resource system; SO = shale-oil resource system; P-SG = prospective for shale-gas resource system; P-SO = prospective for shale-oil resource system; P-SG-SO = prospective for shale-gas or shale-oil or both resource systems; XSG = has not worked to date as a shale-gas resource system; H = hybrid; f = fractured; sub. = subbasin; na = not available.