

Notes and References Cited

This part of volume 4 (1939–61) contains the endnotes followed by the list of references cited. Mary C. Rabbitt's volumes 1 ("Before 1879"), 2 (1879–1904), and 3 (1904–1939) appeared in large quarto as USGS unnumbered special books (Rabbitt, 1979, 1980, 1986); they also are online in the USGS Publications Warehouse at <http://pubs.er.usgs.gov/publication/800000> (volume 1), <http://pubs.er.usgs.gov/publication/800002> (volume 2), and <http://pubs.er.usgs.gov/publication/800003> (volume 3). Mary Rabbitt (1989) provided a brief overview of USGS history before 1985.

The notes, separately numbered for each chapter in volume 4, identify the sources of materials used in preparing the narrative analysis. The sources quoted directly include the U.S. Statutes at Large (Stat. L.); presidential addresses, messages, proclamations, and related public papers; Executive orders (Ex. O.); the Federal Register (Fed. Reg.); Interior Secretarial orders (Secr. O.); Survey (USGS) orders (Surv. O.); the Congressional Record (Cong. Rec.); the hearings held by the House and Senate subcommittees responsible for approving Interior Department and USGS budget requests; other congressional documents; treaties and agreements; and U.S. Supreme Court decisions. Many of these documents also are available on the Web by subscription at HeinOnline and at ProQuest Congressional Collections and in Readex's U.S. Congressional Serial Set. Many of the executive branch documents are in the printed volumes of the Public Papers and Addresses (PPA) for each year of the Presidencies of Herbert Hoover, Franklin D. Roosevelt (FDR), Harry S. Truman (HST), and Dwight D. Eisenhower (DDE). The PPA volumes, also available at HeinOnline, are cited herein by the last names of their compilers and editors: Jean Eisinger, Faye Rosser, and Michael Sullivan (Hoover); Samuel Rosenman (FDR); and Warren Reid and others (HST and DDE). Some of their documents plus others are in the Public Papers of the Presidents of the United States (PPPUS), part of John Woolley's and Gerhard Peters' American Presidency Project (1999–) at the University of California at Santa Barbara (UCSB), at www.presidency.ucsb.edu/ws.

Quotations from the annual reports of the Secretary of the Interior and of the Director of the U.S. Geological Survey and from other USGS serial publications are cited, but paraphrased sections are not referenced. All USGS books, maps, and charts issued between 1879 and December 1961 are listed in the compilation by the U.S. Geological Survey (1964a); of them, only those providing quotes or figures or otherwise cited are among the references cited in volume 4. These internal and many of the external publications by USGS authors also are listed in the USGS Bulletins [937 [1929–39], 1049 [1940–49], 1195 [1950–59], 1196 [1960], 1197 [1961], and 1232 [1962]] that form the

Bibliography of North American Geology for 1929–62. Most of the USGS publications now are available online in the Publications Warehouse at <http://pubs.er.usgs.gov>.

The USGS Water Resources Division's internal history covers the years to 1994 in three mimeographed and five printed volumes. In this set, Follansbee (1954), Ferguson and others (1990), and Hudson and others (1996) combined to treat the 1939–61 interval. Gere (1979) contains a brief history of the USGS Conservation Division, from its founding to 1979, 3 years before its transfer to form Interior's Minerals Management Service (since 2011, in part, the Bureau of Ocean Energy Management). The text of the USGS Topographic Division's mimeographed internal history covered mapping by direct predecessor surveys from 1867 to 1879 and work by the USGS Division from 1879 to 1954; it was completed in 1954 for the USGS' 75th anniversary and was published without significant modification as Evans, R.T., and Frye (2009). All reports prepared during 1942–61 by USGS military geologists for the U.S. Army Corps of Engineers are listed in Bonham and Leith (1997). The USGS Pick and Hammer Club shows were held during 1904–1986 in Washington, D.C.; Denver, Colorado; Menlo Park, California; and Reston, Virginia, and programs (G(226)/P58p) are in the Rare Book Room (RBR) in the USGS Library in Reston.

Volume 4, like its three predecessors, is a framework history that depends heavily on printed primary and secondary sources for its national and international context. Gilbert, Martin (1997, 1999), Howard and Louis (1998), Reynolds (1999), Roberts, J.M. (1999), and Stearns, P.N. (2001), provided principally international perspectives. Kissinger (1994) and McCormick (1995) held useful information about diplomacy. Boorstin (1973), Manchester (1973), Burns, J.M. (1989), Cohen, W.I. (1993), Morris, J.B., and Morris, R.B. (1996), Patterson (1996), Kennedy, David (1999), and Boyer (2001) furnished mostly national overviews. Significant biographies and administration histories consulted for three presidents include the following: for FDR, McJimmsey (2000) and Smith, J.E. (2007); for HST, McCoy (1984) and McCullough (1992); and for DDE, Ambrose (1983, 1984), Pach and Richardson (1991), and Smith, J.E. (2012). Hall (2002, 2005, 2009) and Zelizer (2004) supplied historical overviews of the U.S. Congress, the U.S. Supreme Court, and American jurisprudence. Millett and Maslowski (1984), Chambers (1999), and Holmes (2001) provided military perspective, and Rothenberg (2001) supplied a similar overview of the history of science. Cohen, S.B. (1998), furnished a global guide to place names.

Of the several manuscript collections also consulted, the most important was Record Group (RG) 57 (USGS) maintained by the National Archives and Records Administration (NARA) in College Park, Maryland, at the building known informally as

Archives II (NARA II). The inventory of RG 57 by Jaussaud (2000) included the documents accessioned there through 1997. The holdings at NARA's regional archives have not yet been added to the inventory, but see Ulibarri (1982) for a guide to Alaskan documents in Federal archives. Matchette and others (1995) provided a guide to other Record Groups, and Ashby and others (1971) and Ehrenberg (1987) furnished guides to cartographic collections at NARA and elsewhere in the Washington, D.C., area. Some of the photographs reproduced in volume 4 likewise may be found in the USGS Denver Library Photographic Collection. As in the preceding volumes, images in volume 4 were chosen principally from USGS publications to show the development of the techniques of USGS scientific illustration, as well as the agency's contributions to science and technology. Although the reproduction quality of some older images does not meet digital standards, the figures are still significant historically. Burger (1990) provided a guide to the collections in NARA's Still Picture Branch.

For additional biographical information about the persons mentioned in volume 4, readers may wish to consult entries in the volumes of *American Men and Women of Science*, the *American National Biography*, the *Biographical Directory of the United States Congress*, *Biography and Genealogy Master Index* (2d edition, with culmination and yearly volumes), the *Dictionary of American Biography*, the *Dictionary of Scientific Biography*, the *National Cyclopedia of American Biography*, the *New Dictionary of Scientific Biography*, *Notable American Women*, and *Who Was Who in America*. Several of these biographical compilations also are available online. Other biographical information is in the memoirs and memorials series of the National Academy of Sciences (NAS) and the Geological Society of America (GSA), and in the individual articles published in the serial periodicals issued by other professional societies of science and engineering.

Notes

Title Page

The title of this series, "Minerals, Lands, and Geology for the Common Defence and General Welfare," is based on article I, section 8 of the Constitution, which provides that "The Congress shall have Power To lay and collect Taxes, Duties, Imposts and Excises, to pay the Debts and provide for the common Defence and general Welfare of the United States." This section authorizes the appropriation and expenditure of public funds for scientific research. (Quotation from Morris, J.B., and Morris, R.B., 1996, p. 1194.)

Chapter 1. Prologue: U.S. Geological Survey Mandates, 1879–1939

¹Shakespeare, "The Tempest," Act 2, Scene 1: Wells, Stanley, and others, 1987, v. 2, p. 968, lines 258–259 (reproduced by permission of Oxford University Press).

²This and the preceding quotation: USGS Organic Act, U.S. Statutes at Large (Stat. L.), v. 20, p. 394, March 3, 1879 (hereinafter 20 Stat. L., 394).

³Indian lands are now known as Native American tribal lands.

⁴22 Stat. L., 329, August 7, 1882.

⁵Ibid.

⁶25 Stat. L., 526, October 2, 1888.

⁷Ibid., 527.

⁸28 Stat. L., 398, August 18, 1894.

⁹28 Stat. L., 900, March 2, 1895.

¹⁰30 Stat. L., 623, July 1, 1898.

¹¹32 Stat. L., 388, June 17, 1902.

¹²40 Stat. L., 145, June 12, 1917.

¹³This and the preceding quotation: 33 Stat. L., 1187, March 3, 1905.

¹⁴Coolidge, Executive Order (Ex. O.) 4239, June 4, 1925.

¹⁵See McCartney (2008) to supplement and extend the analysis in Noggle (1962), which also is cited in Rabbitt, M.C. (1986).

¹⁶43 Stat. L., 1011, February 27, 1925.

¹⁷44 Stat. L., 486, May 10, 1926.

¹⁸Ibid.

¹⁹45 Stat. L., 232, March 7, 1928.

²⁰This and the two preceding quotations: Mendenhall, 1929, p. 12.

²¹Hoover, State of the Union Message to Congress, December 3, 1929; Eisinger, Rosser, and Sullivan, 1974, p. 432; also in HeinOnline and in PPPUS 1929/document 295 (hereinafter 1929/295).

²²46 Stat. L., 1147, February 14, 1931.

²³47 Stat. L., 119, April 22, 1932.

²⁴Ickes, Secretarial Order (Secr. O.) 678, September 12, 1933.

²⁵48 Stat. L., 1269, June 28, 1934; amended by 49 Stat. L., 1976, June 26, 1936. Franklin D. Roosevelt's Ex. O. 6910, November 26, 1934, withdrew the lands for classification to facilitate administration of the new law's provisions. See Rosenman, 1938, p. 477–478; also in HeinOnline and in PPPUS 1934/192.

²⁶48 Stat. L., 1269, June 28, 1934.

²⁷Ibid., 1272.

²⁸Mendenhall, January 20, 1938, *in* Hearing before Subcommittee on Interior Department, House Committee on Appropriations (hereinafter House hearing), 75th Congress, 3d session, p. 390.

²⁹53 Stat. L., 811, June 7, 1939.

³⁰Ibid., 812.

³¹Bruce, 1987, p. 4.

Chapter 2. Pursuing Simultaneous Courses, 1939–1941

¹FDR, commencement address, University of Virginia, June 10, 1940: Rosenman, 1941b, p. 264; reproduced in HeinOnline, from which differ slightly the versions in the Cong. Rec., v. 86, pt. 16, appendix, p. 3741, and in the PPPUS 1940/59.

²The German-Soviet trade and nonaggression pacts of August 20–23, 1939, facilitated the German invasion of Poland; see Read and Fisher (1988).

³Mendenhall, December 11, 1935, *in* House hearing, 74th Cong., 2d sess., p. 240.

⁴Dugan and Lafore, 1973, p. 184. For the significance of the Ethiopian and earlier and later crises in the history of the League of Nations, see Bendiner (1975). Italy withdrew from the League on December 11, 1937. For an evaluation of Mussolini, see Bosworth (2002).

⁵For the history of the Third Reich, see Shirer (1960) and Evans, R.J. (2004, 2005, 2009). For an evaluation of Hitler, see Kershaw, Ian (1998, 2000). Germany and Japan withdrew from the League of Nations in 1933.

⁶Mendenhall, January 20, 1938, *in* House hearing, 75th Cong., 3d sess., p. 390.

⁷52 Stat. L., 809, June 21, 1938, provided \$965 million for the Public Works Administration.

⁸Eckes (1979, p. 58), drawing on works primarily by Leith and Emeny, listed as most important chromite, coal, copper, iron, manganese, mica, nickel, oil, tin, and tungsten. Emeny (1934, plates) noted that America remained especially dependent on imports of antimony, chromite, manganese, nickel, tin, tungsten, and rubber.

⁹Barnhart (1987) analyzed Japan's drive for autarky.

¹⁰Leith, 1939, p. 441. See also Leith (1940).

¹¹Leith, 1939, p. 442.

¹²*Ibid.*

¹³See Beevor (2006). For an evaluation of Franco, see Preston (1994).

¹⁴This and the preceding quotation: 52 Stat. L., 235–236, April 26, 1938.

¹⁵53 Stat. L., 770, May 25, 1939.

¹⁶53 Stat. L., 722, May 10, 1939, not including the \$7,000 provided for stationery and the \$6,000 for the purchase or exchange of books during the year (*ibid.*, p. 688). 53 Stat. L., 697, May 10, 1939, authorized the Office of Indian Affairs (renamed a Bureau in 1947) to transfer to the USGS \$116,000 for examining mineral deposits, inspecting mines, and supervising mining operations on Indian lands; \$100,000 actually was provided.

¹⁷53 Stat. L., 811, June 7, 1939.

¹⁸The USBM and the USGS quickly explored, as Eckes (1979, p. 103) noted, for high-grade deposits of antimony, chrome, manganese, mercury, mica, nickel, quartz crystals, tin, and tungsten. Under the Strategic and Critical Materials Act, Congress subsequently approved an additional \$60 million.

¹⁹53 Stat. L., 812, June 7, 1939. On August 11, 1939, 53 Stat. L., 1407, facilitated “the exchange of surplus [domestic] agricultural commodities * * * for reserve stocks of strategic and critical materials produced abroad.”

²⁰53 Stat. L., 1317, August 9, 1939. A subsequent section (p. 1326–1327) allotted \$10 million to the Procurement Division in the Treasury Department's Branch of Supply “for the acquisition, transportation, maintenance, storage, and rotation of strategic and critical materials in accordance with * * * the Act of June 7, 1939.”

²¹In the appropriations hearing on February 9, 1940, the USGS reported a grand total of \$6,713,000 in funds available for fiscal year 1939–40, which would not end until June 30, 1940. The USGS *Annual Report* for that fiscal year (published by February 6, 1941) listed \$7,246,000 in funds available versus \$6,880,000 in obligations for the whole agency, leaving a balance of \$366,000. In addition to Branch totals given in this chapter's text, the *Annual Report* includes \$150,000 for salaries of Director's Office personnel, \$474,000 for publishing (printing and binding texts, preparation of illustrations, and engraving and printing geologic and topographic maps), and \$82,000 in funds for purposes not identified by Branch but likely intended for topographic and water-resources work.

²²FDR, fireside chat, by radio to the Nation, September 3, 1939: Rosenman, 1941a, p. 463; PPPUS 1939/120. On September 5, Ex. O. 8233 prescribed regulations governing neutrality enforcement.

²³Rosenman, 1941a, p. 463.

²⁴*Ibid.*, p. 461–462.

²⁵FDR, Ex. O. 8248, September 8, 1939: Rosenman, 1941a, p. 491; PPPUS 1939/127.

²⁶This and the preceding quotation: FDR, address to Congress, September 21, 1939, *in* Cong. Rec., v. 85, pt. 1, p. 11; Rosenman, 1941a, p. 517; PPPUS 1939/132.

²⁷54 Stat. L., 10, November 4, 1939.

²⁸This and subsequent totals for the funds available to the Branches for fiscal year 1939–40 include direct appropriations, transfers, repayments, and adjustments.

²⁹53 Stat. L., 1317, August 9, 1939. On June 7, 1939, 53 Stat. L., 812, provided for the transfer to the USGS of \$150,000 from the USBM's appropriation intended to increase the acquisition of strategic and critical minerals. This latter sum was not listed in the USGS *Annual Report* as being received.

³⁰Reserve data from American Gas Association and American Petroleum Institute, 1946, table 3, p. 10. Production data from DeGolyer and MacNaughton, 1990, p. 20.

³¹USGS Pick and Hammer Club show program, March 1, 1940, “Persons” and song 1; copies are in the Rare Book Room (RBR) in the USGS Library in Reston, Va.

³²*Ibid.*, song 5.

³³*Ibid.*, song 6. Henry (“Fergie”) Ferguson reviewed all manuscripts in Hewett's Section.

³⁴*Ibid.*

³⁵Ickes, Secretarial Order (Secr. O.) 1415, August 16, 1939. The U.S. Department of the Interior's Library in Washington, D.C., contains a complete run, in paper and microfilm copies, of these orders.

³⁶For a dictionary of Alaska place names, see Orth (1967).

³⁷The Public Roads Administration (PRA) was the former Bureau of Public Roads, renamed and transferred from the Agriculture Department to join the Public Buildings Administration, the Public Works Administration (PWA), the Work Projects Administration (WPA, known

from 1935 to 1939 as the Works Progress Administration), and the Federal Housing Administration in the new Federal Works Agency on July 1, 1939. FDR terminated the PWA in 1943.

³⁸For an overview of the historical development of photogrammetric methods, see Blachut and Burkhardt (1988). Gruner (1962) summarized the Multiplex's history, and Struck (1952) compared the Multiplex, Kelsh, and Wild Autograph plotters.

³⁹In 1941, the Bureau of the Budget established the original accuracy standards for map production, including 1/40 of an inch horizontal tolerance for 1:24,000 maps. Thompson (1988, p. 102–104) discussed these standards and their revisions in 1943 and 1947.

⁴⁰For a brief history of classifying lands for water-power and water-storage sites, see Lawrence, F.F., Nordeen, and Pumphrey (1957).

⁴¹California's NPR-1 (Elk Hills) covered nearly 39,000 acres, and its NPR-2 (Buena Vista) held more than 29,000 acres. The Conservation Branch also supervised shut-in production within the 9,500 acres of NPR-3 (Teapot Dome) in Wyoming north of Casper. NPR-4, which encompassed about 23 million acres in northwestern Alaska (north of the Brooks Range), awaited detailed exploration.

⁴²The League of Nations expelled the Soviet Union on December 14, 1939, an act that Bendiner (1975, p. 397) thought futile.

⁴³FDR, State of the Union Message to Congress, January 3, 1940: Rosenman, 1941b, p. 2; PPPUS 1940/1.

⁴⁴Rosenman, 1941b, p. 5.

⁴⁵*Ibid.*, p. 6.

⁴⁶Leavy, February 19, 1940, *in* Cong. Rec., v. 86, pt. 13, Appendix, p. 837.

⁴⁷This and the four preceding quotations: Ickes, February 8, 1940, *in* House hearing, 76th Cong., 3d sess., p. 4–5. The report of the Secretaries of War, Commerce, and the Interior on topographic mapping is 76th Cong., 1st sess., Senate Doc. 54 (serial 10315).

⁴⁸Johnson, February 9, 1940, *in* House hearing, 76th Cong., 3d sess., p. 532.

⁴⁹Mendenhall, *ibid.*

⁵⁰Hayden, January 16, 1940, to amend H.R. 7805, *in* Cong. Rec., v. 86, pt. 1, p. 353. See also Hayden to Ickes, December 18, 1939, *in* Cong. Rec., v. 86, pt. 13, Appendix, p. 359.

⁵¹McKellar, April 4, 1940, *in* Hearing before Subcommittee on Interior Department, Senate Committee on Appropriations (hereinafter Senate hearing), 76th Cong., 3d sess., p. 326.

⁵²Mendenhall, *ibid.*

⁵³This and the preceding quotation: Schley, *ibid.*, p. 327.

⁵⁴54 Stat. L., 509, June 24, 1940.

⁵⁵54 Stat. L., 441, June 18, 1940. 54 Stat. L., 509 authorized the transfer of \$1,210,350 for topographic surveys and mapping from the War Department's civil-functions appropriations to the USGS, provided the latter used the funds to map "in strategic areas, in accordance with priorities to be determined by the Secretary of War."

⁵⁶German warships sunk or damaged during the campaign in Norway left a heavy cruiser as the largest operational unit.

⁵⁷Churchill, W.S. [2d], 2003, p. 206. For evaluations of Churchill during the war and postwar years, see Gilbert, Martin (1983, 1986b, 1988, 1991), Jenkins (2001), and Manchester and Reid, Paul (2012).

⁵⁸For a recent evaluation of de Gaulle, see Fenby (2012).

⁵⁹54 Stat. L., 573, June 25, 1940.

⁶⁰54 Stat. L., 714, July 2, 1940, is part of an act to "expedite the strengthening of the national defense" (712).

⁶¹FDR, proclamation 2413, 54 Stat. L., 2713, July 2, 1940: Rosenman, 1941b, p. 278; PPPUS 1940/68. Before these restrictions, the United States sent to Japan 90 percent of the latter's aviation fuel, 75 percent of its scrap iron and steel, and 67 percent of its machine tools.

⁶²54 Stat. L., 779, July 19, 1940, authorized and funded the construction that added to the Navy some 260 ships, including the *Essex*-class fleet carriers and the *Iowa*-class fast battleships.

⁶³Rosenman, 1941b, p. 184; PPPUS 1940/43.

⁶⁴Rosenman, 1941b, p. 187.

⁶⁵On May 25, 1938, 52 Stat. L., 442–443 authorized the temporary detail of United States employees with "special scientific or other technical qualifications" for up to 1-year's service in the American Republics, Liberia, and the Philippines, as agreed by those Governments. 53 Stat. L., 653, of May 3, 1939, extended that interval by 6 months.

⁶⁶Hale, 1916, p. 507–508.

⁶⁷Rhodes, 1986, p. 313–314.

⁶⁸This and the three preceding quotations: Einstein to FDR, Peconic, New York, August 2, 1939, Roosevelt Papers, FDR Library, Hyde Park, New York. Facsimile in Stoff, Fanton, and Williams, R.H., 1991, p. 18–19. Also printed in Reingold and Reingold (1981, p. 469–470) and Williams, R.C., and Cantelon (1984, p. 12–14). Stoff, Fanton, and Williams (1991, p. 20) reproduced Roosevelt's reply of October 19, 1939.

⁶⁹FDR, Ex. O. 8807, June 28, 1941; PPPUS 1941/70.

⁷⁰See Zimmerman (1996) and Phelps (2010).

⁷¹For an overview of code breaking in World War II, see Budiansky (2000). See Sebag-Montefiore (2000) for an analysis of deciphering the Enigma codes.

⁷²54 Stat. L., 441, June 18, 1940.

⁷³54 Stat. L., 1041, October 9, 1940.

⁷⁴Johnston (1947) briefly summarized USGS work in Latin America during the 1940s.

⁷⁵54 Stat. L., 440, June 18, 1940.

⁷⁶For radar's contribution to defeating the Luftwaffe, see Zimmerman (2001).

⁷⁷For an account and analysis of the attack on Taranto, and its subsequent significance, see Lowry and Wellham (1995).

⁷⁸Morris, J.B., and Morris, R.B., 1996, p. 408.

⁷⁹FDR, press conference, December 20, 1940: Rosenman, 1941b, p. 631; PPPUS 1940/152.

⁸⁰FDR, fireside chat, by radio to the Nation, December 29, 1940: Rosenman, 1941b, p. 643; PPPUS 1940/154.

⁸¹Rosenman, 1941b, p. 667; PPPUS 1941/3.

⁸²Rosenman, 1941b, p. 668.

⁸³*Ibid.*, p. 669. For an overview of U.S. defense preparations, see Klein, Maury (2013).

⁸⁴FDR, Ex. O. 8629, January 7, 1941: Rosenman, 1941b, p. 689; PPPUS 1941/5.

⁸⁵Rosenman, 1941b, p. 691.

⁸⁶*Ibid.*, p. 690.

⁸⁷Burns, J.M., 1970, p. 52. Stimson's papers are at Yale.

⁸⁸FDR, Ex. O. 8607, December 10, 1940.

⁸⁹FDR, Ex. O. 8617, December 20, 1940.

⁹⁰FDR, Ex. O. 8631, January 10, 1941.

⁹¹FDR, Ex. O. 8693, February 25, 1941: PPPUS 1941/unnumbered document (hereinafter doc.) between 19 and 20; and Ex. O. 8694, February 25, 1941.

⁹²Truman, having read the reports (1863–66) of the Joint Committee on the Conduct of the War (1861–65), did not intend to repeat that partisan committee's mistakes (Miller, Merle, 1973, p. 165). But the Truman committee's actual congressional analog during the Civil War was the House Select Committee on War Contracts (1861–63).

⁹³55 Stat. L., 31, March 11, 1941. FDR's Ex. O. 8926, October 28, 1941, established the Office of Lend-Lease Administration, and its Administrator, in the Office for Emergency Management: Rosenman, 1950a, p. 445; PPPUS 1941/118. Kimball (1969) traced the development of the Lend-Lease Program during 1939–41. For the Lend-Lease Program's aid to the Soviet Union, see Jones, R.H. (1969). FDR also had decided late in 1940 to increase U.S. aid to China by a second loan to be repaid with additional supplies of Chinese tin, tungsten, and tung-tree oil. The loan principally funded the American Volunteer Group (AVG, better known as the "Flying Tigers"). The AVG, led by retired Major (later Major General) Claire L. Chennault, became the U.S. Army Air Forces' 23d Fighter Group. Ford (2007) provided a comprehensive account and analysis of the AVG's founding and its operations against the Japanese between December 20, 1941, and July 4, 1942.

⁹⁴Cryolite, or "Greenland spar," was important in aluminum production. The world's largest deposit of this commodity was then at Ivittuut on the island's southwest coast.

⁹⁵FDR to Ickes, July 1, 1941, *in* Ickes, 1954, p. 567.

⁹⁶FDR, Ex. O. 8785, June 14, 1941: Rosenman, 1950a, p. 217; PPPUS 1941/64. Ex. O. 8785 amended Ex. O. 8389 of April 10, 1940.

⁹⁷55 Stat. L., 341, June 28, 1941.

⁹⁸55 Stat. L., 752, October 28, 1941. 54 Stat. L., 603, June 26, 1940, authorized USBM "exploration of manganiferous deposits."

⁹⁹The Civil Service Commission gave the USGS, as a war agency, the authority to make appointments for the war's duration but not to exceed 6 months thereafter. FDR's Ex. O. 9067, February 20, 1942, authorized the transfer of executive branch employees to war agencies.

¹⁰⁰Schley, May 21, 1941, *in* Senate hearing, 77th Cong., 1st sess., p. 146.

¹⁰¹55 Stat. L., 752, October 28, 1941.

¹⁰²Survey Order (Surv. O.) 143, July 23, 1941. Copies of Survey orders (1911–59) for the U.S. Geological Survey are in the Director's Office, Central Classified Files, Record Group 57 (RG 57), National Archives and Records Administration's Archives II facility (NARA II), College Park, Md.

¹⁰³As Theis continued his investigations, Hubbert (1940) critiqued the theory of groundwater motion.

¹⁰⁴Ickes, Secr. O. 1466, April 15, 1940.

¹⁰⁵Ickes, Secr. O. 1527, October 29, 1940.

¹⁰⁶FDR, fireside chat, by radio to the Nation, September 11, 1941: Rosenman, 1950a, p. 390; PPPUS 1941/100.

¹⁰⁷Rosenman, 1950a, p. 391.

¹⁰⁸FDR, message to Congress on the arming of U.S. merchant ships, October 9, 1941: Rosenman, 1950a, p. 406; PPPUS 1941/106. The authority is 55 Stat. L., 764, November 17, 1941.

¹⁰⁹FDR, Ex. O. 8832, July 26, 1941: Rosenman, 1950a, p. 281–282; PPPUS 1941/80.

¹¹⁰FDR, Ex. O. 8839, July 30, 1941; Rosenman, 1950a, p. 290; PPPUS 1941/83.

¹¹¹*Ibid.*

¹¹²FDR, Ex. O. 8832, July 26, 1941; Rosenman, 1950a, p. 281.

¹¹³Ickes, 1954, p. 588. Utley (1985) summarized America's passage during 1937–41 to war with Japan.

¹¹⁴See Anderson, I.H. (1975). For an overview of U.S. economic diplomacy during 1933–91, see Dobson (2002). Ketchum (1989) provided a comprehensive review of America's passage from peace to war during 1938–41; Heinrichs (1988) concentrated on the interval between March and December 1941.

¹¹⁵Atlantic Charter, 55 Stat. L., 1603, January 1, 1942.

¹¹⁶*Ibid.*

¹¹⁷Ickes, 1954, p. 606, 616.

¹¹⁸*Ibid.*, p. 606. FDR, Ex. O. 8875, August 28, 1941, established the Supply Priorities and Allocations Board (SPAB): Rosenman, 1950a, p. 349; PPPUS 1941/95.

¹¹⁹The Japanese began detailed planning for Operation Z, the attack on Pearl Harbor, in January 1941. Lowry and Wellham (1995) briefly described the 3-week visit, during May–June 1941, to Taranto by a Japanese delegation led by a rear admiral and the subsequent planning, preparations, and attack. For additional details, see Prange, Goldstein, and Dillon (1981).

¹²⁰Rhodes, 1986, p. 384–386. In 1998, Michael Frayn's two-act play "Copenhagen" dramatized the Bohr-Heisenberg meeting.

¹²¹Rhodes, 1986, p. 378.

¹²²Ickes, 1954, p. 649.

¹²³FDR to Hirohito, December 6, 1941: Rosenman, 1950a, p. 513; PPPUS 1941/137.

¹²⁴For details of the casualties, see Prange, Goldstein, and Dillon (1981, p. 539–540).

¹²⁵FDR, address to Congress, December 8, 1941: Rosenman, 1950a, p. 514; PPPUS 1941/138.

¹²⁶This and the preceding quotation: *ibid.*, p. 515.

¹²⁷Arthur Vandenberg, December 8, 1941, *in* Cong. Rec., v. 87, pt. 9, p. 9505.

¹²⁸FDR, fireside chat, by radio to the Nation, December 9, 1941: Rosenman, 1950a, p. 524; PPPUS 1941/140.

¹²⁹This and the two preceding quotations: Rosenman, 1950a, p. 528.

¹³⁰*Ibid.*, p. 530.

¹³See Weinberg (2005) for a comprehensive one-volume account and analysis of World War II; the text of Keegan's book (1989a) and the maps and tables in Keegan's atlas (1989b) provide significant supplements. See also Dear and Foot (1995), Murray and Millett (2000), Hastings (2011), and Beevor (2012).

Chapter 3. Washington Madhouse, 1941–1943

¹FDR, State of the Union Address to Congress, January 7, 1943: Rosenman, 1950c, p. 29; PPPUS, 1943/4.

²Bedini, 1975, title page.

³On February 19, 1942, FDR approved Ex. O. 9066 authorizing the mass removal of Japanese-American citizens and Japanese resident aliens from Pacific coast and international border areas to inland camps; see Robinson, Greg (2001).

⁴Eckes, 1979, p. 83. Eckes based his subsequent discussion (p. 83–84) on Pehrson (1942). Elmer W. Pehrson, Chief of the USBM's Economics and Statistics Branch, estimated that Axis control of the world's oil would rise significantly above 7 percent if its forces occupied the principal Soviet fields. The Axis also doubled or tripled its access to copper, lead, and zinc.

⁵This and the preceding quotation: FDR, State of the Union Address to Congress, January 6, 1942: Rosenman, 1950b, p. 36, 38; PPPUS 1942/5.

⁶Ickes, Secr. O. 1629, December 16, 1941. FDR authorized a minimum wartime workweek of 48 hours in Ex. O. 9301, February 9, 1943: Rosenman, 1950c, p. 69; PPPUS 1943/15.

⁷Also on January 14, 1942, FDR transmitted to Congress the National Resources Planning Board's "Development of National Resources—Report for 1942": Rosenman, 1950b, p. 52; PPPUS 1942/8.

⁸This and the five preceding quotations: Ickes, Secr. O. 1636, January 14, 1942.

⁹FDR, Ex. O. 9036, January 22, 1942, and Ex. O. 9067, February 20, 1942; the latter is in PPPUS 1942/unnumbered doc. between 22 and 23.

¹⁰FDR, letters of May 28 and November 5, 1941. See FDR, Ex. O. 9276, December 2, 1942, and Ex. O. 9332, April 19, 1943: Rosenman, 1950b, p. 496, and 1950c, p. 167; PPPUS 1942/135 and 1943/39.

¹¹55 Stat. L., 838, December 18, 1941.

¹²FDR, Ex. O. 9024, January 16, 1942: Rosenman, 1950b, p. 54–56; PPPUS 1942/9. Ex. O. 9040, January 24, 1942: PPPUS 1942/unnumbered doc. between 10 and 11. Ex. O. 8629, January 7, 1941, established the Office of Production Management (OPM): Rosenman, 1941b, p. 689–692; PPPUS 1941/5. The SPAB replaced OPM's Priorities Board by Ex. O. 8875, August 28, 1941: Rosenman, 1950a, p. 349–353; PPPUS 1941/95. For a history of the War Production Board (WPB), see U.S. Civilian Production Administration (1947).

¹³FDR, Ex. O. 9128, April 13, 1942; copy in the DoI Library, in Washington, D.C.

¹⁴FDR, Ex. O. 8982, December 17, 1941.

¹⁵Jesse Jones continued to oppose stockpiling after 1940.

¹⁶56 Stat. L., 539, July 2, 1942.

¹⁷Ibid., 545–546.

¹⁸This and the three preceding quotations: Ickes, Secr. O. 1743, October 5, 1942.

¹⁹Terman, 1998b, p. 49. See U.S. Geological Survey and U.S. Army Corps of Engineers (1945, cover 2); Hunt, C.B. (1946, p. 94–96); and Terman (1998b, table 1) for lists of persons who served in the USGS Military Geology Unit (MGU) during 1942–45. For the origin of and operations by the MGU in World War II, see Nelson, C.M., and Rose, E.P.F. (2012).

²⁰For organizational and operational evaluations, see Häusler (2000), Häusler and Willig (2000), and Rose, E.P.F., Häusler, and Willig (2000).

²¹E.C. Eckel later returned to consulting, but he left his practice in 1933 to serve as the TVA's chief geologist. Eckel died on November 22, 1941.

²²USGS topographers served as officers in the Army Engineers and in the Coast Artillery; see Rabbitt, M.C., 1986, p. 196.

²³Brooks, 1920, p. 124. For additional perspective on American geologists in World War I, see Pittman (1998).

²⁴Johnson, D.W. (1940); Leith (1940); and Bucher (1941).

²⁵Hotchkiss (1942); Johnson, D.W. (1942); and Paige (1942).

²⁶This and the three preceding quotations: Daly, 1942, p. 71.

²⁷This and the preceding quotation: Aldrich, 1942, p. 10.

²⁸Ibid., p. 11.

²⁹Rubey, 1947, p. 1.

³⁰Ibid., p. 1–2

³¹Hotchkiss and others (1942). The committee's report is Hotchkiss and others (1943).

³²This and the two preceding quotations: Rubey, 1947, p. 2.

³³This and the three preceding quotations: *ibid.*, p. 3.

³⁴Ibid., p. 5.

³⁵Ibid. Liberia, just south of Sierra Leone and a republic since 1847, gave air- and naval-base rights to the United States on March 31, 1942.

³⁶Ibid., p. 6.

³⁷See Hunt, C.B., 1982, p. 12. The map of "Alpine Quadrangle," published in 1949 in USGS Circular 46, obverse leaf 5, seems to fit more closely the terrain of Alpine, Texas, rather than Alpine, Arizona.

³⁸This and the two preceding quotations: Rubey, 1947, p. 7.

³⁹See Turner, Gordon-Cumming, and Betzler (1961); Keegan (1989a,b); and Weinberg (2005) for overviews of the Madagascar campaign.

⁴⁰Beck and others, 1985, p. 49. See also Loper (1943) for his evaluation, as a photogrammetrist, of the effectiveness of applied photogrammetry during the war prior to January 1943.

⁴¹Army Engineer-USGS agreement of October 26, 1942: Director's Office, Central Classified Files, 1912–53, RG 57, NARA II; copy in Rubey, 1947, p. 10.

⁴²Hunt, C.B., 1982, p. 13.

⁴³For a complete list, see Bonham and Leith (1997).

⁴⁴Loughlin, memorandum, August 29, 1942: Geologic Division, General Correspondence Files, 1899–1952, RG 57, NARA II.

⁴⁵Ibid.

⁴⁶Sydney H. Ball: Ball served as an Assistant Geologist with the USGS during 1903–07 and then traveled widely in Africa, Asia, Europe, and

North America as a consulting mining engineer and mineralogist. By 1934, Ball also had directed (sequentially) the AIMME, the Society of Economic Geologists (SEG), and the Mining and Metallurgical Society of America.

⁴⁷Schmedeman (1948) evaluated the ores in the Dominican Republic, Haiti, and Jamaica.

⁴⁸The USGS sponsored and Philip S. Smith, the Chief Alaskan Geologist, co-planned fieldwork on permafrost in Alaska during 1935; results were published in Taber (1943). The MGU's initial study of permafrost and its engineering problems appeared in Muller, S.W. (1943). For a brief history of permafrost studies, see Péwé (1991).

⁴⁹For a history of the Alcan Highway that includes the Canol pipeline, see Twichell (1992).

⁵⁰The Canol pipeline, which required 14,000 workers during its 2 years' construction, supplied gas and oil for the Alcan Highway and the air-transfer route. Fairbanks began receiving oil in February 1944: Dod, 1966, p. 338.

⁵¹Lyddan, 1983, p. 1057.

⁵²FDR, Ex. O. 9094, March 10, 1942: PPPUS 1942/unnumbered doc. between 28 and 29.

⁵³Mendenhall, Surv. O. 145, November 24, 1942.

⁵⁴See Meinzer (1943).

⁵⁵Ickes, Secr. O. 1740, September 26, 1942.

⁵⁶FDR, Ex. O. 9246, September 17, 1942: Rosenman, 1950b, p. 379; PPPUS 1942/97.

⁵⁷FDR, Ex. O. 9250, October 3, 1942: Rosenman, 1950b, p. 396; PPPUS 1942/100.

⁵⁸FDR, Ex. O. 9257, October 15, 1942. Ex. O. 9257 expanded NPR-1 (Elk Hills) by adding to it other lands in Kern County.

⁵⁹Harding, Ex. O. 3797-A, February 27, 1923.

⁶⁰FDR, Ex. O. 9276, December 2, 1942: Rosenman, 1950b, p. 496; PPPUS 1942/135. For a history of the PAW, see Frey and Ide (1946).

⁶¹For an account and evaluation of the Battle of Midway, see Prange, Goldstein, and Dillon (1982) and Symonds (2011). For an analysis of the war in Alaska and the Aleutians, see Garfield (1995).

⁶²For a comprehensive analysis of the Guadalcanal campaign, see Frank (1990); Hornfischer (2011) concentrated on naval operations during the struggle.

⁶³The Germans restored production, but it reached only 70 barrels per day before Soviet forces recaptured Maikop in January 1943: Yergin, 1991, p. 336.

⁶⁴Morris, J.B., and Morris, R.B., 1996, p. 428, 1185.

⁶⁵FDR, State of the Union Address, January 7, 1943: Rosenman, 1950c, p. 31; PPPUS 1943/4.

⁶⁶Stoff, Fanton, and Williams, 1991, p. 21-26, reproduced Bush's letter (and its two appendixes), in which he reported 26 contracts let for about \$3.6 billion, and Roosevelt's reply of March 11. For an evaluation of earlier work in Britain on nuclear weapons, see Farmelo (2013).

⁶⁷Jones, V.C., 1985, p. 43.

⁶⁸Ibid., p. 8.

⁶⁹Helmreich (1986) assessed diplomatic efforts in acquiring uranium during 1943-54.

⁷⁰Rhodes, 1986, p. 455-457, 512-517.

⁷¹George, February 15, 1943, *in* Cong. Rec., v. 89, pt. 1, p. 900.

⁷²FDR, Ex. O. 8628, January 4, 1941, and Ex. O. 9030, January 20, 1942.

⁷³Mendenhall, March 11, 1942, *in* House hearing, 77th Cong., 2d sess., p. 854; partial and uncited quote *in* Nolan, 1975, p. 322. As part of Interior's Defense Resources Committee, established in 1940 by Ickes' Secr. O. 1496 (June 15) and Secr. O. 1502 (July 3), Mendenhall oversaw mineral and oil resources. Mendenhall also served occasionally as Acting Secretary or as Acting Assistant Secretary, also responsible for the OIA, the GLO, and the USBM.

⁷⁴Engineering and Mining Journal, 1943, p. 48. For a summary of Mendenhall's career, see Nelson, C.M. (1999a).

⁷⁵Letter of Paul H. Price (President) and Robert H. Dott (Sr., Secretary, Association of American State Geologists) to Ickes, February 19, 1943, *in* Dott, 1943, p. 6.

⁷⁶Carlisle, 1964, p. 58. In 1907, Wrather served with Frank Calkins' party mapping the geology and mineral deposits of the Philipsburg (1:125,500) quadrangle in western Montana and earned thanks for his "efficient aid": Emmons and Calkins, 1913, p. 26.

⁷⁷Wrather earned his Ph.B. in geology at Chicago in February 1908. Wrather decided against joining the Land Classification Branch, newly established in the USGS. Instead, he worked as a scout for wildcatters, convinced some of them of the value of geology in finding oil, discovered the Desdemona field (the largest since Spindletop in 1901), sold his share for \$750,000, and in 1918 became an independent consultant in Dallas. For a summary of Wrather's career, see Nelson, C.M. (1999b).

⁷⁸This and the preceding quotation: Wrather, n.d., p. 257.

⁷⁹American Association for the Advancement of Science, 1943, p. 80.

⁸⁰Ibid.

⁸¹Ibid. "Mr. Wrather is its [NAS] first choice": Ickes to Roosevelt, April 7, 1943: General Records, Office of the Secretary of the Interior, RG 48, NARA II. Wrather also confirmed that his "name headed the list of recommended candidates" (Wrather, n.d., p. 188), although he "didn't see the list" (Carlisle, 1964, p. 61).

⁸²Ickes, 1944b, p. 26.

⁸³Wrather, n.d., p. 229.

⁸⁴Ibid., p. 258.

⁸⁵Dott, 1943, p. 35.

⁸⁶Wrather, n.d., p. 190.

⁸⁷This and the preceding quotation: Ladd to Josiah Bridge, July 10, 1943: Box 6, Paleontology and Stratigraphy Branch (PSB), Bridge office files, 1922-53, Geologic Division, RG 57, NARA II.

⁸⁸FDR, Ex. O. 9332, April 19, 1943: Rosenman, 1950c, p. 167; PPPUS 1943/39.

⁸⁹Ickes, Secr. O. 1894, November 9, 1943. The new Coal Mines Administration dealt with the strikebound industry by seizing some 3,000 nonoperating mines to restore and maintain full production.

⁹⁰57 Stat. L., 163, June 25, 1943.

⁹¹Johnson, March 17, 1943, *in* House hearing, 78th Cong., 1st sess., p. 2.

⁹²Johnson, May 20, 1943, *in* Cong. Rec., v. 89, pt. 4, p. 4689.

⁹³This and the previous quotation: *ibid.*, p. 4693.

⁹⁴Wrather, May 28, 1943, *in* Senate hearing, 78th Cong., 1st sess., p. 245.

⁹⁵This and the three preceding quotations: *ibid.*, p. 206.

⁹⁶Baker, *ibid.*, p. 207.

⁹⁷McCarran, *ibid.*

⁹⁸Wrather, *ibid.*

⁹⁹Philip Smith, May 31, 1943, *in* Senate hearing, 78th Cong., 1st sess., p. 249. Smith also noted that seepages were “widely known throughout the Territory,” especially on the Alaska Peninsula and on Alaska’s south-central coast.

¹⁰⁰Reed, J.C. (Sr.), 1958a, p. 3.

¹⁰¹57 Stat. L., 477, July 12, 1943.

¹⁰²Wrather, n.d., p. 201.

¹⁰³FDR, Ex. O. 9380, September 25, 1943: Rosenman, 1950c, p. 406; PPPUS 1943/107.

¹⁰⁴Sommers, 1945, p. 97.

¹⁰⁵*Ibid.*, p. 18; Hunt, C.B., 1982, p. 14; Terman, 1998b, p. 53.

¹⁰⁶The completed quadrangles included 192 at 1:24,000 and 61 at 1:62,500; 49 at 1:24,000 and 41 at 1:62,500 were in progress.

¹⁰⁷56 Stat. L., 1086, December 24, 1942.

¹⁰⁸For a review of USGS work on water resources abroad during 1940–70, see Taylor, G.C., Jr. (1976).

¹⁰⁹This and the preceding quotation: FDR, Ex. O. 9347, May 27, 1943: Rosenman, 1950c, p. 233, 232; PPPUS 1943/57.

¹¹⁰Robertson, 1994, p. 323.

¹¹¹FDR, Ex. O. 9361, July 15, 1943: Rosenman, 1950c, p. 298; PPPUS 1943/82.

¹¹²Willkie, 1943, p. 165.

¹¹³*Ibid.*, p. 179.

¹¹⁴*Ibid.*, p. 202–203. Willkie based his volume on his global tour, by B–24 Liberator bomber, in 1942; he died on October 8, 1944.

¹¹⁵U.S. equipment and supplies increasingly helped to revitalize the Red Army and improve its mobility; for evaluations of this part of the Lend-Lease Program during and immediately after the war, see Jones, R.H. (1969), and Herring (1973).

¹¹⁶For details of the campaign in Sicily, see D’Este (1988) and Kennedy, Paul (2013). Rose, E.P.F., and Clatworthy (2007) evaluated the role of British military geologists in the campaign. See also Nelson, C.M., and Rose, E.P.F. (2012).

¹¹⁷Hunt, C.B., 1982, p. 13.

¹¹⁸Sommers, 1945, p. 97; and reprinted, March 21, 1945, *in* House hearing, 79th Cong., 1st sess., p. 626.

¹¹⁹This and the previous quotation: Reybold to Wrather, September 3, 1943: “File SPETI,” Director’s Office, Central Classified Files, 1912–53, RG 57 (NARA II, College Park, Md.) and RG 77 (NARA I, Washington, D.C.). Two deception operations before the invasion of Sicily succeeded in diverting German reinforcements from Sicily to the Balkans and Sardinia; see Macintyre (2010).

¹²⁰The House voted 320 to 29 to pass Fulbright’s resolution: Cong. Rec., v. 89, pt. 6, p. 7728.

¹²¹FDR, signing address, November 9, 1943: Rosenman, 1950c, p. 503; PPPUS 1943/127.

¹²²Jones, V.C. 1985, p. 241.

¹²³Dallek, 1979, p. 420 (by permission of Oxford University Press). The United Nations Relief and Rehabilitation Administration, established by the international agreement (57 Stat. L., 1164), met between November 9 and December 1, 1943.

¹²⁴FDR, fireside chat, by radio to the Nation, December 24, 1943: Rosenman, 1950c, p. 558; PPPUS 1943/142.

¹²⁵*Ibid.*, p. 561.

¹²⁶FDR, message to Congress on the progress of the war, September 17, 1943: Rosenman, 1950c, p. 402; PPPUS 1943/106. FDR also reported gains of 40 percent for bituminous coal, 106 percent for steel, and 125 percent for iron ore.

¹²⁷Yergin, 1991, p. 375–376. On July 19, 1944, the Big Inch pipeline began moving crude oil between Texas and Pennsylvania.

¹²⁸The PRCO’s records form part of RG 234, NARA II.

¹²⁹This and the preceding quotation: Heroy, 1943, p. 957.

¹³⁰Lea committee, *in* 78th Cong., 1st sess., House Report 663, p. 7 (serial 10763).

¹³¹*Ibid.*

¹³²Yergin, 1991, p. 291. Most of the discussion herein is drawn from Yergin’s volume, but see also Anderson, I.H. (1981), and Sampson (1993).

¹³³Yergin, 1991, p. 300. Dammam No. 7 produced more than 3,800 barrels of free-flowing oil per day. In 1940, another Casoc well more than doubled Dammam No. 7’s daily output.

¹³⁴*Ibid.*, p. 301.

¹³⁵*Ibid.*, p. 398.

¹³⁶Ralph, 1943, p. 12. The article reported the DeGolyer party’s departure, but it also printed a posed photograph that included four persons: DeGolyer, Fortas (who did not join the mission), “Murrell” (Morrell), and Wrather.

¹³⁷This and the four preceding quotations: Wrather to Nolan (c/o Ogden Tweto), November 3, 1943: Director’s Office, Central Classified Files, 1912–53, RG 57, NARA II. Nolan would have, Wrather predicted, “clear sailing so far as the Survey is concerned”: *ibid.* For a summary of Nolan’s career, see Nelson, C.M. (2002b).

Chapter 4. A Double Task, 1943–1945

¹FDR, budget message to Congress, January 10, 1944: Rosenman, 1950d, p. 7; PPPUS 1944/3.

²FDR, State of the Union Message to Congress, January 11, 1944: Rosenman, 1950d, p. 32; PPPUS 1944/4.

³This and the two preceding quotations: *ibid.*, p. 32.

⁴*Ibid.*, p. 36.

⁵This and the four preceding quotations: *ibid.*, p. 37.

⁶This and the three preceding quotations: *ibid.*, p. 41.

⁷Alexander, J.H. (1995, p. 76–77), analyzed the unusual tide and its effects on the battle for Betio.

⁸This and the preceding quotation: Ickes, 1944b, p. 26. Kapstein (1990) assessed the political aspects of energy crises since 1944.

⁹This and the two preceding quotations: Ickes, 1944b, p. 27.

¹⁰This and the five preceding quotations: DeGolyer, 1944, p. 919.

¹¹This and the two preceding quotations: *ibid.*, p. 920.

¹²This and the preceding quotation: *ibid.*, p. 921.

¹³This and the two preceding quotations: 58 Stat. L., 190, April 5, 1944.

¹⁴58 Stat. L., 495, June 28, 1944.

¹⁵59 Stat. L., 1219, February 3, 1944; effective November 8, 1945.

¹⁶Ickes, Secr. O. 1946, May 2, 1944.

¹⁷This and the preceding quotation: Acting Secretary Abe Fortas, Secr. O. 1972, July 20, 1944.

¹⁸This and the two preceding quotations: Brewster and Moore, Senate Resolution 253, February 3, 1944, *in* Cong. Rec., v. 90, pt. 2, p. 1469.

¹⁹Wrather, n.d., p. 194.

²⁰*Ibid.*, p. 204–205.

²¹*Ibid.*, p. 205.

²²*Ibid.*, p. 202.

²³Kirwan, March 6, 1944, *in* House hearing, 78th Cong., 2d sess., p. 337.

²⁴54 Stat. L., 573, June 25, 1940.

²⁵Wrather, May 12, 1944, *in* Senate hearing, 78th Cong., 2d sess., p. 565.

²⁶This and the preceding quotation: Jensen, June 20, 1944, *in* Cong. Rec., v. 90, pt. 5, p. 6308.

²⁷58 Stat. L., 463, June 28, 1944; the USGS section begins on p. 491.

²⁸Thompson's brigade formed part of the Provisional Engineer Special Brigade Group; see Snyder, C.T. (1957), and Beck and others (1985).

²⁹Stearns, H.T. (1945), evaluated water supplies for the invasion.

³⁰Wrather, n.d., p. 203.

³¹This and the two preceding quotations: *ibid.*, p. 205.

³²Wrather, Surv. O. 146, July 13, 1944. For a summary of Bradley's career, see Nelson, C.M. (2005).

³³Loughlin began work on New England's metamorphic rocks and aided the preparation of a new geologic map of Connecticut, but he died in Washington on October 22, 1946.

³⁴This and the seven preceding quotations: Hewett and others, Report, May 3, 1944: Geologic Division, General Correspondence Files, 1899–1952, RG 57, NARA II.

³⁵This and the preceding quotation: *ibid.*

³⁶Hendricks, S.B., Goldich, and Nelson, R.A. (1945), described the portable differential-thermal-analysis unit used in exploration for bauxite.

³⁷This and the preceding quotation: Balsley, 1946b, p. 1. See also Balsley (1946a).

³⁸This and the preceding quotation: *ibid.*

³⁹This and the two preceding quotations: *ibid.*

⁴⁰Hanna, 1990, p. 67.

⁴¹This and the preceding quotation: Balsley, 1946b, p. 2.

⁴²This and the preceding quotation: *ibid.*

⁴³American Association for the Advancement of Science, 1945a, p. 137. For the NRC Committee's brief report, see Fuller (1945).

⁴⁴Bush, A.L., 1987, p. 1.

⁴⁵Reed, J.C. (Sr.), 1958a, p. 33.

⁴⁶Byers and others, 1947, p. 41.

⁴⁷This and the preceding quotation: Wilcox, 1959, p. 418. Byers and others (1947, p. 41) reported the June 1 quake as being of "moderate intensity" and "lasting 1 minute."

⁴⁸For a recent evaluation of the Novarupta-Katmai eruption of 1912, see Hildreth and Fierstein (2012).

⁴⁹This and the preceding quotation: Wilcox, 1959, p. 418.

⁵⁰Robinson, G.D., 1948, p. 514.

⁵¹This and the preceding quotation: Wilcox, *in* Fournelle, 1998, p. 7.

⁵²This and the two preceding quotations: Wilcox, 1959, p. 419.

⁵³See Rose, E.P.F., and Pareyn (1995, 1998), Pareyn and Rose, E.P.F. (2000), and Rose, E.P.F. (2008). For U.S. input, see Kaye (1957), Snyder, C.T. (1957), and Nelson, C.M., and Rose, E.P.F. (2012).

⁵⁴Bonham and Leith, 1997, p. 7.

⁵⁵For additional information about the Benson Program, begun by the British in 1942 and named for an RAF airfield in Oxfordshire, see Beck and others (1985, p. 294, 296).

⁵⁶Kaye, 1957, p. 49.

⁵⁷*Ibid.*, p. 50.

⁵⁸Rose, E.P.F., and Clatworthy, 2009, fig. 2.

⁵⁹Hunt, C.B., 1946, p. 80. See also Nelson, C.M., and Rose, E.P.F. (2012).

⁶⁰McCurdy and others (1944).

⁶¹FitzGerald (1944a,b) described the methods and results of aeronautical-chart production.

⁶²Nolan (1944) provided a preliminary view of postwar plans for the Branch's photogrammetric-mapping program.

⁶³Straus on Wrather's memorandum for Ickes, August 10, 1944: Director's Office, Central Classified Files, 1912–53, RG 57, NARA II.

⁶⁴Wrather, memorandum for Ickes (through Straus), November 8, 1944; *ibid.* Attached was a memo from Richard W. Cooper (the FEA's Personnel Officer) to Wrather, November 3, requesting Brown's service, via a reimbursable loan, "for approximately one year." The FEA paid all travel and living expenses and transferred Brown's official station to Dharhan on January 17, 1945. The 1938–39 statutes continued to authorize USGS work in the American Republics, Liberia, and the Philippines (when liberated).

⁶⁵Wrather to Crowley, November 28, 1944; *ibid.*

⁶⁶See Hart (1998) and the 1945 photograph of Ibn Saud, Rogers, and Brown at Kharij on p. 101. See also Jacobs (2011).

⁶⁷Rogers to Wrather, February 5, 1945: Director's Office, Central Classified Files, 1912–53, RG 57, NARA II.

⁶⁸See Brown, G.F. (1949). Jackson (1990) provided a brief summary of USGS operations in Saudi Arabia during 1944–73.

⁶⁹For a brief coeval summary of military water-supply operations, see Sayre (1945).

⁷⁰58 Stat. L., 484, June 28, 1944.

⁷¹See Eckes (1975) for an analysis of the meeting and its effects.

⁷²FDR, budget message to Congress, January 3, 1945: Rosenman, 1950d, p. 476–477; PPPUS 1945/1.

⁷³This and the two preceding quotations: FDR, message to Congress, February 12, 1945: Rosenman, 1950d, p. 553.

⁷⁴This and the preceding quotation: Ickes, 1944a, p. 21.

⁷⁵Ickes, Secr. O. 2012, December 1, 1944.

⁷⁶58 Stat. L., 776, October 3, 1944.

⁷⁷FDR, Ex. O. 9488, October 3, 1944: Rosenman, 1950d, p. 304 (reference only).

⁷⁸For FDR's views on conservation during this interval, see Nixon (1957); for Pinchot's role, see Miller, Char (2001). For overviews of U.S. environmental politics since 1945, see Hays, S.P., and Hays, B.D. (1987), and Hays, S.P. (2000). Stoll (2007) provided a brief history, including selected documents.

⁷⁹FDR to Stettinius, November 22, 1944, *in* Smith, F.E., 1971, p. 378 (reprinted with the permission of the publisher).

⁸⁰Neufeld, 1995, p. 263; the preceding information about the V–2 project also is from Neufeld.

⁸¹This and the preceding quotation: Kaye, 1957, p. 52. For the USGS engineering-geology mission, see Eckel (1945).

⁸²Dod, 1966, p. 584.

⁸³FDR to Vannevar Bush, November 17, 1944, *in* Bush, Vannevar, 1945, p. VIII.

⁸⁴This and the preceding quotation: *ibid.*, p. VII.

⁸⁵This and the six preceding quotations: *ibid.*, p. VIII.

⁸⁶Morris, J.B., and Morris, R.B., 1996, p. 428.

⁸⁷59 Stat. L., 887, December 22, 1944. See Pick (1948) and Ridgeway (1955) for the subsequent history of the Pick-Sloan Plan.

⁸⁸Nolan, 1978, p. 24.

⁸⁹This and the preceding quotation: *ibid.*, p. 26.

⁹⁰This and the two preceding quotations: *ibid.*, p. 59.

⁹¹Wrather, Surv. O. 147, December 20, 1944.

⁹²*Ibid.*

⁹³Rabbitt, M.C., 1989, p. 35.

⁹⁴This and the preceding quotation: Nolan, 1978, p. 43.

⁹⁵Wrather, n.d., p. 203.

⁹⁶*Ibid.*, p. 202.

⁹⁷This and the three preceding quotations: FDR, State of the Union Message to Congress, January 6, 1945: Rosenman, 1950d, p. 506–507; PPPUS 1945/2.

⁹⁸FDR, fourth inaugural address, January 20, 1945: Rosenman, 1950d, p. 524; PPPUS 1945/7.

⁹⁹For accounts of FDR's last year as President, see Bishop (1974) and Ferrell (1998).

¹⁰⁰For an analysis of the Yalta conference, see Plokhy (2010).

¹⁰¹FDR, address to Congress, March 1, 1945: Rosenman, 1950d, p. 571; PPPUS 1945/16.

¹⁰²This and the two preceding quotations: *ibid.*, p. 575.

¹⁰³This and the preceding quotation: *ibid.*, p. 580.

¹⁰⁴*Ibid.*, p. 579.

¹⁰⁵*Ibid.*, p. 580.

¹⁰⁶*Ibid.*, p. 581.

¹⁰⁷This and the preceding quotation: *ibid.*, p. 584.

¹⁰⁸This and the preceding quotation: *ibid.*, p. 585.

¹⁰⁹This and the preceding quotation: *ibid.*, p. 584.

¹¹⁰Ickes, March 1, 1945, *in* House hearing, 79th Cong., 1st sess., p. 3.

¹¹¹*Ibid.*, p. 3–4.

¹¹²*Ibid.*, p. 8.

¹¹³For an account of the construction, see Anders (1965); Webster, Donovan (2003), evaluated the effort as part of a history of the China-Burma-India Theater.

¹¹⁴See Roberts, R.J. (1945).

¹¹⁵See Swenson (1948).

¹¹⁶Sears, March 21, 1945, *in* House hearing, 79th Cong., 1st sess., p. 588.

¹¹⁷Kirwan, *ibid.*, p. 589.

¹¹⁸Norrell, *ibid.*, p. 610.

¹¹⁹Bradley, *ibid.*, p. 621.

¹²⁰*Ibid.*, p. 623.

¹²¹This and the preceding quotation: *ibid.*, p. 631.

¹²²*Ibid.*, p. 624. Sommers (1945, p. 98) wrote “the Army's engineering officers.” Sommers (1945) was reprinted in Bradley, March 21, 1945, *in* House hearing, 79th Cong., 1st sess., p. 625–627.

¹²³Mikesh, 1972, p. 1. Mikesh's volume provided the details for the summary of the balloon-bomb project herein, which expands his brief section (p. 34–35) about the MGU's contribution. Lewis, J.M., 2003, p. 366, cited a 1945 estimate that increased the balloons' travel time across the Pacific to 72–120 hours. For more on the USGS role, see Coen, 2014, p. 114–115. Balloon bombs continued to be found in North America through 2014. For an overview of the military use of balloons during World War II, see Christopher (2004).

¹²⁴See White, Michael (2005).

¹²⁵See Harris (2002) and Barenblatt (2003).

¹²⁶Johnson, March 21, 1945, *in* House hearing, 79th Cong., 1st sess., p. 636.

¹²⁷This and the preceding quotation: Parker, *ibid.*, p. 639. Rogers to Judd, February 26, 1945, is printed on p. 640.

¹²⁸This and the three preceding quotations: Nolan to Rogers, March 26, 1945, *in* House hearing, 79th Cong., 1st sess., p. 641.

¹²⁹58 Stat. L., 284, June 22, 1944. See also Bennett, M.J. (1996), and Humes (2006).

¹³⁰Hadden, 2008, p. 250. In 1946, these materials passed to the USGS to form the Heringen Collection, now held in the National Center's Library in Reston, Va.

¹³¹Frank (1999) provided a comprehensive overview, including the casualty estimates, of the planning for Operation Downfall.

¹³²Truman, 1955, p. 5. See McJimsey (2000) for an overview and evaluation of Roosevelt's Presidency.

¹³³HST, Ex. O. 9568, June 8, 1945: PPPUS 1945/unnumbered doc. between 55 and 56. Ex. O. 9604, August 25, 1945, amended and extended Ex. O. 9568.

¹³⁴For a history of the Holocaust, see Gilbert, Martin (1986a) and Dwork and van Pelt, R.J. (2002).

¹³⁵Ickes, *in* Senate hearing, May 7, 1945, 79th Cong., 1st sess., p. 122.

¹³⁶Johnson, April 24, 1945, 79th Cong., 1st sess., House Report 437, p. 19 (serial 10932). The House cuts reduced the estimate by some \$1,703,000.

¹³⁷This and the preceding quotation: Wrather, May 14, 1945, *in* Senate hearing, 79th Cong., 1st sess., p. 560.

¹³⁸59 Stat. L., 345, July 3, 1945.

¹³⁹*Ibid.*

¹⁴⁰See Schlesinger (2003) for the establishment of the U.N.

¹⁴¹This and the preceding quotation: Reinke and Olsen, 1984a, p. 3. See also Leet (1945, 1946).

¹⁴²Leet, *in* Reinke and Olsen, 1984a, p. 4.

¹⁴³See Gutenberg (1946).

¹⁴⁴Leet, *in* Reinke and Olsen, 1984a, p. 5.

¹⁴⁵Leet, 1946, p. 209, and Reinke and Olsen, 1984a, p. 6.

¹⁴⁶Reinke and Olsen, 1984a, p. 6, where they suggest that "Leet's H-wave * * * is composed of one or more higher modes of the Rayleigh wave." See also Reinke and Olsen (1984b). For a history of U.S. seismograph stations, see Poppe (1979). Howell (1990) published a history of seismological research.

¹⁴⁷Rhodes, 1986, p. 605; see p. 605–610 for all of the Alsos mission's accomplishments and the account herein. See also Goudsmit (1947), Pash (1969), and Szasz (2001).

¹⁴⁸Bernstein, 1993, p. 1925, confirming Goudsmit's earlier conclusion. See also Bernstein and Cassidy (1995) and Bethe (2000). For the Manhattan Project's physics, see Reed, B.C. (2011).

¹⁴⁹See Bower (1987), Hunt, Linda (1991), and Jacobsen (2014).

¹⁵⁰Second Lieutenant (later 1st Lt.) R. Gordon Arneson, Secretary, interim (Stimson) committee meeting notes, May 31, 1945, Office of the Secretary of War, RG 107, NARA II; facsimile *in* Stoff, Fanton, and Williams, 1991, p. 110.

¹⁵¹FDR and others, meeting minutes, White House, May 31, 1945; facsimile *in* Stoff, Fanton, and Williams, 1991, p. 150.

¹⁵²This and the two preceding quotations: 1st Lt. R. Gordon Arneson, memorandum for George L. Harrison, June 25, 1945, Office of the Secretary of War, RG 107, NARA II; facsimile *in* Stoff, Fanton, and Williams, 1991, p. 157.

¹⁵³Feis, 1966, p. 85.

¹⁵⁴Hardy to Spaatz, July 24, 1945; *in* Truman, 1955, p. 420; *in* Groves, 1962, p. 308.

¹⁵⁵Morison, 1960, p. 633.

¹⁵⁶Truman, 1955, p. 416.

¹⁵⁷*Ibid.* See also Ferrell (1996).

¹⁵⁸Churchill, W.S. [1st], 1953, p. 670.

¹⁵⁹Truman, 1955, p. 416.

¹⁶⁰Holloway (1994) traced the Soviet Union's development of its own atomic bombs.

¹⁶¹Truman, 1955, p. 391; Stoff, Fanton, and Williams, 1991, p. 215 (Potsdam Declaration, July 26, 1945).

¹⁶²Truman, 1955, p. 391; Stoff, Fanton, and Williams, 1991, p. 216.

¹⁶³Truman, 1955, p. 392; Stoff, Fanton, and Williams, 1991, p. 215.

¹⁶⁴Truman, 1955, p. 392; Stoff, Fanton, and Williams, 1991, p. 216.

¹⁶⁵HST, statement, August 6, 1945: Reid and others, 1961b, p. 199; PPPUS 1945/93.

¹⁶⁶Hirohito, August 14, 1945, *in* Rhodes, 1986, p. 745.

¹⁶⁷*Ibid.*, p. 746.

¹⁶⁸See MacArthur, 1964, p. 275.

¹⁶⁹This and the preceding quotation: HST, statement, August 6, 1945: Reid and others, 1961b, p. 199–200.

¹⁷⁰*Ibid.*, p. 200. See also Dobbs (2012).

Chapter 5. Pioneering a New Course, 1945–1947

¹Chapman, February 4, 1946, *in* House hearing, 79th Cong., 2d sess., p. 6.

²HST, radio address to the American people, September 1, 1945: Reid and others, 1961b, p. 257; PPPUS 1945/122.

³HST, address at the U.N.'s closing session in San Francisco, June 26, 1945: Reid and others, 1961b, p. 141; PPPUS 1945/66.

⁴W.S. Churchill [1st], speech at Westminster College, Fulton, Missouri, March 5, 1946, *in* Churchill, W.S. [2d], 2003, p. 414.

⁵Dreyer (1995) and Westad (2003) reviewed the wars in China during 1941–50. For recent evaluations of Chiang and Mao, see, respectively, Fenby (2003) and Pantsov and Levine (2012).

⁶For histories of the ensuing war in Indochina to 1954, see Fall (1963), Lawrence, M.A., and Logevall (2007), and Morgan, Ted (2010). For the U.S. role during 1940–63, see Brown, W.A. (1975), and Logevall (2012).

⁷HST, Ex. O. 9568, June 8, 1945; PPPUS 1945/unnumbered doc. between 55 and 56.

⁸HST, Ex. O. 9604, August 25, 1945.

⁹HST, Ex. O. 9599, August 18, 1945.

¹⁰HST, Ex. O. 9630, September 27, 1945; PPPUS 1945/unnumbered doc. between 147 and 148.

¹¹This and the preceding quotation: HST, special message to Congress, September 6, 1945: Reid and others, 1961b, p. 271; PPPUS 1945/128.

¹²*Ibid.*, p. 293.

¹³Vannevar Bush to HST, July 5, 1945, *in* Bush, Vannevar, 1945, p. V.

¹⁴See Baxter (1946). See also Stewart, Irvin (1948), Pursell (1979), and Kennedy (2013).

¹⁵England, 1982, p. 21. Most of the account herein of the founding and early history, to 1957, of the National Science Foundation is drawn from England's book. For subsequent history, see U.S. Library of Congress, Legislative Reference Service, Science Policy Research Division (1965) and Lomask (1976).

¹⁶Bush, Vannevar, 1945, p. 4.

¹⁷For additional perspective on the volume's origin and its effects on U.S. research policy, see Kevles (1977), Rossiter (1985), Reingold (1987), and Kleinman (1995). For a biography of Vannevar Bush, see Zachary (1997).

¹⁸Bush, Vannevar, 1945, p. 25.

¹⁹*Ibid.*, p. 26.

²⁰This and the preceding quotation: *ibid.*, p. 27.

²¹*Ibid.*, p. 33.

²²This and the two preceding quotations: *ibid.*, p. 75.

²³This and the three preceding quotations: *ibid.*, p. 76.

²⁴This and the two preceding quotations: *ibid.*, p. 77.

²⁵This and the five preceding quotations: Huxley, 1935, p. 253.

²⁶Kilgore, 1945, p. 631.

²⁷This and the two preceding quotations: *ibid.* England (1982, p. 28–36) described the hearings.

²⁸Kilgore, 1945, p. 632.

²⁹*Ibid.*, p. 633.

³⁰*Ibid.*, p. 638.

³¹HST, Proclamation 2667, 59 Stat. L., 884, September 28, 1945: Reid and others, 1961b, p. 352; PPPUS 1945/150.

³²HST, Proclamation 2668, 59 Stat. L., 885, September 28, 1945: PPPUS 1945/unnumbered doc. between 149 and 150.

³³HST, Ex. O. 9633, September 28, 1945: PPPUS 1945/unnumbered doc. between 149 and 150.

³⁴HST, Ex. O. 9634, September 28, 1945.

³⁵This and the preceding quotation: HST, Proclamation 2667, September 28, 1945.

³⁶HST, Proclamation 2668, September 28, 1945.

³⁷Critz (1947) and Pratt (1947) evaluated the petroleum potential of the U.S. Continental Shelves. Victor (1984) assessed business-government relations in the formulation and conduct of U.S. energy policy since 1945.

³⁸HST, Ex. O. 9633, September 28, 1945.

³⁹HST, special message to Congress, October 3, 1945: Reid and others, 1961b, p. 365; PPPUS 1945/156.

⁴⁰This and the preceding quotation: *ibid.*, p. 366.

⁴¹HST, Ex. O. 9613, September 13, 1945: PPPUS 1945/unnumbered doc. between 132 and 133.

⁴²This and the three preceding quotations: HST, Ex. O. 9701, March 4, 1946: PPPUS 1946/unnumbered doc. between 50 and 51.

⁴³Krug, Secr. O. 2188, April 19, 1946.

⁴⁴60 Stat. L., 762, August 1, 1946.

⁴⁵HST, Ex. O. 9816, December 31, 1946: PPPUS 1946/unnumbered doc. between 271 and 272. On the same day, Truman officially proclaimed the end of hostilities in World War II.

⁴⁶HST, news conference, December 12, 1946: Reid and others, 1962, p. 491; PPPUS 1946/262. Truman also appointed John R. Steelman as "Assistant to the President": *ibid.*

⁴⁷HST, Ex. O. 9829, February 21, 1947, extending Ex. O. 9177, May 30, 1942.

⁴⁸This and the preceding quotation: Ickes, Secr. O. 2089, August 21, 1945.

⁴⁹American Association for the Advancement of Science, 1945b, p. 640.

⁵⁰Wrather, n.d., p. 210.

⁵¹USGS Pick and Hammer Club show program, 1947, Wonderment 234; copy in the RBR.

⁵²*Ibid.*, cast list.

⁵³*Ibid.*, 15th song.

⁵⁴This and the three preceding quotations: Wrather, n.d., p. 210.

⁵⁵*Ibid.*, p. 211.

⁵⁶61 Stat. L., 715, August 1, 1947.

⁵⁷HST, Ex. O. 9691, February 4, 1946: PPPUS 1946/unnumbered doc. between 28 and 29.

⁵⁸This and the four preceding quotations: Wrather, n.d., p. 205.

⁵⁹*Ibid.*, p. 205–206.

⁶⁰This and the preceding quotation: *ibid.*, p. 206.

⁶¹This and the two preceding quotations: *ibid.*

⁶²This and the preceding quotation: *ibid.*

⁶³HST, Message to the Congress on the State of the Union and on the Budget for 1947, January 21, 1946: Reid and others, 1962, p. 41; PPPUS 1946/18.

⁶⁴This and the preceding quotation: *ibid.*, p. 60.

⁶⁵*Ibid.*, p. 83.

⁶⁶Wrather, n.d., p. 259; Nolan later agreed. Wrather called Ickes "a good friend" and described their relationship as "very pleasant" (Carlisle, 1964, p. 61). Both men appreciated Ickes' practice of consulting all staffers connected with an issue before making a decision.

⁶⁷USGS Pick and Hammer Club show program, 1947, 9th song; copy in the RBR.

⁶⁸This and the preceding quotation: Wrather, op. cit. Krug (1946) described the administration's view on national mineral policies.

⁶⁹This and the three preceding quotations: Chapman, February 4, 1946, *in* House hearing, 79th Cong., 2d sess., p. 6.

⁷⁰Wrather, February 12, 1946, *in* House hearing, 79th Cong., 2d sess., p. 221.

⁷¹*Ibid.*, p. 221 and 223.

⁷²This and the two preceding quotations: *ibid.*, p. 223.

⁷³This and the three preceding quotations: *ibid.*, p. 222.

- ⁷⁴Kennan, 1967, p. 557, as part of the reprint of the entire telegram, which was published initially in Kennan (1947) and reprinted in Kennan (1951). From “Memoirs, 1925–1950,” by George F. Kennan. Copyright ©1967 by George F. Kennan. By permission of Little, Brown and Company. All rights reserved.
- ⁷⁵W.S. Churchill [1st], speech at Westminster College, Fulton, Missouri, March 5, 1946, in Churchill, W.S. [2d], 2003, p. 420.
- ⁷⁶Wrather, May 17, 1946, in Senate hearing, 79th Cong., 2d sess., p. 246.
- ⁷⁷This and the preceding quotation: *ibid.*, p. 248.
- ⁷⁸This and the preceding quotation: *ibid.*
- ⁷⁹60 Stat. L., 371, July 1, 1946. The additional \$90,000 for gaging streams provided in 61 Stat. L., 111, May 26, 1947, was available only for State-county-municipality cooperation and increased these cooperative funds to \$1,710,000.
- ⁸⁰Hewlett and Anderson, O.E., Jr., 1962, p. 531. Hewlett and Duncan (1969) and Hewlett and Holl (1989) evaluated the AEC’s administration and operations during 1947–61.
- ⁸¹Hewlett and Anderson, O.E., Jr., 1962, p. 538.
- ⁸²See U.S. Department of State (1946).
- ⁸³The Armed Forces Special Weapons Project issued in 1947 a three-volume technical report of Bikini’s scientific resurvey. For an overview of Operation Crossroads, see Weisgall (1994).
- ⁸⁴See Belcher and Hinds (1843).
- ⁸⁵For evaluations of Darwin’s contributions to coral-reef theory and other aspects of his work in geology, see Herbert (2005).
- ⁸⁶For summaries of Wilkes’ expedition, see Stanton (1975), Viola and Margolis (1985), and Philbrick (2003).
- ⁸⁷For an overview of coral-reef studies, see Stoddart (1994).
- ⁸⁸This and the preceding quotation: Charles Darwin to Alexander Agassiz, May 5, 1881, CUL MS.DAR. 143:11, Darwin Papers, Department of Manuscripts and Library Archives, Cambridge University, Cambridge, England, published here by permission of the Syndics of Cambridge University Library. Originally published in Darwin, Francis, and Seward, A.C., eds., 1903, v. 2, p. 198, and also available at <<http://fig.lib.harvard.edu/fig/?bib=002801427>>.
- ⁸⁹David and Sweet (1904) and Hinde (1904) described, respectively, Funafuti’s geology and the cores from the borings. For additional perspective, see also MacLeod (1988).
- ⁹⁰Emery, Tracey, and Ladd, 1954, p. 76; drill hole 2B’s section, with lithology and paleontology (including key foraminifers), is shown on p. 83. See also Ladd, Tracey, and Lill (1948).
- ⁹¹This and the three preceding quotations: Ickes, 1946, p. 4. Brinkley (2011) assessed conservation efforts in Alaska during 1879–1960.
- ⁹²This and the five preceding quotations: Wrather, Surv. O. 150, May 17, 1946.
- ⁹³Wrather, Surv. O. 153, July 22, 1946.
- ⁹⁴This and the preceding quotation: 60 Stat. L., 751, July 31, 1946.
- ⁹⁵Wrather, n.d., p. 223.
- ⁹⁶This and the three preceding quotations: Wrather, Surv. O. 156, September 27, 1946.
- ⁹⁷Reed, J.C. (Sr.), 1958a, p. 43, who also noted the initial focus “on the possibility of stratigraphic traps” in addition to those anticlinal. The discussion herein of the work in NPR–4 is drawn principally from Reed’s volume. For a summary of U.S. exploration in the Arctic since 1939, see Reed, J.C. ([Sr.] 1970).
- ⁹⁸Reed, J.C. (Sr.), 1958a, p. 33–34.
- ⁹⁹This and the preceding quotation: *ibid.*, p. 47.
- ¹⁰⁰This and the preceding quotation: Wrather, n.d., p. 225. After Smithsonian Secretary Alexander Wetmore also approved the idea, archeologist Ralph Solecki spent a field season with the USGS in northern Alaska tracing human migration routes into North America.
- ¹⁰¹This and the four preceding quotations: Reed, J.C. (Sr.), 1958a, p. 43.
- ¹⁰²This and the three preceding quotations: *ibid.*, p. 59.
- ¹⁰³This and the preceding quotation: *ibid.*, p. 60.
- ¹⁰⁴60 Stat. L., 482, July 8, 1946.
- ¹⁰⁵Reed, J.C. (Sr.), 1958a, p. 49.
- ¹⁰⁶Wrather, n.d., p. 225.
- ¹⁰⁷This and the preceding quotation: Wilcox, 1959, p. 419.
- ¹⁰⁸See Robinson, G.D. (1947).
- ¹⁰⁹*Ibid.*, p. III.
- ¹¹⁰Wilcox, in Fournelle, 1998, p. 7.
- ¹¹¹Parícutin’s eruption ended in 1952; for an overview, see Luhr and Simkin (1993).
- ¹¹²In 1948, the U.S. Board on Geographic Names accepted “Fisher Caldera,” proposed by Bernard Fisher’s USGS colleagues for the 7-mile-long feature they discovered west of Shishaldin Volcano on Unimak.
- ¹¹³See Bodle (1946).
- ¹¹⁴See Powers (1946) and Macdonald, Shepard, and Cox, D.C. (1947).
- ¹¹⁵See U.S. Coast and Geodetic Survey (1949); for the System’s performance during 1948–67, see Cox, D.C. (1968).
- ¹¹⁶60 Stat. L., 596, July 23, 1946.
- ¹¹⁷This and the preceding quotation: *ibid.*, p. 599.
- ¹¹⁸Chapman, Secr. O. 2269, October 30, 1946.
- ¹¹⁹For a history of the Section (later Branch) of Geophysics, see Kronstedt (1957).
- ¹²⁰During that time (1948–54), Hilpert rediscovered the site in northwestern Colorado of the notorious Diamond Hoax of 1872, an American “Kimberley” exposed as fraudulent by Clarence King and members of his U.S. Geological Exploration of the Fortieth Parallel. As Hilpert did not publish the results of his find, see Faul (1972) and Hausel and Stahl (1995).
- ¹²¹HST, Ex. O. 9718, May 3, 1946; Reid and others, 1962, p. 233 (reference only); PPPUS 1946/unnumbered doc. between 95 and 96. Truman abolished the Solid Fuels Administration for War on May 6.
- ¹²²Krug, Secr. O. 2193, May 6, 1946.
- ¹²³Krug, Secr. O. 2309, March 29, 1947.
- ¹²⁴This and the two preceding quotations: Patterson to Krug, March 8, 1946; Military Geology, Miscellaneous Memoranda and Data File, Box 7, and Josiah Bridge Office Files, Geologic Division, RG 57, NARA II.

¹²⁵See the initial summary, work aided from March 1946 by USBM specialists, by Schenck (1946); the full report is Supreme Commander for the Allied Powers, Natural Resources Section (1949). Schonberger (1989) evaluated the U.S. restoration of Japan during 1945–52.

¹²⁶This and the four preceding quotations: Whitmore, F.C., Jr., 1946, p. 1242. For a history of USGS military geology during 1945–72, see Terman (1998a). Rose, E.P.F., and Rosenbaum (1993a,b, 1998) evaluated British military geology in World War II and the cold war.

¹²⁷See Johnson, C.G. (1946).

¹²⁸Corwin (1998) and Whitmore, F.C., Jr. (2001), reviewed the Pacific Geologic Mapping Program's operations and results.

¹²⁹The moribund League of Nations ceased to exist on April 19, 1946; see Bendiner (1975, p. 405).

¹³⁰Corwin used his study as his doctoral dissertation at the University of Minnesota in 1951.

¹³¹Admiral Marc A. Mitscher, *in* Rose, L.A., 1980, p. 41.

¹³²For a comprehensive chronology of Antarctic expeditions, see Headland (1989), who listed Highjump's ships and staff on p. 314. For the history of science on Antarctica, see Fogg (1992, 2005). Alberts (1995) provided a guide to the geographic names of the Antarctic.

¹³³For a summary of all USGS participants in the scientific study and mapping of Antarctica during 1946–2006, see Meunier (2007a), who listed Balsley and Howard on p. 4. See also Meunier (2007b, p. 4, 7).

¹³⁴See Sullivan (1957, p. 241–243) and Rose, L.A. (1980, p. 226–227).

¹³⁵Wrather, Surv. O. 160, January 2, 1947.

¹³⁶This and the preceding quotation: Wrather, Surv. O. 151, June 3, 1946.

¹³⁷Wrather, Surv. O. 150, May 17, 1946.

¹³⁸This and the preceding quotation: Wrather, n.d., p. 206.

¹³⁹Wrather, Surv. O. 157, October 1, 1946.

¹⁴⁰Wrather, Surv. O. 152, July 1, 1946.

¹⁴¹For a summary of Operation Windmill, named for its many helicopters, see Smith, L.O. (1968). See also Headland (1989, p. 322) and Meunier (2007a, p. 4, and 2007b, p. 5, 8).

¹⁴²Headland (1989, p. 321).

¹⁴³This and the two preceding quotations: Wrather, n.d., p. 211.

¹⁴⁴This and the preceding quotation: *ibid.*

¹⁴⁵Krug, Secr. O. 2257, September 26, 1946.

¹⁴⁶60 Stat. L., 1100, July 16, 1946; Reorganization Plan No. 3 was transmitted May 17, 1946.

¹⁴⁷Wrather, Surv. O. 158, November 13, 1946.

¹⁴⁸Krug, Secr. O. 2201, May 31, 1946.

¹⁴⁹Jacob, 1946, p. 198. Jacob established a “partial differential equation” for the aquifer with “vertical leakage in proportion to the draw-down”: *ibid.*

¹⁵⁰Jacob's article earned the American Society of Civil Engineers' Rudolph Herring Medal in 1948.

¹⁵¹20 Stat. L., 394, March 3, 1879.

¹⁵²This and the three preceding quotations: Wrather, n.d., p. 229.

¹⁵³Wrather, Surv. O. 153, July 22, 1946.

¹⁵⁴HST, Ex. O. 9701, March 4, 1946.

¹⁵⁵Krug, Secr. O. 2188, April 19, 1946.

¹⁵⁶Chapman, Secr. O. 2333, June 10, 1947.

¹⁵⁷Burns, J.M., 1970, p. 608. Harriman was the U.S. Ambassador to the Soviet Union from October 23, 1943, to January 24, 1946; then he was the U.S. Ambassador to the United Kingdom in 1946 until he became the U.S. Secretary of Commerce on October 7, 1946.

¹⁵⁸England, 1982, p. 43.

¹⁵⁹Meyerhoff, 1946, p. 97.

¹⁶⁰This and the three preceding quotations: *ibid.*, p. 98; *in* England, 1982, p. 58.

¹⁶¹See England, 1982, p. 62–63.

¹⁶²HST, Ex. O. 9791, October 17, 1946: PPPUS 1946/unnumbered doc. between 232 and 233; reprint *in* U.S. President's Scientific Research Board, 1947, v. 1, p. 70–71.

¹⁶³HST, statement, October 17, 1946: Reid and others, 1962, p. 456; reprint *in* U.S. President's Scientific Research Board, 1947, v. 1, p. 69.

¹⁶⁴HST, Ex. O. 9791, October 17, 1946: PPPUS/op. cit.; reprint *in* U.S. President's Scientific Research Board, 1947, v. 1, p. 70.

¹⁶⁵This and the three preceding quotations: HST, signing statement, October 17, 1946: Reid and others, 1962, p. 456; reprint *in* U.S. President's Scientific Research Board, 1947, v. 1, p. 69.

¹⁶⁶Morris, J.B., and Morris, R.B., 1996, p. 497, 1185.

¹⁶⁷Richard Tolman began representing the United States on the United Nations Atomic Energy Commission in 1946.

¹⁶⁸HST, State of the Union Message to Congress, January 6, 1947: Reid and others, 1963, p. 8; PPPUS 1947/2.

¹⁶⁹For a history of the ONR, see Sapolsky (1990).

¹⁷⁰60 Stat. L., 779, August 1, 1946.

¹⁷¹This and the preceding quotation: Wrather, February 3, 1947, *in* House hearing, 80th Cong., 1st sess., p. 743.

¹⁷²Jones, *ibid.*, p. 808.

¹⁷³Bradley, *ibid.*

¹⁷⁴This and the preceding quote: Krug, May 5, 1947, *in* Senate hearing, 80th Cong., 1st sess., p. 9.

¹⁷⁵This and the three preceding quotations: *ibid.*, p. 10.

¹⁷⁶This and the preceding quotation: 61 Stat. L., 478, July 25, 1947.

¹⁷⁷HST, special message to Congress, March 12, 1947: Reid and others, 1963, p. 178–179; PPPUS 1947/56.

¹⁷⁸After Baruch used the term “cold war,” Walter Lippmann popularized it in 1947: Halle, 1967, p. 136, note 1.

¹⁷⁹Kennan, 1947, p. 575; *in* Kennan, 1951; *in* Miscamble, 1992, p. 32. See also Kuklick (2007) and Gaddis (2011).

¹⁸⁰61 Stat. L., 103, May 22, 1947.

¹⁸¹Marshall, address, June 5, 1947, *in* Pogue, 1987, p. 527.

¹⁸²This and the preceding quotation: 61 Stat. L., 934, December 17, 1947.

¹⁸³This and the preceding quotation: *ibid.*, p. 935.

¹⁸⁴HST Ex. O. 9875, July 18, 1947: Reid and others, 1963, p. 347 (reference only); PPPUS 1947/unnumbered doc. between 146 and 147.

¹⁸⁵61 Stat. L., 397, July 18, 1947.

¹⁸⁶This and the two preceding quotations: 62 Stat. L., 15, January 28, 1948.

¹⁸⁷61 Stat. L., 246, July 7, 1947.

¹⁸⁸61 Stat. L., 696, July 31, 1947.

¹⁸⁹61 Stat. L., 940, December 19, 1947.

¹⁹⁰61 Stat. L., 380, July 18, 1947.

¹⁹¹This and the preceding quotation: 61 Stat. L., 495, July 26, 1947.

¹⁹²61 Stat. L., 136, June 23, 1947; PPPUS 1947/unnumbered doc. between 58 and 59.

¹⁹³HST, Ex. O. 9835, March 21, 1947.

¹⁹⁴Krug, Secr. O. 2308, March 9, 1947.

¹⁹⁵HST established the President's Committee on Civil Rights in Ex. O. 9808, December 5, 1946; PPPUS 1946/unnumbered doc. between 259 and 260.

¹⁹⁶Wrather, Surv. O. 164, July 9, 1947.

¹⁹⁷This and the two preceding quotations: Wrather, Surv. O. 163, June 6, 1947.

¹⁹⁸This and the three preceding quotations: Reed, J.C. (Sr.), 1958a, p. 62.

¹⁹⁹This and the two preceding quotations: *ibid.*, p. 74.

²⁰⁰*Ibid.*, p. 82.

²⁰¹Wrather, June 7, 1949, *in* Senate hearing, 81st Cong., 1st sess., p. 1606. Other sources indicated that the official transfer was not completed until December. An appropriation of \$10,960 principally supported the salaries and operations by the HVO's two full-time staff members.

²⁰²This and the seven preceding quotations: Wrather, n.d., p. 250.

²⁰³61 Stat. L., 456, July 25, 1947. President Benjamin Harrison authorized the BGN by Executive order on September 4, 1890.

²⁰⁴Burns, J.P., 1981, p. 995. See also Kelsh (1949).

²⁰⁵In 1951, the Division's Trimetrogon Section modified a Kelsh plotter "to demonstrate the possibility of its use with oblique (trimetrogon) photographs": Thompson, 1958, p. 16.

²⁰⁶HST, Ex. O. 9908, December 5, 1947: PPPUS 1947/unnumbered doc. between 230 and 231.

²⁰⁷61 Stat. L., 913, August 7, 1947.

²⁰⁸Mather, 1947, p. 608. Mather expected U.S. proved reserves to peak in 1950 and "thereafter * * * descend toward zero": *ibid.*, p. 605.

²⁰⁹This and the two preceding quotations: *ibid.*, p. 608.

²¹⁰Leith, 1947, p. 87.

²¹¹This and the preceding quotation: HST, memorandum of disapproval of the NSF bill, August 6, 1947: Reid and others, 1963, p. 368; PPPUS 1947/169.

²¹²This and the two preceding quotations: *ibid.*, p. 369.

²¹³*Ibid.*, p. 370.

²¹⁴This and the two preceding quotations: *ibid.*, p. 371.

²¹⁵England, 1982, p. 85; see also Bush, Vannevar (1970).

²¹⁶England, 1982, p. 82.

²¹⁷This and the preceding quotation: HST, memorandum of disapproval of the NSF bill, August 6, 1947: Reid and others, 1963, p. 371; PPPUS 1947/169.

²¹⁸U.S. President's Scientific Research Board, 1947, v. 1, p. 3. Blanpied (1999) evaluated the Steelman report.

²¹⁹This and the four preceding quotations: U.S. President's Scientific Research Board, 1947, v. 1, p. 6.

²²⁰This and the nine preceding quotations: *ibid.*, p. 7.

²²¹See Bronk (1974). For overall reviews of science advice to the President, see Golden (1980) and Herken (2000). Golden (1995) extended coverage to Congress and the Judiciary.

²²²This and the preceding quotation: HST, signing statement, Ex. O. 9912, December 24, 1947: Reid and others, 1963, p. 531; PPPUS 1947/241.

²²³HST, Ex. O. 9913, December 26, 1947: PPPUS 1947/unnumbered doc. between 241 and 242.

²²⁴Vogt, 1947, p. 483.

²²⁵60 Stat. L., 754, August 1, 1946.

²²⁶This and the preceding quotation: U.S. President's Scientific Research Board, 1947, v. 1, p. 38.

²²⁷*Ibid.*, p. 5.

Chapter 6. Replenishing the Research Capital, 1947–1950

¹Wrather, February 3, 1947, *in* House hearing, 80th Cong., 1st sess., p. 744. The chapter's title paraphrases Wrather's coeval view that geology especially needed to replenish its capital of fundamental research, so that it might have the best tools and background to work effectively in helping to overcome the Nation's existing deficiencies in vital mineral resources.

²HST, State of the Union Message to Congress, January 7, 1948: Reid and others, 1964a, p. 7; PPPUS 1948/2.

³HST, special message on civil rights to Congress, February 2, 1948: Reid and others, 1964a, p. 121–126; PPPUS 1948/20.

⁴HST, Ex. O. 9980 and Ex. O. 9981, July 26, 1948: PPPUS 1948/unnumbered doc. between 164 and 165.

⁵This and the four preceding quotations: HST, budget message to Congress, January 12, 1948: Reid and others, 1964a, p. 47; PPPUS 1948/5.

⁶Wrather, March 15, 1948, *in* House hearing, 80th Cong., 2d sess., p. 508.

⁷*Ibid.*, p. 509.

⁸FitzGerald, *ibid.*, p. 513.

⁹*Ibid.*, p. 522.

¹⁰Norrell, *ibid.*, p. 520.

¹¹Wrather, *ibid.*, p. 523.

¹²This and the preceding quotation: Bradley, *ibid.*, p. 524.

¹³Wrather, *ibid.*, p. 525.

¹⁴This and the five preceding quotations: *ibid.*, p. 532.

¹⁵This and the preceding quotation: *ibid.*, p. 569.

¹⁶*Ibid.*, p. 534.

¹⁷*Ibid.*, p. 547.

¹⁸This and the preceding quotation: *ibid.*, p. 548.

¹⁹*Ibid.*, p. 509, 586.

²⁰This and the preceding quotation: Jensen, *ibid.*, p. 597.

²¹This and the four preceding quotations: *ibid.*, p. 584.

²²This and the two preceding quotations: Krug, April 29, 1948, *in* House hearing, 80th Cong., 2d sess., p. 1111.

²³62 Stat. L., 1135, June 29, 1948.

²⁴Noted in the USGS Annual Report for 1948–49 as \$364,900 for general administration, including \$15,000 from the Office of the Secretary.

²⁵62 Stat. L., 1134–1135, June 29, 1948.

²⁶*Ibid.*, p. 1135.

²⁷63 Stat. L., 259, June 23, 1949.

²⁸62 Stat. L., 1135, June 29, 1948.

²⁹Lodge to William E. Chandler (R–NH), *in* Cong. Rec., v. 33, pt. 7, p. 6212. Chandler agreed that a USGS navy was inevitable; for the wider context of their exchange, see Rabbitt, M.C., 1980, p. 301.

³⁰In 1987, the Aerospace Museum of California at McClellan Park, in north Sacramento, acquired the C–53D for restoration to its wartime state for the Normandy invasion in 1944 and for display.

³¹Gelvin (2005) reviewed the conflicts in Palestine after 1900.

³²Dupuy, R.E., and Dupuy, T.N., 1993, p. 1224. For additional details and analyses, see Dupuy, T.N. (1978), and Morris, Benny (2008).

³³Yergin, 1991, p. 422, and map of Middle East consortiums on p. 423. The subsequent discussion herein also is based primarily on Yergin's account.

³⁴HST, special message to Congress, March 12, 1947: Reid and others, 1963, p. 178–179; PPPUS 1947/56. 61 Stat. L., 103, May 22, 1947, endorsed the Truman Doctrine.

³⁵62 Stat. L., 137, April 3, 1948.

³⁶*Ibid.*, p. 138. For a recent evaluation of the Marshall Plan's effectiveness, see Behrman (2007).

³⁷For an overview of the Berlin blockade, see Holloway, 1994, p. 258–263. See also Zubok (2007).

³⁸Sudoplatov and others, 1994, p. 210.

³⁹62 Stat. L., 604, June 24, 1948.

⁴⁰Tusa and Tusa, 1988, p. 374. See also Reeves (2010).

⁴¹Millett (2005) described and analyzed the 1945–50 interval in the struggle to control the Korean Peninsula.

⁴²This and the preceding quotation: NSC–20/4, reprinted in NSC–68; see Drew (1994).

⁴³Krug, Secr. O. 2428, May 14, 1948.

⁴⁴Krug, Secr. O. 2429, May 18, 1948.

⁴⁵Krug, Secr. O. 2438, July 1, 1948.

⁴⁶This and the preceding quotation: Wrather, n.d., p. 216.

⁴⁷Wrather, Surv. O. 168, May 10, 1948.

⁴⁸Wrather, Surv. O. 169, June 25, 1948.

⁴⁹This and the preceding quotation: *ibid.*

⁵⁰Wrather, Surv. O. 173, December 15, 1948.

⁵¹This and the two preceding quotations: USGS Pick and Hammer Club show program, 1948, p. 11; copy in the RBR.

⁵²Wrather, Surv. O. 174, December 31, 1948.

⁵³Hein, Perkins, and McIntyre (2004) traced the development of ideas about the origin of these rocks and their principal commodity.

⁵⁴This and the preceding quotation: Wrather, Surv. O. 178, June 24, 1949.

⁵⁵USGS Pick and Hammer Club show program, 1949, p. 9; copy in the RBR.

⁵⁶Sears, Surv. O. 171, September 29, 1948.

⁵⁷This and the preceding quotation: 62 Stat. L., 6, January 27, 1948.

⁵⁸*Ibid.*, p. 10.

⁵⁹*Ibid.*, p. 6.

⁶⁰Sears, Surv. O. 171, September 29, 1948.

⁶¹Reed, J.C. (Sr.), 1958a, p. 82–83.

⁶²This and the two preceding quotations: *ibid.*, p. 83.

⁶³This and the preceding quotation: *ibid.*, p. 90.

⁶⁴Wrather, Surv. O. 166, February 5, 1948.

⁶⁵For a brief history of the Hawaiian Volcano Observatory, see Babb, Kauahikaua, and Tilling (2011).

⁶⁶See Bonham and Leith (1997).

⁶⁷Rodgers (1948) evaluated the islands' phosphate deposits; he identified high-grade, but marginally economic, reserves only on Kitadaito-jima and Angaur.

⁶⁸USGS Pick and Hammer Club show program, 1948, p. 12; copy in the RBR.

⁶⁹Nolan, memorandum, December 6, 1948; Director's Office, Central Classified Files, 1912–53, RG 57, NARA II. Nolan was responding to the November 23 memorandum from Interior's Acting Director of Information requesting information for the Secretary's memorandum to key people in the Department.

⁷⁰See Gustafson and Fennell (1950).

⁷¹Radlinski, 1985, p. 976.

⁷²This and the three preceding quotations: Thompson, 1979, p. 1612.

⁷³This and the preceding quotation: Thompson, 1958, p. 18.

⁷⁴This and the two preceding quotations: Wells, J.V.B., 1975, p. 3.

⁷⁵Jacob and Lohman, 1952, p. 564.

⁷⁶This and the two preceding quotations: 62 Stat. L., 1155, June 30, 1948.

⁷⁷This and the preceding quotation: *ibid.*, p. 1158.

⁷⁸63 Stat. L., 31, April 6, 1949.

⁷⁹Sayre (1948) summarized groundwater investigations in the United States.

⁸⁰See Carslaw and Jaeger (1947).

- ⁸¹See Ferris (1948).
- ⁸²See Ferris (1949). The editors of the volume that included Ferris' chapter dedicated their book to Robert E. Horton for his efforts toward developing a science of hydrology (Wisler and Brater, 1949, p. [v]). Oscar Meinzer's "Hydrology" (1942), the earlier standard reference, was reprinted in 1949 by Dover.
- ⁸³See Durum (1978) for a history of USGS water-quality laboratories. Milazzo (2006) assessed congressional concern about clean water during 1945–72.
- ⁸⁴This and the two preceding quotations: Ferguson and others, 1990, p. 110. "The allegation that Nace selected the site for the [radwaste] burial ground had no substance.": *ibid.*
- ⁸⁵This and the three preceding quotations: Davidson, Secr. O. 2505, December 30, 1948.
- ⁸⁶HST, Ex. O. 10052, April 20, 1949: PPPUS 1949/unnumbered doc. between 82 and 83.
- ⁸⁷62 Stat. L., 1291, August 16, 1948. See also HST, signing statement, August 16, 1948: Reid and others, 1964a, p. 449; PPPUS 1948/176.
- ⁸⁸Morris, J.B., and Morris, R.B., 1996, p. 499, 1185.
- ⁸⁹HST, State of the Union Message to Congress, January 5, 1949: Reid and others, 1964b, p. 6; PPPUS 1949/2.
- ⁹⁰*Ibid.*, p. 7.
- ⁹¹This and the preceding quotation: HST, inaugural address, January 20, 1949: Reid and others, 1964b, p. 112; PPPUS 1949/19.
- ⁹²*Ibid.*, p. 113.
- ⁹³This and the 10 preceding quotations: *ibid.*, p. 114.
- ⁹⁴This and the two preceding quotations: *ibid.*
- ⁹⁵This and the preceding quotation: *ibid.*, p. 115.
- ⁹⁶62 Stat. L., 1225, July 2, 1948.
- ⁹⁷Qing (2007) assessed the nature and results of U.S.-China diplomacy during 1945–60; Zhang (1992) evaluated the two countries' confrontations from 1949 to 1958. Chang (1990) reviewed relationships among the United States, China, and the Soviet Union, during 1948–72.
- ⁹⁸Barlow (1994) provided a detailed account of the admirals' revolt, from which the narrative herein is principally drawn.
- ⁹⁹This and the two preceding quotations: U.S. Commission on Organization of the Executive Branch of the Government, 1949b, p. 6.
- ¹⁰⁰*Ibid.*, p. 7.
- ¹⁰¹*Ibid.*
- ¹⁰²This and the preceding quotation: *ibid.*, p. 19.
- ¹⁰³*Ibid.*, p. 20.
- ¹⁰⁴This and the two preceding quotations: *ibid.*, p. 50.
- ¹⁰⁵This and the six preceding quotations: *ibid.*, p. 51. U.S. Bureau of Mines and U.S. Geological Survey (1948) provided a summary of U.S. mineral resources.
- ¹⁰⁶*Ibid.*, p. 51.
- ¹⁰⁷This and the preceding quotation: *ibid.*, p. 52.
- ¹⁰⁸*Ibid.*, p. 52–53.
- ¹⁰⁹This and the three preceding quotations: U.S. Commission on Organization of the Executive Branch of the Government, 1949a, p. 21.
- ¹¹⁰*Ibid.*, p. 22.
- ¹¹¹U.S. Commission on Organization of the Executive Branch of the Government, 1949c, p. 1.
- ¹¹²*Ibid.*, p. 9.
- ¹¹³*Ibid.*, p. 43.
- ¹¹⁴This and the five preceding quotations: *ibid.*, p. 44.
- ¹¹⁵This and the seven preceding quotations: U.S. Department of the Interior, 1949, p. 1.
- ¹¹⁶This and the two preceding quotations: *ibid.*, p. 3.
- ¹¹⁷This and the six preceding quotations: *ibid.*, pt. VII [Water Resources Development], p. 5.
- ¹¹⁸*Ibid.*, p. 6.
- ¹¹⁹U.S. Commission on Organization of the Executive Branch of the Government, 1949d, p. 41.
- ¹²⁰This and the five preceding quotations: 63 Stat. L., 203, June 20, 1949.
- ¹²¹*Ibid.*, p. 205.
- ¹²²64 Stat. L., 1262, May 24, 1950.
- ¹²³63 Stat. L., 377, June 30, 1949; Sec. 101 (a), on p. 379, established the General Services Administration (GSA).
- ¹²⁴This and the preceding quotation: 63 Stat. L., 954, October 28, 1949.
- ¹²⁵This and the two preceding quotations: Krug, January 26, 1949, *in* House hearing, 81st Cong. 1st sess., p. 7.
- ¹²⁶Wrather, February 2, 1949, *ibid.*, p. 224.
- ¹²⁷This and the six preceding quotations: *ibid.* p. 227.
- ¹²⁸Krug, May 23, 1949, *in* Senate hearing, 81st Cong., 1st sess., p. 27.
- ¹²⁹Wrather, June 7, 1949, *in* Senate hearing, 81st Cong., 1st sess., p. 1580.
- ¹³⁰*Ibid.*, p. 1587–1588.
- ¹³¹*Ibid.*, p. 1605.
- ¹³²63 Stat. L., 785–786, October 12, 1949, but not including the \$19,500 provided elsewhere for the yearly supplies of stationery (*ibid.*, p. 766).
- ¹³³Krug, Secr. O. 2537, October 3, 1949.
- ¹³⁴64 Stat. L., 296, June 29, 1950.
- ¹³⁵This and the three preceding quotations: Nolan, Surv. O. 181, July 18, 1949.
- ¹³⁶This and the three preceding quotations: Wrather, Surv. O. 188, November 17, 1949.
- ¹³⁷This and the preceding quotation: Wrather, Surv. O. 189, January 4, 1950.
- ¹³⁸Wrather, Surv. O. 197, May 11, 1950.
- ¹³⁹This and the 11 preceding quotations: Wrather, Surv. O. 194, March 29, 1950.
- ¹⁴⁰Wrather, Surv. O. 196, April 21, 1950.

- ¹⁴¹Wrather, *Surv. O.* 199, June 16, 1950.
- ¹⁴²This and the preceding quotation: Wrather, *Surv. O.* 198, June 16, 1950.
- ¹⁴³Wrather, *Surv. O.* 187, October 14, 1949.
- ¹⁴⁴This and the preceding quotation: Wrather, *Surv. O.* 190, January 5, 1950.
- ¹⁴⁵Lasky (1950) described the appraisal's goals and methods.
- ¹⁴⁶The Mineral Investigations Field Studies (MF) series began in 1950 with MF 1, a 1:31,680-scale geologic map, by John A. Straczek and Douglas M. Kinney, of the Batesville manganese district in northeastern Arkansas. Manganese remained vital for making stronger steel, and shipments from the district continued until 1959. See Straczek and Kinney (1950).
- ¹⁴⁷This and the preceding quotation: Hubbert, 1949, p. 108.
- ¹⁴⁸See Bonham and Leith (1997). Hunt, C.B. (1950), published an overview of military geology's applications to engineering practice.
- ¹⁴⁹This and the preceding quotation: 63 Stat. L., 627, August 24, 1949.
- ¹⁵⁰Reed, J.C. (Sr.), 1958a, p. 97.
- ¹⁵¹For historical perspective on U.S. influence on the Philippines, see Karnow (1989).
- ¹⁵²This and the nine preceding quotations: Wrather, *Surv. O.* 193, March 22, 1950.
- ¹⁵³Wrather, *Surv. O.* 160, January 2, 1947.
- ¹⁵⁴Wrather, *Surv. O.* 193, March 22, 1950.
- ¹⁵⁵Skop (1947) described the 1:250,000 program just before it left the Army Map Service (AMS).
- ¹⁵⁶This and the five preceding quotations: Wrather, *Surv. O.* 193, March 22, 1950.
- ¹⁵⁷This and the preceding quotation: Wrather, *Surv. O.* 192, February 6, 1950. See Snyder, J.P. (1982), for map projections used by the USGS.
- ¹⁵⁸Wrather, *in* U.S. Department of the Interior, 1950, p. 182.
- ¹⁵⁹An existing USGS-Kentucky cooperative but intermittent program of investigations of surface and groundwater resources ran from 1915 to 1938 and then continued uninterrupted.
- ¹⁶⁰Thompson, 1958, p. 18. See also Thompson, 1979, p. 1612. Bean (1953, 1954) discussed the development and use of the ER-55 projector.
- ¹⁶¹This and the preceding quotation: HST, Ex. O. 10095, January 3, 1950; PPPUS 1950/unnumbered doc. preceding 1.
- ¹⁶²Cooke worked for Gifford Pinchot in Pennsylvania, led the Rural Electrification Administration for FDR, served as a consultant to the Office of Production Management, and led the U.S. technical mission to Brazil in 1942.
- ¹⁶³This and the two preceding quotations: Krug, *Secr. O.* 2530, August 16, 1949.
- ¹⁶⁴This and the preceding quotation: Krug, *Secr. O.* 2537, October 3, 1949.
- ¹⁶⁵Duncan (1950) described the Conservation Division's organization and operational functions.
- ¹⁶⁶Cook, Don (1989), traced the evolution of NATO during 1945–50. Kaplan (1999) evaluated subsequent years.
- ¹⁶⁷63 Stat. L., 2241, July 25, 1949.
- ¹⁶⁸See Holloway (1994) for a detailed analysis. Shimkin (1949) summarized current knowledge of the Soviet Union's uranium deposits, especially the significant ones discovered "in Central Asia within the last decade": *ibid.*, p. 60.
- ¹⁶⁹63 Stat. L., 66, May 11, 1949.
- ¹⁷⁰63 Stat. L., 578, August 10, 1949.
- ¹⁷¹This and the preceding quotation: 63 Stat. L., 711, October 6, 1949.
- ¹⁷²This and the preceding quotation: *ibid.*, p. 714.
- ¹⁷³HST, statement, January 31, 1950; Reid and others, 1965a, p. 138.
- ¹⁷⁴64 Stat. L., 204, June 5, 1950.
- ¹⁷⁵*Ibid.*, p. 209.
- ¹⁷⁶HST, State of the Union Message to Congress, January 4, 1950: Reid and others, 1965a, p. 2; PPPUS 1950/2.
- ¹⁷⁷This and the preceding quotation: *ibid.*, p. 3.
- ¹⁷⁸*Ibid.*, p. 10.
- ¹⁷⁹For overviews of the McCarthy era and its impact on the Federal Government, see Goldston (1973), Cauter (1978), and Johnson, Haynes (2005); for the effects of these times on science and scientists in America, see Wang, Jessica (1999).
- ¹⁸⁰Espionage by Hiss and other Americans was confirmed after the end of the cold war in 1989 by the results of searches in Soviet files by Allen Weinstein and other historians from the United States, Russia, and Hungary and the publication of memoirs by spy master Pavel Sudoplatov (Sudoplatov and others, 1994) and other Soviet officials.
- ¹⁸¹64 Stat. L., 987, September 23, 1950.
- ¹⁸²The discussion herein is based principally on England (1982, p. 85–106).
- ¹⁸³This and the five preceding quotations: Webster, B.M., 1947, p. 444.
- ¹⁸⁴*Ibid.*, p. 445.
- ¹⁸⁵Wolfe, 1950, p. 81.
- ¹⁸⁶American Association for the Advancement of Science, 1950, p. 506.
- ¹⁸⁷This and the eight preceding quotations: 64 Stat. L., 149, May 10, 1950.
- ¹⁸⁸*Ibid.*, p. 150.
- ¹⁸⁹*Ibid.*, p. 156.
- ¹⁹⁰This and the four preceding quotations: Wrather, n.d., p. 259.
- ¹⁹¹This and the three preceding quotations: *ibid.*, p. 260.
- ¹⁹²Wrather, n.d., p. 212–213.
- ¹⁹³*Ibid.*, p. 213.
- ¹⁹⁴This and the two preceding quotations: *ibid.*, p. 214.
- ¹⁹⁵*Ibid.*, p. 260.
- ¹⁹⁶This and the preceding quotation: *ibid.*, p. 214.
- ¹⁹⁷Kirwan, January 10, 1950, *in* House hearing, 81st Cong., 2d sess., p. 1.
- ¹⁹⁸This and the three preceding quotations: Chapman, *ibid.*, p. 2.
- ¹⁹⁹*Ibid.*, p. 99 and p. 100.

²⁰⁰This and the preceding quotation: Kirwan, January 16, 1950, *in* House hearing, 81st Cong., 2d sess., p. 250.

²⁰¹This and the two preceding quotations: Wrather, *ibid.*, p. 240.

²⁰²Jackson, February 8, 1950, *ibid.*, p. 1643.

²⁰³Nolan, April 5, 1950, *in* Senate hearing, 81st Cong., 2d sess., p. 104.

²⁰⁴Hayden, *ibid.*, p. 105.

²⁰⁵FitzGerald, *ibid.*, p. 106.

²⁰⁶This and the preceding quotation: Nolan, *ibid.*, p. 107.

²⁰⁷This and the five preceding quotations: Nolan, *ibid.*, p. 108.

²⁰⁸Hayden, *ibid.*

²⁰⁹Paulsen, *ibid.*, p. 109.

²¹⁰Nolan, *ibid.*, p. 110.

²¹¹Truman to Acheson, January 31, 1950, *in* Drew, 1994, p. 33.

²¹²NSC-68: *ibid.*, p. 97.

²¹³*Ibid.*, p. 18. NSC-68/1, of September 21, 1950, suggested spending \$35 billion for defense during fiscal year 1950–51, \$57.2 billion in 1951–52, and \$63.4 billion in 1952–53 (*ibid.*, p. 110).

²¹⁴See Shen (2012) for details of this and subsequent decisions by the triumvirate and the economic and military aid Stalin gave to Mao and Kim.

Chapter 7. Natural Resources and National Security, 1950–1953

¹HST, budget message to Congress, January 15, 1951: Reid and others, 1965b, p. 85; PPPUS 1951/13.

²Millett (2010) described and analyzed the 1950–51 portion of the Korean conflict; the third volume of his planned trilogy will treat 1951–53. For a single-volume overview of the entire war, see Stokesbury (1988).

³This and the preceding quotation: 64 Stat. L., 477, August 28, 1950.

⁴This and the three preceding quotations: HST, radio and television report to the American people, September 1, 1950: Reid and others, 1965a, p. 613; PPPUS 1950/232.

⁵Wrather, *in* U.S. Department of the Interior, 1951a, p. 189.

⁶This and the two preceding quotations: 64 Stat. L., 583, September 5, 1950.

⁷This and the preceding quotation: *ibid.*, p. 584.

⁸This and the five preceding quotations: *ibid.*, p. 585.

⁹Chapman, Secr. O. 2615, February 12, 1951.

¹⁰This and the preceding quotation: 64 Stat. L., 1262, May 24, 1950.

¹¹Chapman, Secr. O. 2574, July 17, 1950, as amended on July 17 and August 15, 1950. Chapman's Secr. O. 2599, December 1, 1950, revoked Secr. O. 2574.

¹²This and the six preceding quotations: Chapman, Secr. O. 2598, November 24, 1950.

¹³Chapman, Secr. O. 2602, December 1, 1950, established the Office of the Assistant Secretary for Mineral Resources.

¹⁴The Division of Oil and Gas was responsible for the functions not transferred to the Petroleum Administration for Defense (PAD).

¹⁵Chapman, Secr. O. 2577, July 28, 1950.

¹⁶Wrather, n.d., p. 263.

¹⁷This and the preceding quotation: Princeton University, Appraisal and Evaluation Committee, 1950, pt. I, p. 1. [Interior Committee-Princeton report.]

¹⁸*Ibid.*, p. 28.

¹⁹This and the three preceding quotations: *ibid.*, p. 29.

²⁰This and the preceding quotation: *ibid.*, p. 30.

²¹This and the three preceding quotations: *ibid.*, p. 31.

²²*Ibid.*, p. 32.

²³Princeton University, Appraisal and Evaluation Committee, 1950, pt. II, p. 116.

²⁴This and the preceding quotation: *ibid.*, p. 127.

²⁵*Ibid.*, p. 116.

²⁶This and the four preceding quotations: *ibid.*, p. 117.

²⁷*Ibid.*, p. 131.

²⁸*Ibid.*, p. 132.

²⁹This and the three preceding quotations: *ibid.*, p. 139.

³⁰*Ibid.*, p. 138.

³¹*Ibid.*, p. 149.

³²This and the preceding quotation: *ibid.*, p. 150.

³³*Ibid.*, p. 149.

³⁴Wrather received the Interior Committee-Princeton report on October 25. Wrather's "Policies and Plans of the Geological Survey" closed by questioning "the advisability of imposing an ill-adapted organizational pattern on an agency * * * [that] emphasizes management at the expense of accomplishment.": Wrather to Chapman, December 21, 1950, p. 9; Director's Office, Central Classified Files, 1912–53, RG 57, NARA II.

³⁵64 Stat. L., 690, September 6, 1950.

³⁶*Ibid.*

³⁷This and the preceding quotation: *ibid.*

³⁸This and the five preceding quotations: *ibid.*

³⁹HST, Ex. O. 10159, September 8, 1950: Reid and others, 1965a, p. 624 (reference only); PPPUS 1950/unnumbered doc. between 239 and 240.

⁴⁰This and the seven preceding quotations: 64 Stat. L., 798, September 8, 1950.

⁴¹*Ibid.*, p. 800.

⁴²HST, Ex. O. 10161, September 9, 1950: Reid and others, 1965a, p. 631 (reference only); PPPUS 1950/unnumbered doc. between 240 and 241.

⁴³64 Stat. L., 1056, September 27, 1950.

⁴⁴This and the preceding quotation: Wrather, Surv. O. 203, October 13, 1950.

⁴⁵332 U.S. 19. The U.S. Supreme Court rejected similar claims by Louisiana in 339 U.S. 699 and by Texas in 339 U.S. 706.

⁴⁶Chapman, Secr. O. 2588, September 18, 1950.

⁴⁷Chapman, Secr. O. 2591, October 3, 1950; amended on December 21, 1950, and on January 29 and March 23, 1951. For a history of the PAD, see Brown, B.K. (1965).

⁴⁸65 Stat. L., 131, July 31, 1951.

⁴⁹Chapman, Secr. O. 2605, December 4, 1950.

⁵⁰HST, Ex. O. 10200, January 3, 1951; PPPUS 1951/unnumbered doc. before 1.

⁵¹This and the preceding quotation: 65 Stat. L., 60, June 2, 1951.

⁵²Wrather, Surv. O. 205, December 22, 1950.

⁵³Wrather, Surv. O. 208, January 15, 1951.

⁵⁴Fischer, R.P. (1950), summarized knowledge about the uranium-bearing sandstones and the USGS long-range program of diamond-drilling exploration.

⁵⁵This and the preceding quotation: 64 Stat. L., 1035, September 25, 1950.

⁵⁶Kiersch (1951) discussed the engineering geology of underground installations; for a history of engineering geology, see Kiersch (1955).

⁵⁷The USGS Aleutian Volcano Investigations Unit used the Adak facilities during 1949–54. The Unit was principally funded by the Department of Defense.

⁵⁸Wrather, Surv. O. 200, August 2, 1950.

⁵⁹For Alaska's place in a continental evaluation of potential petroleum provinces, see Gryc, Miller, D.J., and Payne (1951).

⁶⁰Reed, J.C. (Sr.), 1958a, p. 134.

⁶¹Ibid., p. 118.

⁶²Ibid., p. 135.

⁶³Ibid., p. 136.

⁶⁴Ibid., p. 138.

⁶⁵HST, Ex. O. 10159, September 8, 1950; Reid and others, 1965a, p. 624 (reference only); PPPUS 1950/240.

⁶⁶Yergin, 1991, p. 442.

⁶⁷Wrather, Surv. O. 206, December 22, 1950.

⁶⁸Bean, 1955, p. 531.

⁶⁹See U.S. Congress, House of Representatives, Committee on Public Lands (1950).

⁷⁰This and the preceding quotation: U.S. President's Water Resources Policy Commission, 1950, v. 1, p. 10. For the DoI's review and suggested revision of the Commission's report, see U.S. Department of the Interior (1951b,c).

⁷¹See U.S. President's Water Resources Policy Commission, 1950, v. 3.

⁷²See U.S. President's Water Resources Policy Commission, 1950, v. 2.

⁷³U.S. President's Water Resources Policy Commission, 1950, v. 1, p. 12.

⁷⁴Ibid., p. 15.

⁷⁵This and the preceding quotation: *ibid.*, p. 17.

⁷⁶64 Stat. L., 319, July 3, 1950.

⁷⁷For an analysis of U.S. military assistance in Vietnam during 1945–50, see Pach (1991).

⁷⁸HST, Ex. O. 10281, August 28, 1951; Reid and others, 1965b, p. 491 (reference only); PPPUS 1951/unnumbered doc. between 204 and 205.

⁷⁹This and the preceding quotation: 65 Stat. L., 373, October 10, 1951.

⁸⁰Ibid., p. 382.

⁸¹England (1982, p. 124) published the full list.

⁸²Golden, *in ibid.*, p. 125.

⁸³The NSF occupied four headquarters during 1951–65; see the photographs in England (1982, following p. 160).

⁸⁴Morris, J.B., and Morris, R.B., 1996, p. 501, 1185.

⁸⁵General (later Marshal) Peng Teh-huai (Peng Dehuai) replaced General Lin as leader of the Chinese forces on February 16, 1951.

⁸⁶64 Stat. L., 1121, December 28, 1950.

⁸⁷65 Stat. L., 75, June 19, 1951.

⁸⁸This and the five preceding quotations: HST, economic report to Congress, January 12, 1951; Reid and others, 1965b p. 35; PPPUS 1951/11.

⁸⁹This and the preceding quotation: HST, State of the Union Message to Congress, January 8, 1951; Reid and others, 1965b, p. 8; PPPUS 1951/4.

⁹⁰Chapman, *in* U.S. Department of the Interior, 1951a, p. IV.

⁹¹Ibid., p. VII.

⁹²Ibid., p. XI. See also p. XII.

⁹³This and the three preceding quotations: HST, budget message to Congress, January 15, 1951; Reid and others, 1965b, p. 84; PPPUS 1951/13.

⁹⁴This and the preceding quotation: *ibid.*, p. 85.

⁹⁵This and the two preceding quotations: *ibid.*, p. 87.

⁹⁶This and the five preceding quotations: HST to Paley, January 19, 1951 (released on the 22d); Reid and others, 1965b, p. 118; PPPUS 1951/19.

⁹⁷This and the two preceding quotations: Wrather, *in* House hearing, February 23, 1951, 82d Cong., 1st sess., p. 830.

⁹⁸This and the preceding quotation: *ibid.*, p. 831.

⁹⁹This and the two preceding quotations: *ibid.*, p. 830.

¹⁰⁰Ibid., p. 831.

¹⁰¹Norrell, *ibid.*, p. 856.

¹⁰²Jensen, *ibid.*, p. 857.

¹⁰³Kirwan, *ibid.*, p. 857.

¹⁰⁴See MacArthur, 1964, p. 405.

¹⁰⁵Chapman, *in* Senate hearing, May 8, 1951, 82d Cong., 1st sess., p. 7.

¹⁰⁶This and the preceding quotation: Wrather, *in* Senate hearing, May 11, 1951, 82d Cong., 1st sess., p. 130.

¹⁰⁷O'Mahoney, *ibid.*, p. 137.

¹⁰⁸Hayden, *ibid.*, p. 131.

¹⁰⁹FitzGerald, *ibid.*

¹¹⁰This and the preceding quotation: Wrather, *ibid.*, p. 136.

¹¹¹65 Stat. L., 258, August 31, 1951.

¹¹²USGS Pick and Hammer Club show program, 1952, title page; copy in the RBR.

¹¹³Ibid, p. 5.

¹¹⁴This and the preceding quotation: *ibid.*, p. 9. C.G. = Chief Geologist.

¹¹⁵This and the preceding quotation: Wrather, *in* U.S. Department of the Interior, 1953, p. 219.

¹¹⁶HST, letter to Congress, January 15, 1952, copy bound with U.S. National Science Foundation (1951) in the USGS Library in Reston, Va.

¹¹⁷This and the three preceding quotations: Conant, *ibid.*, text p. VIII.

¹¹⁸See Rubey (1951) as an example of his coeval research, aimed in part at increasing the knowledge of ore formation.

¹¹⁹See Ringholz (1989).

¹²⁰See U.S. Atomic Energy Commission and U.S. Geological Survey (1951).

¹²¹Eckel, E.B. (1952), provided a guide to interpreting geologic maps for engineers.

¹²²Drilling data are from Ladd and others (1953) and Ladd and Schlanger (1960).

¹²³Emery, Tracey, and Ladd, 1954, p. 2. Ladd and others (1953) initially summarized the results of drilling on Enewetak.

¹²⁴See Rhodes (1995). The initial test of a thermonuclear device, at Enewetak on May 9, 1951, yielded a 225-kiloton blast.

¹²⁵Wrather, Surv. O. 216, March 10, 1952.

¹²⁶Ibid.

¹²⁷Reed, J.C. (Sr.), 1958a, p. 149.

¹²⁸This and the two preceding quotations: *ibid.*, p. 150.

¹²⁹Ibid., p. 160.

¹³⁰HST, Ex. O. 10077 (September 7, 1949), 10137 (June 30, 1950), 10264 (June 29, 1951), and 10265 (also June 29, 1951).

¹³¹Wrather, Surv. O. 216, March 10, 1952.

¹³²65 Stat. L., 373, October 10, 1951.

¹³³See Irving, E.M. (1952).

¹³⁴This and the preceding quotation: Randolph W. ("Bill") Bromery, letter to C. Ervin Brown, July 15, 2002, p. 2; copy in the RBR. See also Vacquier and others (1951) and Spall and Davis, R.E. (2002).

¹³⁵Wrather, Surv. O. 213, December 27, 1951.

¹³⁶See Loper (1951).

¹³⁷FitzGerald (1951) discussed USGS surveying and mapping in Alaska.

¹³⁸See Eckert (1951).

¹³⁹The Soviet Union, Poland, and Czechoslovakia were not represented at the meeting.

¹⁴⁰The treaty did not recognize Soviet sovereignty over the Kurils; in 2013, Japan still claimed the southernmost four islands.

¹⁴¹HST, budget message to Congress, January 21, 1952: Reid and others, 1966, p. 89; PPPUS 1952/18.

¹⁴²Congress added a year to the Defense Production Act's life on June 30, 1952, but with less rigorous controls on the national economy.

¹⁴³Chapman, *in* House hearing, January 25, 1952, 82d Cong., 2d sess., p. 615.

¹⁴⁴Wrather, *in* House hearing, January 21, 1952, 82d Cong., 2d sess., p. 327.

¹⁴⁵This and the two preceding quotations: *ibid.*, p. 328.

¹⁴⁶FitzGerald, *in* Senate hearing, April 25, 1952, 82d Cong., 2d sess., p. 420.

¹⁴⁷This and the preceding quotation: Wrather, *ibid.*, p. 424.

¹⁴⁸This and the preceding quotation: U.S. President's Materials Policy Commission [Paley Commission], 1952, v. I, p. 3.

¹⁴⁹This and the preceding quotation: *ibid.*, p. 169.

¹⁵⁰This and the preceding quotation: *ibid.*, p. 26.

¹⁵¹This and the preceding quotation: *ibid.*, p. 27.

¹⁵²This and the two preceding quotations: *ibid.*, p. 28.

¹⁵³This and the preceding quotation: *ibid.*, p. 29.

¹⁵⁴This and the preceding quotation: *ibid.*, p. 163.

¹⁵⁵U.S. President's Materials Policy Commission, 1952, v. IV, p. 2.

¹⁵⁶Ibid., p. 3.

¹⁵⁷This and the four preceding quotations: *ibid.*, p. 25. Herres (1952) discussed the pluses and minuses of the Paley Commission's report for the U.S. mining industry.

¹⁵⁸This and the two preceding quotations: U.S. President's Materials Policy Commission, 1952, v. I, p. 110.

¹⁵⁹HST, Ex. O. 10426, January 16, 1953: Reid and others, 1966, p. 1203 (reference only); PPPUS 1953/unnumbered doc. between 378 and 379.

¹⁶⁰U.S. President's Materials Policy Commission, 1952, v. I, p. 130.

¹⁶¹This and the preceding quotation: *ibid.*, p. 171.

¹⁶²This and the eight preceding quotations: *ibid.*, p. 55.

¹⁶³Ibid.

¹⁶⁴66 Stat. L., 454, July 9, 1952.

¹⁶⁵Sears, Surv. O. 222 (Administrative Division) and Surv. O. 223 (Publications Office), February 17, 1953.

¹⁶⁶Wrather, Surv. O. 225, March 19, 1953.

¹⁶⁷Bannerman (1952) emphasized the problems involved in securing adequate supplies of 15 of the strategic nonmetallic minerals.

¹⁶⁸Kirk Bryan, Arthur Buddington, Fritiof Fryxell, Herbert Hawkes, Clifford Kaye, Esper Larsen, Jr., Dwight Lemmon, Louis Ray, John Rodgers, and Nelson Sayre also attended the 18th IGC. For a review of that initial postwar meeting, see Trümpy (2004).

¹⁶⁹Wrather attended scientific meetings during 1946–50 in Brazil, Britain, and The Netherlands. Alan Bateman, Glen Brown, Henry Faul, William Johnston, Thomas Lovering, Vincent McKelvey, John Rodgers, Nelson Sayre, and Wendell Woodring also attended the 19th IGC. See Durand-Delga (2005) for a review of that meeting.

¹⁷⁰Wrather, n.d., p. 246.

¹⁷¹See Snyder, G.L. (1954), and Wilcox (1959, p. 419–420). Dome-building activity began at Trident in 1954.

¹⁷²Reed, J.C. (Sr.), 1958a, p. 152.

¹⁷³This and the preceding quotation: USGS Pick and Hammer Club show program, 1953, p. 17; copy in the RBR.

¹⁷⁴For a history of the Arctic Research Laboratory (renamed the Naval Arctic Research Laboratory [NARL] in 1967) at Barrow, see Reed, J.C. ([Sr.] 1969); Reed, J.C. (Sr.), and Ronhovde (1971) provided a longer version, covering 1947–66.

¹⁷⁵This and the preceding quotation: Gryc, 1985, p. C14.

¹⁷⁶Reed, J.C. (Sr.), 1958a. Reed, J.C. (Sr.), and French (1975) delineated the boundaries and status of the lands and resources in NPR–4.

¹⁷⁷See DeGoes and Neal (1998) for a review of military geology activities in the Arctic during 1950–70.

¹⁷⁸HST, Ex. O. 10408, November 10, 1952: PPPUS 1952/unnumbered doc. between 327 and 328.

¹⁷⁹Members of the Branch of Paleontology and Stratigraphy established criteria for correlating oil-bearing zones in the Williston Basin (in the Dakotas and Montana). They used paleobotanical evidence to determine the Cretaceous-Tertiary boundary in the Hiawatha gas field (in Wyoming and Colorado); that determination helped the Conservation Division to resolve a significant royalty problem.

¹⁸⁰This and the preceding quotation: USGS Pick and Hammer Club show program, 1953, p. 10; copy in the RBR.

¹⁸¹This and the three preceding quotations: *ibid.*

¹⁸²Wrather, Surv. O. 219, October 14, 1952.

¹⁸³This and the five preceding quotations: Wrather, Surv. O. 220, December 5, 1952.

¹⁸⁴Wrather, in U.S. Department of the Interior, 1954, p. 260.

¹⁸⁵Thompson, 1979, p. 1612. See also Southard (1984). Burns, J.P. (1958), compared operations by the Kelsh and Balplex (Twinplex) plotters. See also Landen (1952) for a history of photogrammetry to the early 1950s.

¹⁸⁶For histories of these and subsequent computers and computing, see Rojas (2001), Agar (2003), and Ceruzzi (2003).

¹⁸⁷See Bennett, H.G. (1952), for surveying and mapping under the Point Four Program.

¹⁸⁸66 Stat. L., 328, July 3, 1952.

¹⁸⁹This and the three preceding quotations: *ibid.*

¹⁹⁰For the development of the nuclear Navy during 1946–62, see Hewlett and Duncan (1974).

¹⁹¹Yergin, 1991, p. 455.

¹⁹²66 Stat. L., 163, June 27, 1952.

¹⁹³Morris, J.B., and Morris, R.B., 1996, p. 502, 1185.

¹⁹⁴HST, statement on DDE's election as President, November 5, 1952: Reid and others, 1966, p. 1048; PPPUS 1952/325.

¹⁹⁵Smith, F.E., 1971, p. 658–678, contains a reprint of the Bureau of the Budget's Circular A–47 from December 31, 1952.

¹⁹⁶HST, Ex. O. 10318, January 3, 1952: Reid and others, 1966, p. 9 (reference only); PPPUS 1952/unnumbered doc. between 1 and 2.

¹⁹⁷BoB Circular A–16 (15 p.) was revised by adding an undated 5-p. Exhibit A, "Procedure for Programming and Coordination of Federal Topographic Activities."

¹⁹⁸HST, State of the Union Message to Congress, January 7, 1953: Reid and others, 1966, p. 1126; PPPUS 1953/366.

¹⁹⁹HST, farewell address, January 15, 1953: Reid and others, 1966, p. 1199; PPPUS 1953/378. For a view of how the world's principal political leaders might otherwise have operated to greater advantage during 1945–53, see Dallek (2010).

²⁰⁰This and the two preceding quotations: HST, farewell address, January 15, 1953: Reid and others, 1966, p. 1201.

Chapter 8. Partnership in the Natural-Resources Program, 1953–1955

¹DDE, State of the Union Message to Congress, February 2, 1953: Reid and others, 1960a, p. 26; PPPUS 1953/6.

²See Pach and Richardson (1991). See also Smith, J.E. (2012).

³See Stegner (1955).

⁴See Stegner (1954).

⁵For an evaluation of this struggle in the wider context of development and preservation in the Truman-Eisenhower years, see Richardson (1973).

⁶DDE, Ex. O. 10432, January 24, 1953: 18 Federal Register (Fed. Reg.) 617, January 29.

⁷67 Stat. L., 142, July 10, 1953.

⁸For a review of the Eisenhower administration's foreign economic policy, see Kaufman (1982).

⁹This and the preceding quotation: DDE, inaugural address, January 20, 1953: Reid and others, 1960a, p. 1; PPPUS 1953/1.

¹⁰*Ibid.*, p. 2.

¹¹This and the three preceding quotations: DDE, State of the Union Message to Congress, February 2, 1953: Reid and others, 1960a, p. 12; PPPUS 1953/6.

¹²This and the preceding quotation: *ibid.*, p. 19.

¹³*Ibid.*, p. 23.

¹⁴This and the preceding quotation: *ibid.*, p. 24.

¹⁵DDE, Ex. O. 10450, April 27, 1953; PPPUS 1953/unnumbered doc. between 58 and 59. For a history of background investigations of Federal employees and other activities by the FBI, see Weiner (2012).

¹⁶American Association for the Advancement of Science, Editorial Board, 1953, addendum, p. 3.

¹⁷See American Association for the Advancement of Science, 1953, p. 683. See also Cochrane (1966).

¹⁸This and the three preceding quotations: DDE, State of the Union Message to Congress, February 2, 1953: Reid and others, 1960a, p. 26; PPPUS 1953/6.

¹⁹Smith, F.E., 1966, p. 279.

²⁰67 Stat. L., 29, May 22, 1953.

²¹*Ibid.*, p. 32.

²²This and the preceding quotation: 67 Stat. L., 462, August 7, 1953.

²³347 U.S. 272, March 15, 1954.

²⁴On February 5, 1953, the Air Force's Louisiana OCS funds passed to the Interior Department by Public Land Order 884: 18 Fed. Reg. 846. Bartley (1953) analyzed the tidelands oil controversy.

²⁵McKay, *in* House hearing, February 24, 1953, 83d Cong., 1st sess., p. 4.

²⁶This and the two preceding quotations: *ibid.*, p. 5.

²⁷This and the preceding quotation: Jensen, *ibid.*, p. 10.

²⁸McKay, *ibid.*, p. 11.

²⁹This and the two preceding quotations: Wrather, *in* House hearing, February 25, 1953, 83d Cong., 1st sess., p. 84.

³⁰This and the preceding quotation: *ibid.*

³¹FitzGerald, *ibid.*, p. 87.

³²Wrather, *ibid.*

³³This and the two preceding quotations: Jensen, *ibid.*, p. 128.

³⁴This and the preceding quotation: McKay, *in* Senate hearing, April 14, 1953, 83d Cong., 1st sess., p. 2.

³⁵Wrather, *in* Senate hearing, April 20, 1953, 83d Cong., 1st sess., p. 197.

³⁶Cordon, *ibid.*

³⁷Wrather, *ibid.*, p. 201–202.

³⁸This and the preceding quotation: *ibid.*, p. 202.

³⁹This and the preceding quotation: Cordon, *ibid.*

⁴⁰This and the preceding quotation: Cordon, *ibid.*

⁴¹Wrather, *ibid.*

⁴²Wrather, *ibid.*, p. 203.

⁴³FitzGerald, *ibid.*, p. 207.

⁴⁴67 Stat. L., 269, July 31, 1953.

⁴⁵U.S. Department of the Interior, Secretary's Survey Committee on the Geological Survey [Van Pelt Committee], 1954, p. 1.

⁴⁶This and the three preceding quotations: *ibid.*, p. i.

⁴⁷*Ibid.*, p. 1.

⁴⁸*Ibid.*

⁴⁹*Ibid.*, p. iii–vii.

⁵⁰*Ibid.*, p. 13.

⁵¹This and the eight preceding quotations: Wormser to Wrather, April 28, 1954: Director's Office, Central Classified Files, 1953–74, RG 57, NARA II.

⁵²This and the three preceding quotations: Wrather, Administrative Circular 55, June 29, 1953: Director's Office, Central Classified Files, 1912–53, RG 57, NARA II; copy attached as Exhibit 6 to U.S. Department of the Interior, Secretary's Survey Committee on the Geological Survey, 1954.

⁵³*Ibid.*

⁵⁴This and the preceding quotation: Wrather, Administrative Circular 59, September 11, 1953: Director's Office, Central Classified Files, 1953–74, RG 57, NARA II; copy attached as Exhibit 5 to U.S. Department of the Interior, Secretary's Survey Committee on the Geological Survey, 1954.

⁵⁵Wrather, *in* House hearing, February 25, 1953, 83d Cong., 1st sess., p. 110.

⁵⁶Sears, Surv. O. 222, February 17, 1953: Director's Office, Central Classified Files, 1912–53, RG 57, NARA II.

⁵⁷Mowitt, *in* House hearing, February 25, 1953, 83d Cong., 1st sess., p. 110.

⁵⁸This and the two preceding quotations: *ibid.*, p. 111.

⁵⁹This and the two preceding quotations: Wrather, *ibid.*, p. 125.

⁶⁰See Snyder, G.H. (1966).

⁶¹DDE, State of the Union Message to Congress, January 7, 1954: Reid and others, 1960b, p. 6; PPPUS 1954/3.

⁶²*Ibid.*, p. 8.

⁶³This and the two preceding quotations: *ibid.*, p. 18.

⁶⁴For a critical biography of Mossadegh, see De Bellaigue (2012).

⁶⁵See Kinzer (2008, 2013) and Abrahamian (2013); for an overview and evaluation of worldwide operations by the CIA, see Weiner (2007).

⁶⁶In 1954, Anglo-Iranian renamed itself British Petroleum; the yellow letters BP on a green shield formed the company's new logo.

⁶⁷Yergin, 1991, p. 476.

⁶⁸*Ibid.*, p. 477.

⁶⁹For an account of Operation Vautour (Vulture), see Prados (1983).

⁷⁰See the overviews in Fall (1963) and Morgan, Ted (2010).

⁷¹See the summary in Randle (1969).

⁷²The United States was not officially represented at Bandung.

⁷³See the account in Immerman (1982) and the overviews in Ranelagh (1987), Prados (2006), and Weiner (2007).

⁷⁴For a history of Castro's insurgency, see Ruiz (1968).

⁷⁵Leighton, 1953, p. 14, provided all the percentages and comparisons.

⁷⁶This and the preceding quotation: *ibid.*

⁷⁷U.S. President's Materials Policy Commission [Paley Commission], 1952, v. I (overview) and II (details on mineral commodities).

⁷⁸At the GSAm's annual meeting in Boston during November 1952, Lovering recommended promoting security and peace through a domestic Marshall Plan, by which a U.S. "government-supported [minerals] market would give dollars to foreign nations in exchange for raw materials." Twenty-five years of these subsidies, Lovering projected, would yield industrial reserve stocks (in addition to the military stock-piles) of essential durable minerals "at least equivalent to about five years' consumption": Lovering, 1953, p. 102.

⁷⁹See U.S. President's Commission on Foreign Economic Policy (1954) and Eckes, 1979, p. 203–206.

⁸⁰67 Stat. L., 639, August 1, 1953.

⁸¹This and the four preceding quotations: 67 Stat. L., 417, August 7, 1953.

⁸²DDE, Ex. O. 10480, August 14, 1953: PPPUS 1953/unnumbered doc. between 165 and 166.

⁸³This and the two preceding quotations: DDE to McKay, October 26, 1953: Reid and others, 1960a, p. 713; PPPUS 1953/228.

⁸⁴*Ibid.*

- ⁸⁵McKay, Secr. O. 2756, April 30, 1954.
- ⁸⁶The Cosmos Club occupied the Townsend Mansion, its new home at 2121 Massachusetts Ave., N.W., in 1952.
- ⁸⁷This and the three preceding quotations: U.S. National Science Foundation, 1954, p. 9–10.
- ⁸⁸This and the preceding quotation: *ibid.*, p. 109.
- ⁸⁹This and the preceding quotation: *ibid.*, p. 10.
- ⁹⁰DDE, Ex. O. 10521, March 17, 1954: Reid and others, 1960b, p. 336 (reference only); PPPUS 1954/unnumbered doc. between 56 and 57.
- ⁹¹DDE, Ex. O. 10521.
- ⁹²Douglas McKay and others to DDE, November 30, 1954, p. 1 of the 3-page letter accompanying U.S. President's Cabinet Committee on Minerals Policy (1954); copy in the DoI Library in Washington, D.C.
- ⁹³This and the three preceding quotations: U.S. President's Cabinet Committee on Minerals Policy, 1954, p. 1.; copy in the DoI Library in Washington, D.C.
- ⁹⁴This and the preceding quotation: *ibid.*, p. 2.
- ⁹⁵*Ibid.*, p. 3.
- ⁹⁶*Ibid.*, p. 5–6.
- ⁹⁷*Ibid.*, p. 16.
- ⁹⁸*Ibid.*, p. 13.
- ⁹⁹67 Stat. L., 434, August 7, 1953.
- ¹⁰⁰This and the two preceding quotations: Wrather, n.d., p. 262.
- ¹⁰¹Wrather, 1954, p. 3A.
- ¹⁰²See Rabbitt, J.C., and Rabbitt, M.C. (1954).
- ¹⁰³See Rabbitt, M.C. (1954).
- ¹⁰⁴Nolan, Surv. O. 231, January 11, 1954.
- ¹⁰⁵See Rothrock, and others (1953). Bergenback and Terriere (1953) described the Scurry Reef's petrography and petrology. Stafford (1957) summarized the field's geology and production.
- ¹⁰⁶Nolan, Surv. O. 232, January 11, 1954.
- ¹⁰⁷Hawkes (1976) described some of the early efforts in exploration geochemistry.
- ¹⁰⁸Nolan, Surv. O. 234, September 17, 1954.
- ¹⁰⁹USGS Pick and Hammer Club show program, 1953, p. 15; copy in the RBR.
- ¹¹⁰Wrather, Surv. O. 236, November 1, 1954.
- ¹¹¹USGS Pick and Hammer Club show program, 1954, p. 11; copy in the RBR.
- ¹¹²This and the two preceding quotations: U.S. Geological Survey, Engineering Geology and Ground Water Branches, 1953, p. [1].
- ¹¹³See Fischer, W.A. (1954), for a summary of the use of aerial photographs in geologic mapping.
- ¹¹⁴See Juhle and Coulter (1955) and Wilcox (1959, p. 420–423). Muller, E.H., Juhle, and Coulter (1954) reported the activity at Katmai.
- ¹¹⁵Wilcox, 1959, p. 441–470.
- ¹¹⁶This and the four preceding quotations: Wright and Takahashi, 1989, p. xix.
- ¹¹⁷USGS Pick and Hammer Club show program, 1953, p. 11; copy in the RBR.
- ¹¹⁸*Ibid.*, p. 17.
- ¹¹⁹For a history of research in the Paleontology and Stratigraphy Branch, by one of its subsequent Chiefs, see Dutro (2004).
- ¹²⁰USGS Pick and Hammer Club show program, 1954, p. 6; copy in the RBR.
- ¹²¹Reed, J.C. (Sr.), 1958a, p. 168.
- ¹²²DDE, Ex. O. 10470, July 17, 1953.
- ¹²³DeGolyer to F.E. Wellings, Iraq Petroleum's Chief Geologist, December 24, 1953, *in* Yergin, 1991, p. 499. Everette L. DeGolyer, Sr., papers, courtesy of the DeGolyer Library, Southern Methodist University, Dallas, Texas. See also Painter (1986) and Randall, S.J. (2005).
- ¹²⁴USGS Pick and Hammer Club show program, 1953, p. 17; copy in the RBR.
- ¹²⁵Wrather, Surv. O. 228, November 6, 1953.
- ¹²⁶DDE, budget message to Congress, January 21, 1954: Reid and others, 1960b, p. 128; PPPUS 1954/14.
- ¹²⁷This and the preceding quotation: *ibid.*, p. 130.
- ¹²⁸This and the five preceding quotations: McKay, *in* House hearing, January 31, 1954, 83d Cong., 2d sess., p. 3.
- ¹²⁹This and the preceding quotation: Wrather, *in* House hearing, February 2, 1954, 83d Cong., 2d sess., p. 437.
- ¹³⁰This and the two preceding quotations: Bradley, *ibid.*, p. 454.
- ¹³¹Fenton, *ibid.*, p. 456.
- ¹³²This and the preceding quotation: Wrather, *ibid.*
- ¹³³This and the preceding quotation: Paulsen, *ibid.*, p. 463.
- ¹³⁴This and the preceding quotation: Fenton, *ibid.*, p. 467.
- ¹³⁵Duncan, *ibid.*, p. 480.
- ¹³⁶The John Fritz Medal, Biography of William Embry Wrather, Medalist for 1954: New York, John Fritz Medal Book Supplement, February 1954, p. [i]; copy bound as part of Wrather, n.d. The list of awardees during 1905–54 is on p. [iii].
- ¹³⁷This and the preceding quotation: Jensen, *in* House hearing, February 2, 1954, 83d Cong., 2d sess., p. 488.
- ¹³⁸This and the two preceding quotations: McKay, *in* Senate hearing, April 12, 1954, 83d Cong., 2d sess., p. 4.
- ¹³⁹Hayden, *in* Senate hearing, April 16, 1954, 83d Cong., 2d sess., p. 178.
- ¹⁴⁰Cordon, *ibid.*, p. 175.
- ¹⁴¹FitzGerald, *ibid.*, p. 171.
- ¹⁴²USGS Pick and Hammer Club show program, 1954, p. 10; copy in the RBR.
- ¹⁴³68 Stat. L., 368, July 1, 1954.
- ¹⁴⁴McKay, Secr. O. 2781, January 6, 1955.
- ¹⁴⁵This and the preceding quotation: Wrather, Surv. O. 237, December 16, 1954.
- ¹⁴⁶Wrather, Surv. O. 238, December 16, 1954.

¹⁴⁷USGS Pick and Hammer Club show program, 1955, p. 10 (Wonderment 268); copy in the RBR. Charles A. (“Andy”) Anderson succeeded Olaf Rove as Chief of the Mineral Deposits Branch in 1953; see James (1993).

¹⁴⁸Wrather, Surv. O. 239, January 6, 1955.

¹⁴⁹See Martin (1954).

¹⁵⁰Wrather, Surv. O. 236, November 1, 1954.

¹⁵¹See Isachsen, Mitcham, and Wood (1955).

¹⁵²This and the two preceding quotations: Fournelle, 1998, p. 8.

¹⁵³Wright and Takahashi, 1989, p. xxii. See Macdonald and Eaton (1964).

¹⁵⁴Nolan, Surv. O. 234 (revised): May 19, 1955.

¹⁵⁵See Bonham and Leith (1997).

¹⁵⁶See Chapman (1953, 1960), Berkner (1954), and Van Allen (1983), from which most of the summary herein was drawn. Van Allen moved to the University of Iowa in 1951.

¹⁵⁷Headland, 1989, p. 115 (Bellingshausen in *Vostok*) and 118 (Palmer in *Hero*). See also Day (2013).

¹⁵⁸Headland, 1989, p. 357; Meunier, 2007a, p. 4; and Meunier, 2007b, p. 5, 8.

¹⁵⁹68 Stat. L., 666, August 4, 1954.

¹⁶⁰68 Stat. L., 92, May 13, 1954. Willoughby (1961) described the politico-diplomatic process that led to the binational agreement.

¹⁶¹68 Stat. L., 666, August 4, 1954.

¹⁶²68 Stat. L., 708, August 13, 1954. 69 Stat. L., 367, July 23, 1955, amended the act of 1947 (61 Stat. L., 681).

¹⁶³69 Stat. L., 138, June 16, 1955.

¹⁶⁴68 Stat. L., 935, August 30, 1954.

¹⁶⁵See Boyne (2007) and Neufeld (1989), from which the account herein principally was derived.

¹⁶⁶For additional details and perspective, see Goldston (1973), Caute (1978), and Johnson, Haynes (2005).

¹⁶⁷For an overview of the espionage trials, see Haynes and Klehr (2006).

¹⁶⁸68 Stat. L., 775, August 24, 1954.

¹⁶⁹Morris, J.B., and Morris, R.B., 1996, p. 505, 1185.

¹⁷⁰347 U.S. 483, May 17, 1954. For evaluations and results, see Patterson (2001) and Kluger (2004).

¹⁷¹68 Stat. L., 1105, September 1, 1954.

¹⁷²69 Stat. L., 172, June 28, 1955.

¹⁷³This and the eight preceding quotations: DDE, State of the Union Message, January 6, 1955: Reid and others, 1959a, p. 7; PPPUS 1955/4.

¹⁷⁴DDE, special message, January 11, 1955: Reid and others, 1959a, p. 41–46; PPPUS 1955/8.

¹⁷⁵DDE, national-security message, January 13, 1955: Reid and others, 1959a, p. 72–78; PPPUS 1955/12.

¹⁷⁶DDE, budget message, January 17, 1955: Reid and others, 1959a, p. 86–185; PPPUS 1955/17.

¹⁷⁷McKay, in House hearing, January 31, 1955, 84th Cong., 1st sess., p. 6.

¹⁷⁸This and the preceding quotation: *ibid.*, p. 18.

¹⁷⁹This and the two preceding quotations: Kirwan, *ibid.*, p. 11.

¹⁸⁰This and the preceding quotation: Kirwan, *ibid.*, p. 12.

¹⁸¹Nolan, in House hearing, February 1, 1955, 84th Cong. 1st sess., p. 138.

¹⁸²Kirwan, *ibid.*, p. 141.

¹⁸³USGS Pick and Hammer Club show program, 1955, p. 16; copy in the RBR.

¹⁸⁴Kirwan, in House hearing, January 31, 1955, 84th Cong., 1st sess., p. 142.

¹⁸⁵This and the two preceding quotations: Jensen, *ibid.*, p. 155.

¹⁸⁶McKay, in Senate hearing, February 28, 1955, 84th Cong., 1st sess., p. 11. The dollar amounts are on p. 102.

¹⁸⁷Hayden, *ibid.*, p. 107.

¹⁸⁸Nolan, *ibid.*, p. 141.

¹⁸⁹Hayden, *ibid.*

¹⁹⁰The USGS appropriation is 69 Stat. L., 145, June 16, 1955.

¹⁹¹70 Stat. L., 169, May 19, 1956.

¹⁹²This and the six preceding quotations: U.S. Commission on Organization of the Executive Branch of the Government [II], 1955c, p. 22.

¹⁹³U.S. Commission on Organization of the Executive Branch of the Government [II], 1955a, p. 35.

Chapter 9. The Need for More Research, 1955–1958

¹Nolan, in House hearing, January 17, 1956, 84th Cong., 2d sess., p. 193.

²See Peebles (1991). For a review of the military use of balloons during the cold war, see Christopher (2004).

³Sears, Surv. O. 222, December 17, 1953.

⁴This and the preceding quotation: Nolan, Surv. O. 243, March 7, 1956.

⁵DDE, Ex. O. 10610, May 9, 1956.

⁶This and the preceding quotation: USGS Pick and Hammer Club show program, 1956, p. 18; copy in the RBR.

⁷See Varnes and Scott (1967).

⁸70 Stat. L., 374, June 29, 1956.

⁹See Moon (1994) for a brief history of the interstate highway system.

¹⁰This and the preceding quotation: J.R. Balsley [Jr.], memorandum to W.H. Bradley, June 20, 1956; copy in the RBR.

¹¹The 1:500,000 quadrangle maps of Saudi Arabia appeared in the I-Map series of USGS Miscellaneous Geologic Investigations Maps during 1956–64. Both the 1:2,000,000 geologic map (I-270-A, 1963) and the 1:2,000,000 geographic map (I-270-B-1, 1958, which was superseded by I-270-B-2, 1963) depicted the entire Arabian Peninsula.

¹²Dufek (1957) summarized Operation Deep Freeze [I] and its results. See also Headland (1989, p. 361–362), who listed Henry Wexler as chief scientist.

- ¹³Meunier, 2007a, p. 4, and Meunier, 2007b, p. 5, 8, 9.
- ¹⁴DDE to McKay, May 26, 1954: Reid and others, 1960b, p. 509; PPPUS 1954/122.
- ¹⁵U.S. Commission on Organization of the Executive Branch of the Government [II], 1955b, p. 38–39.
- ¹⁶This and the preceding quotation: *ibid.*, p. 38.
- ¹⁷This and the two preceding quotations: *ibid.*, p. 27.
- ¹⁸This and the two preceding quotations: *ibid.*, p. 36.
- ¹⁹*Ibid.*, p. 37.
- ²⁰This and the preceding quotation: Davis, C.A., 1956, p. 21. See also U.S. Presidential Advisory Committee on Water Resources Policy (1956).
- ²¹This and the preceding quotation: Davis, C.A., 1956, p. 20.
- ²²This and the preceding quotation: Nolan, *Surv. O.* 244, May 3, 1956.
- ²³See Ferris and Sayre (1955).
- ²⁴For contemporary concern about disposing of radioactive waste (radwaste) on land, see Hess (1957). Walker, J.S. (2009), traced the development of U.S. policy on radwaste.
- ²⁵69 Stat. L., 352, July 15, 1955.
- ²⁶69 Stat. L., 367, July 23, 1955.
- ²⁷69 Stat. L., 434, August 1, 1955. The original act is 20 Stat. L., 89, June 3, 1878.
- ²⁸69 Stat. L., 654, August 11, 1955.
- ²⁹This and the two preceding quotations: 69 Stat. L., 679, August 11, 1955.
- ³⁰69 Stat. L., 681, August 11, 1955.
- ³¹36 Stat. L., 847, June 25, 1910.
- ³²70 Stat. L., 105, April 11, 1956.
- ³³For the status of offshore exploration for oil during 1947–72, see Berryhill (1974).
- ³⁴69 Stat. L., 172, June 28, 1955.
- ³⁵McKay, *in* House hearing, January 13, 1956, 84th Cong., 2d sess., p. 9.
- ³⁶This and the two preceding quotations: *ibid.*, p. 4.
- ³⁷Wrather, n.d., p. 262. Wrather's progressive paraplegia confined him to a wheelchair in 1955; his eyesight also was failing (Nelson, C.M., 1999b, p. 896). Wrather died in 1963.
- ³⁸Wrather, n.d., p. 262.
- ³⁹Columbia University, 1954, p. [1]. Li Kuo-chin discovered the world's largest tungsten deposit in 1911 in southeastern China, co-invented the Li Process for manufacturing tungsten carbide, and co-authored, with Wang Chung-yu, a comprehensive volume on tungsten in 1943. Li was Chairman of the Board and Chief Engineer of the Wah Chang Smelting and Refining Company of America when he funded and Eisenhower approved the Li Medal and Prize in 1948.
- ⁴⁰This and the two preceding quotations: Nolan, *in* House hearing, January 17, 1956, 84th Cong., 2d sess., p. 192.
- ⁴¹This and the preceding quotation: *ibid.*, p. 193.
- ⁴²This and the preceding quotation: *ibid.*, p. 198.
- ⁴³*Ibid.*, p. 198–199.
- ⁴⁴This and the two preceding quotations: *ibid.*, p. 199.
- ⁴⁵This and the preceding quotation: Kirwan, *ibid.*, p. 200.
- ⁴⁶This and the preceding quotation: Nolan, *ibid.*
- ⁴⁷*Ibid.*, p. 203.
- ⁴⁸This and the two preceding quotations: USGS Pick and Hammer Club show program, 1956, p. 15; copy in the RBR.
- ⁴⁹The Federal Government condemned and purchased the Heurich Brewery in 1961; its buildings, on a site more valuable for transportation improvements than additional Federal offices, were razed in 1962.
- ⁵⁰Nolan, *in* House hearing, January 17, 1956, 84th Cong., 2d sess., p. 206.
- ⁵¹*Ibid.*, p. 207.
- ⁵²McKay, *in* Senate hearing, February 27, 1956, 84th Cong., 2d sess., p. 13.
- ⁵³70 Stat. L., 261, June 13, 1956.
- ⁵⁴Nolan, *Surv. O.* 246, April 5, 1957.
- ⁵⁵This and the three preceding quotations: Morse to Nolan, June 27, 1956, page 1 of a 2-page letter transmitting U.S. General Accounting Office, Civil Accounting and Auditing Division (1955).
- ⁵⁶*Ibid.*
- ⁵⁷This and the preceding quotation: U.S. General Accounting Office, Civil Accounting and Auditing Division, 1955, p. 30.
- ⁵⁸Nolan, *Surv. O.* 247, June 25, 1957.
- ⁵⁹USGS Pick and Hammer Club show program, 1957, p. 5; copy in the RBR.
- ⁶⁰70 Stat. L., 579, July 19, 1956.
- ⁶¹70 Stat. L., 766, July 31, 1956.
- ⁶²Nolan, *Surv. O.* 236 (revised), June 14, 1957.
- ⁶³This and the preceding quotation: USGS Pick and Hammer Club show program, 1957, p. 19; copy in the RBR.
- ⁶⁴This and the preceding quotation: *ibid.*, p. 17.
- ⁶⁵*Ibid.*
- ⁶⁶U.S. National Science Foundation, 1958, p. 110–111.
- ⁶⁷70 Stat. L., 921, August 1, 1956.
- ⁶⁸Glen, 1982, p. 96–97.
- ⁶⁹See Balsley and Buddington (1954).
- ⁷⁰See Balsley and Buddington (1961).
- ⁷¹See Reed, E.C., and others (1958).
- ⁷²The MGB worked with the Army Engineers' Cold Regions Research Establishment, later the Cold Regions Research and Engineering Laboratory.
- ⁷³For the results of MGB research for airfield sites in the Arctic, see Davies (1961) and Krinsley (1998).
- ⁷⁴See Bonham and Leith (1997) for a full list.
- ⁷⁵This and the nine preceding quotations: USGS Pick and Hammer Club show program, 1957, p. 9; copy in the RBR.

⁷⁶For an overview of the 20th IGC, see Mazadiego-Martínez and Puche-Rivart (2009).

⁷⁷See Headland (1989, p. 370–371), who listed Albert Paddock as chief scientist.

⁷⁸Meunier, 2007a, p. 4, and Meunier, 2007b, p. 6, 8, 9.

⁷⁹For a history of photomechanical techniques in map production, see Cook, K.S. (2002).

⁸⁰Radlinski (1957) reappraised research in photogrammetry.

⁸¹For the use of the Orthophotoscope, see Bean and Thompson (1957).

⁸²For perspective on scribing, see Deardorf (1957).

⁸³Bull, 1986, p. 947. Bull, also a geomorphologist, served with the USGS-WRD during 1956–76; he joined the University of Arizona's faculty in 1968.

⁸⁴70 Stat. L., 1078, August 7, 1956. See DDE, signing statement, August 7, 1956; Reid and others, 1958a, p. 659–660; PPPUS 1956/167.

⁸⁵See Stallman (1956).

⁸⁶Lyddan, *Surv. O.* 245, October 31, 1956.

⁸⁷For Eisenhower's role in the Suez Crisis, see Neff (1981) and Nichols (2011); for an overview, see Whetten (1974). Louis (2006) and Wawro (2010) provided wider historical contexts. DDE soon regretted deciding against his NATO allies.

⁸⁸See Gati (2006) and Lendvai (2008).

⁸⁹Yergin, 1991, p. 217–218.

⁹⁰Morris, J.B., and Morris, R.B., 1996, p. 507, 1185.

⁹¹DDE, special message to Congress, January 5, 1957: Reid and others, 1958b, p. 15; PPPUS 1957/6.

⁹²This and the preceding quotation: DDE, State of the Union Address to Congress, January 10, 1957: Reid and others, 1958b, p. 28; PPPUS 1957/8.

⁹³DDE, budget message to Congress, January 16, 1957: Reid and others, 1958b, p. 38; PPPUS 1957/13.

⁹⁴68 Stat. L., 1112, September 1, 1954.

⁹⁵This and the preceding quotation: DDE, second inaugural address, January 21, 1957: Reid and others, 1958b, p. 60; PPPUS 1957/15.

⁹⁶This and the preceding quotation: *ibid.*, p. 61.

⁹⁷This and the two preceding quotations: Saud, comments on arrival in the United States, January 30, 1957: Reid and others, 1958b, p. 109; PPPUS 1957/23.

⁹⁸71 Stat. L., 5, March 9, 1957.

⁹⁹70 Stat. L., 1119, August 8, 1956.

¹⁰⁰This and the preceding quotation: Kirwan, *in* House hearing, January 22, 1957, 85th Cong., 1st sess., p. 1.

¹⁰¹This and the three preceding quotations: *ibid.*, p. 10.

¹⁰²This and the preceding quotation: *ibid.*, p. 27.

¹⁰³Nolan, *in* House hearing, January 15, 1957, 85th Cong., 1st sess., p. 232.

¹⁰⁴This and the seven preceding quotations: *ibid.*, p. 227.

¹⁰⁵Kirwan, *ibid.*, p. 245.

¹⁰⁶*Ibid.*

¹⁰⁷*Ibid.*, p. 250.

¹⁰⁸For an analysis of Lyndon B. Johnson's rise to power and his service in the Senate, see Caro (1982, 1990, 2002).

¹⁰⁹71 Stat. L., 634, September 9, 1957.

¹¹⁰For an account and analysis of the Little Rock crisis, see Jacoway (2007). Williams, Juan (1987), and Weisbrot (1990) provided overviews of the civil rights movement in America.

¹¹¹This and the preceding quotation: Nolan, *in* Senate hearing, March 15, 1957, 85th Cong., 1st sess., p. 111.

¹¹²This and the two preceding quotations: *ibid.*, p. 112.

¹¹³*Ibid.*

¹¹⁴*Ibid.*, p. 125.

¹¹⁵71 Stat. L., 261, July 1, 1957.

¹¹⁶This and the three preceding quotations: DDE, remarks on the opening of the IGY, June 30, 1957: Reid and others, 1958b, p. 512; PPPUS 1957/122.

¹¹⁷See Sullivan, 1961, p. 1–2. Wilson (1961) supplemented and extended Sullivan's overview of the IGY.

¹¹⁸See Boorstin, 1973, p. 591. See also Dickson (2001).

¹¹⁹This and the preceding quotation: DDE, news conference, October 9, 1957: Reid and others, 1958b, p. 730; PPPUS 1957/210.

¹²⁰*Ibid.*, p. 731.

¹²¹See McDougall (1985) and similar overviews by Heppenheimer (1997) and Burrows (1998). Launius (1994) concentrated on NASA; Oberg (1981), on the Soviet space program. The account herein is based on all these books.

¹²²Rhodes (2007) assessed the arms race between the United States and the Soviet Union.

¹²³Neufeld, 2007, p. 311.

¹²⁴DDE, radio and television address to the Nation, November 7, 1957: Reid and others, 1958b, p. 789; PPPUS 1957/230.

¹²⁵For details of Eisenhower's response to Sputnik, see Divine (1993).

¹²⁶See Killian (1977) for an account of his service.

¹²⁷For a history of the President's Science Advisory Committee after Sputnik to its demise in 1972, see Wang, Zuoyue (2008).

¹²⁸For a history of Project Vanguard, see Green and Lomask (1971).

¹²⁹This and the preceding quotation: DDE, budget message to Congress, January 13, 1958: Reid and others, 1959b, p. 17; PPPUS 1958/5.

¹³⁰U.S. National Science Foundation, 1959, p. 12.

¹³¹DDE, Ex. O. 10758, March 4, 1958: PPPUS 1958/unnumbered doc. between 40 and 41.

¹³²A photograph of this event was reproduced by Pyne (2010, plate facing p. 236), who emphasized the differing and competing views of Pickering, Van Allen, and von Braun on the principal goal of the U.S. space program.

¹³³For overviews of Project Corona, see Peebles (1997) and Day, Logsdon, and Latell (1998). Cloud, John (2001), evaluated the Project's impact on the earth sciences. For a wider perspective, see Brugioni (2010).

- ¹³⁴For an assessment of the Keyhole program, see Richelson (1990).
- ¹³⁵DDE, Ex. O. 10807, March 13, 1959.
- ¹³⁶After NASA's founding, its Administrator joined the Federal Council for Science and Technology (FCST).
- ¹³⁷DDE, special message to Congress, April 2, 1958: Reid and others, 1959b, p. 271; PPPUS 1958/64.
- ¹³⁸Cochrane, 1978, p. 555.
- ¹³⁹Members of the Berkner Panel viewed "the detection system as one which will gradually evolve with time and reach a high level of detection capability only after several years": U.S. President's Science Advisory Committee, Panel on Seismic Improvement, 1959, p. 16.
- ¹⁴⁰Rainier, the first U.S. underground nuclear test, did not vent any radioactive products. It was part of Operation Plumbbob at the Nevada Test Site (May–October 1957), which included 25 aboveground nuclear tests and 3 detonations in open shafts. The atmospheric tests released large amounts of radioactive iodine.
- ¹⁴¹For a brief review of seismic-array development, see Carpenter (1965). Peterson (1992) discussed the system's development during 1960–67.
- ¹⁴²Bates, Gaskell, and Rice, 1982, p. 129.
- ¹⁴³Ibid.
- ¹⁴⁴Divine (1978) and Greene (2007) reviewed the test-ban debate during 1945–63.
- ¹⁴⁵72 Stat. L., 319, July 3, 1958.
- ¹⁴⁶Ibid.
- ¹⁴⁷Smith, F.E., 1971, p. 681 (reprinted with the permission of the publisher).
- ¹⁴⁸This and the two preceding quotations: Seaton, *in* House hearing, January 13, 1958, 85th Cong., 2d sess., p. 2.
- ¹⁴⁹Ibid., p. 3.
- ¹⁵⁰This and the three preceding quotations: Hardy, *ibid.*, January 16, 1958, p. 345. For perspective on the environmental effects of natural-resources development, see McNeill (2000).
- ¹⁵¹This and the preceding quotation: *ibid.*, p. 346.
- ¹⁵²This and the two preceding quotations: Nolan, *ibid.*, p. 346.
- ¹⁵³Ibid., p. 347.
- ¹⁵⁴This and the two preceding quotations: *ibid.*
- ¹⁵⁵This and the two preceding quotations: *ibid.*, p. 348.
- ¹⁵⁶Ibid., p. 352.
- ¹⁵⁷This and the two preceding quotations: *ibid.*, p. 353.
- ¹⁵⁸For a brief account of the geologic aspects of the tests, see Eckel and others (1957).
- ¹⁵⁹This and the preceding quotation: Nolan, *in* House hearing, January 16, 1958, 85th Cong., 2d sess., p. 359.
- ¹⁶⁰Kirwan, *ibid.*
- ¹⁶¹Nolan, *ibid.*, p. 368.
- ¹⁶²This and the preceding quotation: Kirwan, *ibid.*
- ¹⁶³Nolan, *ibid.*, p. 372.
- ¹⁶⁴Jesse Johnson to Nolan, January 20, 1958, *ibid.*, p. 373.
- ¹⁶⁵This and the preceding quotation: Jensen, *ibid.*, p. 379.
- ¹⁶⁶This and the preceding quotation: Nolan, *ibid.*, p. 384.
- ¹⁶⁷Ibid., p. 385.
- ¹⁶⁸This and the preceding quotation: Kirwan, *ibid.*, p. 400.
- ¹⁶⁹Hayden, *in* Senate hearing, March 25, 1958, 85th Cong., 2d sess., p. 65.
- ¹⁷⁰Ibid., p. 73.
- ¹⁷¹DDE, Ex. O. 10753, February 15, 1958: PPPUS 1958/unnumbered doc. between 29 and 30. Ex. O. 10753 superseded Ex. O. 10156, August 26, 1950.
- ¹⁷²This and the two preceding quotations: Libby to Seaton, March 19, 1958, *in* Senate hearing, March 25, 1958, 85th Cong., 2d sess., p. 179.
- ¹⁷³For a retrospective view of Project Plowshare, see Kirsch (2005). Johnson, G.W. (1959), discussed using nuclear explosions to mine oil shale. Neal (1988) reviewed the project's military geology aspects, and Cowan (1961), its scientific applications.
- ¹⁷⁴Hayden, *in* Senate hearing, March 25, 1958, 85th Cong., 2d sess., p. 182.
- ¹⁷⁵Nolan, *ibid.*, p. 182.
- ¹⁷⁶This and the preceding quotation: Hayden, *ibid.*, p. 189.
- ¹⁷⁷This and the two preceding quotations: Nolan, *ibid.*
- ¹⁷⁸72 Stat. L., 159, June 4, 1958.
- ¹⁷⁹72 Stat. L., 874, August 27, 1958.
- ¹⁸⁰73 Stat. L., 57, May 20, 1959.
- ¹⁸¹72 Stat. L., 54, March 28, 1958.
- ¹⁸²Nolan, *in* House hearing, January 28, 1959, 86th Cong., 1st sess., p. 172.
- ¹⁸³Nolan, Surv. O. 248, February 13, 1958.
- ¹⁸⁴This and the preceding quotation: Baker, Surv. O. 249, April 8, 1958.
- ¹⁸⁵Nolan, Surv. O. 250, May 13, 1958.
- ¹⁸⁶For a summary of the dispute about Meteor Crater's origin, see Hoyt (1987).
- ¹⁸⁷See Gilbert, G.K. (1893), and the evaluations by El-Baz (1980) and Pyne (1980).
- ¹⁸⁸See Daly (1946), Dietz (1946, 1959, 1960), and Baldwin (1949).
- ¹⁸⁹Shoemaker, *in* Wilhelms, 1993, p. 27, ©1993 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.
- ¹⁹⁰USGS Pick and Hammer Club show program, 1958, p. 12; copy in the RBR.
- ¹⁹¹Ibid., p. 15.
- ¹⁹²Ibid., p. 14.
- ¹⁹³Ibid., p. 18.
- ¹⁹⁴This and the two preceding quotations: *ibid.*
- ¹⁹⁵Estabrook, 1956, p. 686.
- ¹⁹⁶Munk, *in* Bascom, 1961, p. 47.
- ¹⁹⁷Hess and Munk, *in* *ibid.*
- ¹⁹⁸Ibid., p. 49.
- ¹⁹⁹Ibid., p. 50. Lill and Maxwell, 1959, p. 1408, reprinted the International Union of Geodesy and Geophysics' (IUGG's) Resolution 11.

²⁰⁰The NAS elected Menard a member in 1968.

²⁰¹Rabi, *in* Bascom, 1961, p. 51.

²⁰²Cochrane, 1978, p. 559.

²⁰³See van Keuren (2001) for an account of the NSF's support of the ocean sciences during 1951–65.

²⁰⁴See Bascom (1959), Hess (1959), Lill and Bascom (1959), and Lill and Maxwell (1959).

²⁰⁵This and the preceding quotation: The AMSOC proverb, *in* Lill and Maxwell, 1959, p. 1410; also *in* Greenberg, 1967, p. 179. On January 23, 1960, the U.S. Navy's bathyscape *Trieste*, purchased in 1958, modified, and crewed by oceanographer Jacques Piccard and Lt. (later Captain) Don Walsh, reached bottom at a depth of about 35,800 feet in the Mariana Trench's Challenger Deep near Guam. See Piccard and Dietz (1961).

²⁰⁶For a history of the Carnegie Institution of Washington's Geophysical Laboratory, see Yoder (2005).

²⁰⁷Nolan, Surv. O. 236 (2d revision), May 13, 1958.

²⁰⁸Bush, A.L., 1987, p. 5.

²⁰⁹See Varnes (1958).

²¹⁰See Reed, J.C. ([Sr.] 1958b), for a summary of IGY activities in the Arctic. See also Launius, Fleming, and DeVorkin (2010) for a wider perspective.

²¹¹See Lachenbruch (1957).

²¹²See Bonham and Leith (1997).

²¹³Headland, 1989, p. 376–377.

²¹⁴Behrendt served as assistant seismologist in Edward C. Thiel's party at Ellsworth. For the account of their continuous work in Antarctica between November 1956 and January 1958, see Behrendt (1998). See Behrendt (2005) for details of his subsequent work on the continent that resumed in 1960.

²¹⁵Meunier, 2007a, p. 4; Meunier, 2007b, p. 6, 8–9.

²¹⁶See Whitmore, G.D. (1958). See also Rostow (1982).

²¹⁷U.S. Geological Survey and others, 1970, p. vii. For a brief history of national atlases, see Monmonier (1994).

²¹⁸DDE, Ex. O. 10752, February 12, 1958: PPPUS 1958/unnumbered doc. between 28 and 29. The Executive order made Secretary Seaton responsible for enforcing the Connally "Hot Oil" Act. The law (49 Stat. L., 30) was signed on February 22, 1935, and regulated interstate and foreign commerce in petroleum and its products.

²¹⁹Seaton, Secr. O. 2826, February 14, 1958.

²²⁰71 Stat. L., 341, August 13, 1957.

²²¹The Weather Bureau was transferred to the Commerce Department in 1940. In 1966, the Bureau passed to the new Environmental Science Services Administration (ESSA). In 1970, the ESSA became the National Oceanic and Atmospheric Administration, and the Bureau was renamed the National Weather Service. For histories of the National Weather Service and its antecedents, see Whitnah (1961), Hawes (1966), and Hughes (1970).

²²²The U.S. Coast Guard shifted to the Department of Transportation in 1967 and then passed to the new Department of Homeland Security in 2002. For histories of the USCG and its antecedents, see Evans, S.H. (1951), and Johnson, R.E. (1987).

Chapter 10 A New Cycle, 1958–1961

¹Nolan, 1959, p. 214.

²72 Stat. L., 426, July 29, 1958.

³*Ibid.*, p. 427.

⁴This and the two preceding quotations: *ibid.*, p. 426.

⁵This and the preceding quotation: *ibid.*, p. 427.

⁶*Ibid.*, p. 432.

⁷72 Stat. L., 613, August 14, 1958, and 72 Stat. L., 873, August 27, 1958.

⁸See Wolfe (1979). Major General Charles E. ("Chuck") Yeager and the other civilian and military pilots of the X-15 and other USAF programs who flew their aircraft to altitudes above 50 miles earned designations as pilot-astronauts.

⁹For perspective on attaining the Law of the Sea, see Alexander, L.M. (1967), Wenk (1972), and Duff (2004).

¹⁰U.N. General Assembly Resolution 1472 in 1959 formally established the Committee on the Peaceful Uses of Outer Space.

¹¹See Bates (1961); for retrospectives of Project Vela, see Kisslinger (1971) and Kerr (1985).

¹²For an overview of the Lebanon crisis, see Dowty (1984).

¹³See Welch (1985) for an analysis of U.S. responses during 1959–61 to Castro's revolution. For an overview of Castro's and other insurgencies and counterinsurgencies since 1945, see Boot (2013).

¹⁴The United States did not become a signatory member of CENTO.

¹⁵72 Stat. L., 514, August 6, 1958.

¹⁶This and the preceding quotation: Meyerhoff, 1958, p. 12.

¹⁷72 Stat. L., 1580, September 2, 1958. See also Clowse (1981).

¹⁸This and the three preceding quotations: 71 Stat. L., 623, September 7, 1957.

¹⁹72 Stat. L., 339, July 7, 1958.

²⁰73 Stat. L., c16, January 3, 1959.

²¹Morris, J.B., and Morris, R.B., 1996, p. 509, 1185.

²²Nolan, Surv. O. 222 (2d revision), March 9, 1959.

²³Charles Leith died in 1957, but Elmer Pehrson continued to promote a greater appreciation of the importance of the International Cooperation Administration's role in emphasizing mineral resources in international affairs; see Pehrson (1959).

²⁴Keller, G.V., and Licastro (1959); see also Keller G.V. (1959).

²⁵McKelvey and others (1959).

²⁶James Gilluly, memorandum to Fuels Branch staff, August 6, 1958, 3 p.; copy in the RBR.

²⁷For a history of the HVO's seismic network during 1950–79, see Klein and Koyanagi (1980) and Babb, Kauahikaua, and Tilling (2011).

²⁸Eaton (1959) described the portable water-tube tiltmeter.

²⁹Glen, 1982, p. 154, 177.

³⁰This and the preceding quotation: Becker, 1904, p. 552.

³¹This and the two preceding quotations: Balsley, 1989, p. 7. See also Hill (1959).

- ³²Glen, 1982, p. 163.
- ³³Ibid., p. 180.
- ³⁴Curtis, Evernden, and Joseph I. Lipson reported K-Ar dates for a number of Mesozoic and Cenozoic intrusive rocks in California and elsewhere. Their coauthored articles were published during 1956–58; for example, see Curtis, Evernden, and Lipson (1958).
- ³⁵See Tocher and Miller, D.J. (1959), Tocher (1960a,b), and Stover and Coffman (1993, p. 54–55). In Greenwich Mean Time (now Coordinated Universal Time), the Lituya earthquake occurred on July 10, 1958.
- ³⁶Pomeroy, 1982, p. 1.
- ³⁷See Kuiper (1960a,b).
- ³⁸See Kuiper (1954).
- ³⁹Wilhelms, 1993, p. x–xi. Most of the discussion herein of the USGS lunar program is based on Wilhelms' book, ©1993 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.
- ⁴⁰Ibid., p. xi.
- ⁴¹72 Stat. L., 837, August 23, 1958.
- ⁴²76 Stat. L., 427, September 5, 1962.
- ⁴³This and the preceding quotation: 72 Stat. L., 959, August 28, 1958.
- ⁴⁴72 Stat. L., 837, August 23, 1958.
- ⁴⁵Headland, 1989, p. 384.
- ⁴⁶Meunier, 2007b, p. 6–7, 9; Meunier, 2007a, p. 5.
- ⁴⁷This and the three preceding quotations: Seaton, Secr. O. 2829, July 10, 1958, as amended on August 8, 1958.
- ⁴⁸Fagerholm (1959) discussed photogrammetry's application to land-use planning.
- ⁴⁹See Landen (1959) for an assessment of photogrammetry's impact on geology.
- ⁵⁰For an evaluation of techniques and applications, see Southard (1958). See also Thompson (1979) and Southard (1984).
- ⁵¹USGS Pick and Hammer Club show program, 1959, p. 6; copy in the RBR.
- ⁵²See Cooper, H.H., Jr. (1959).
- ⁵³See Hem (1959).
- ⁵⁴This and the preceding quotation: 72 Stat. L., 596, August 14, 1958.
- ⁵⁵72 Stat. L., 632, August 19, 1958.
- ⁵⁶72 Stat. L., 700, August 21, 1958.
- ⁵⁷Seaton, unnumbered Secretarial order, September 11, 1958; Federal Register, v. 23, p. 7181, September 17, 1958, and supplemented by Secr. O. 2833 and 2834, September 22, 1958.
- ⁵⁸Kirwan, *in* House hearing, January 27, 1959, 86th Cong., 1st sess., p. 1.
- ⁵⁹Seaton, *ibid.*
- ⁶⁰This and the preceding quotation: Nolan, *in* House hearing, January 28, 1959, 86th Cong., 1st sess., p. 169.
- ⁶¹Ibid., p. 183.
- ⁶²Ibid., p. 183–184.
- ⁶³This and the preceding quotation: *ibid.*, p. 184.
- ⁶⁴Ibid., p. 186. The NSF's Advisory Committee on Minerals Research included Astin, Bateman, James Boyd, Ewing, Graton, Leith, Nolan, Rubey, Slichter, Wrather, and Zinner.
- ⁶⁵Ibid., p. 187.
- ⁶⁶This and the preceding quotation: Kirwan, *ibid.*, p. 189.
- ⁶⁷This and the preceding quotation: Nolan, *ibid.*
- ⁶⁸Nolan, *ibid.*, p. 193.
- ⁶⁹Kirwan, *ibid.*, p. 194.
- ⁷⁰This and the preceding quotation: Nolan, *ibid.*
- ⁷¹Kirwan, *ibid.*, p. 208.
- ⁷²42 Stat. L., 20, June 10, 1921, established the Bureau of the Budget and the General Accounting Office.
- ⁷³Nolan, *ibid.*
- ⁷⁴This and the preceding quotation: Nolan, *in* Senate hearing, May 18, 1959, 86th Cong., 1st sess., p. 632.
- ⁷⁵Hayden, *ibid.*
- ⁷⁶73 Stat. L., 96, June 23, 1959.
- ⁷⁷Nolan, Surv. O. 252, July 17, 1959.
- ⁷⁸73 Stat. L., 479, September 9, 1959.
- ⁷⁹Seaton, Secr. O. 2846, January 22, 1960.
- ⁸⁰Pecora (1913–72) later served as Chief Geologist (1964–65) and Director (1965–71) of the USGS before being named Under Secretary of the Interior (1971–72). For a career summary, see Yoder (1999).
- ⁸¹Bascom, 1961, p. 55, incorrectly credited the USGS show to the "Washington Geological Society."
- ⁸²USGS Pick and Hammer Club show program, 1960, p. 15; copy in the RBR.
- ⁸³Ibid., p. 17.
- ⁸⁴Ibid., p. 3.
- ⁸⁵Ibid., p. 17.
- ⁸⁶Ibid.
- ⁸⁷U.S. National Science Foundation, 1962, p. 188. See also the accounts and evaluations of Project Mohole in Bascom (1961), Greenberg (1964, 1967, 1981), Lomask (1976), and Maxwell (1993).
- ⁸⁸See American Geological Institute (1960b) and Horton (1961) for the preliminary results of drilling operations at the sites off La Jolla and off Guadalupe Island. See also the brief summary by Maxwell (1993).
- ⁸⁹See Miller, Payne, and Gryc (1959).
- ⁹⁰See Cashion (1959).
- ⁹¹The Branch's work continued to include isotope geochemistry; for a brief history, see Doe (1979).
- ⁹²See Cressman and Noger (1981).
- ⁹³See Witkind (1960), Tocher (1962), and Witkind and others (1962).
- ⁹⁴See U.S. Geological Survey (1964b).
- ⁹⁵See Eaton and Richter (1961).
- ⁹⁶For a brief history of geologic photogrammetry in the USGS, including the establishment of the Photogrammetric Plotter Laboratory at Denver, see Pillmore (1989).

⁹⁷See Corwin (1983); P.E. Cloud, Jr., like Rubey, was interested in the geochemistry of seawater, especially carbonate precipitation; for an example, see Cloud (1962). In the late 1940s, the BoB twice rejected a USGS request proposed by Thomas Hendricks for \$60 million for a 10-year study of the U.S. Continental Shelves (*ibid.*, p. 18).

⁹⁸See his view of terrain intelligence in Whitmore, F.C., Jr. (1960).

⁹⁹Carder (1961) discussed phototopography for the lunar chart.

¹⁰⁰See also Hackman (1961).

¹⁰¹Wilhelms, 1993, p. 38, ©1993 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.

¹⁰²See Chao (1960).

¹⁰³USGS news release, June 17, 1960; copy in the USGS Library in Reston, Va. See also American Geological Institute (1960a).

¹⁰⁴See Chao, Shoemaker, and Madsen (1960).

¹⁰⁵See Shoemaker (1960).

¹⁰⁶Wilhelms, 1993, p. 46, ©1993 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.

¹⁰⁷For a chronology of the Astrogeology Branch's activities during 1960–73, see Schaber (2005).

¹⁰⁸See Shoemaker and Hackman (1962). The 1:1,000,000 Copernicus sheet (I–515), by H.H. Schmitt, Newell J. Trask, and Shoemaker, appeared in 1967. Geologist-astronaut Harrison H. (“Jack”) Schmitt went to the Moon on the Apollo 17 mission in 1972.

¹⁰⁹This and the two preceding quotations: Wilhelms, 1993, p. 70, ©1993 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.

¹¹⁰See Cox, D.C., and Mink (1963); also see Cox, D.C. (1968), for an evaluation of the Seismic Sea Wave Warning System's performance.

¹¹¹U.S. National Science Foundation, 1961, p. 168.

¹¹²Headland, 1989, p. 391.

¹¹³Meunier, 2007a, p. 5.

¹¹⁴This and the preceding quotation: Antarctic Treaty (12 UST 794), signed in Washington on December 1, 1959. Reprinted in Joyner and Theis, 1997, p. 197. See also Klotz (1990).

¹¹⁵U.S. Geological Survey and others, 1970, p. vii.

¹¹⁶This summary of Bagnold's career is based on the biography by Kenn (1993).

¹¹⁷Leopold, *in* Kenn, 1993, p. 92. For a brief history of research in the Water Resources Division, see Langbein (1981). For the importance of Langbein's own contributions to scientific hydrology, see Dooge (1996).

¹¹⁸See Poland (1960).

¹¹⁹See Garrels (1960).

¹²⁰73 Stat. L., 395, August 18, 1959.

¹²¹73 Stat. L., 572, September 21, 1959.

¹²²This and the two preceding quotations: 74 Stat. L., 7 (Public Law 86–390), March 18, 1960.

¹²³74 Stat. L., 7 (Public Law 86–391), March 18, 1960.

¹²⁴This and the preceding quotation: 74 Stat. L., 257, June 29, 1960.

¹²⁵For a history of lunar mapping and place names, see Whitaker (1999).

¹²⁶Polmar, 1998, p. 68. For histories of the cold war, see Newhouse (1989), Walker, M. (1993), and Gaddis (2005).

¹²⁷For histories of the Indochina and Vietnam Wars, see Karnow (1997), Herring (2002), Olson and Roberts (2008), and Prados (2009). The maps in Summers (1995) provide a significant supplement. In 1960, in a rare counter-insurgency success during postwar times, Britain ended the conflict in Malaya; for an account and analysis, see Barber (1972).

¹²⁸See Fall (1969). Castle (1993) assessed the nature and amount of U.S. military aid to Laos during 1955–75. See also Rust (2012).

¹²⁹Beschloss, 1986, p. 16–17, 22–27, and endpapers map.

¹³⁰This and the preceding quotation: DDE, statement, July 9, 1960: Reid and others, 1961a, p. 568; PPPUS 1960/227.

¹³¹Weissman (1974) evaluated U.S. foreign policy in the Congo during 1960–64.

¹³²For a national view, by a member of the ODM's Special Stockpile Advisory Committee, see Morgan, J.D., Jr. (1960).

¹³³73 Stat. L., 4, March 18, 1959.

¹³⁴73 Stat. L., c74, August 21, 1959.

¹³⁵DDE, Proclamation 3279, 73 Stat. L., c25, March 10, 1959; Seaton, Sections 2 and 21, Oil Import Regulation No. 1, March 13, 1959. See DDE, signing statement, March 10, 1959: Reid and others, 1960c, p. 240–241; PPPUS 1959/51.

¹³⁶74 Stat. L., 86, May 6, 1960.

¹³⁷Eckes, 1979, p. 217–218. Holmon D. Pettibone, Chairman of Chicago Title and Trust's Board, chaired the Special Stockpile Advisory Committee.

¹³⁸73 Stat. L., B19, September 9, 1959.

¹³⁹73 Stat. L., B20, September 10, 1959.

¹⁴⁰Kirwan, *in* House hearing, January 13, 1960, 86th Cong., 2d sess., p. 1.

¹⁴¹This and the preceding quotation: Seaton, *ibid.*, p. 3.

¹⁴²*Ibid.*, p. 9.

¹⁴³Nolan, *in* House hearing, January 14, 1960, 86th Cong., 2d sess., p. 294.

¹⁴⁴This and the preceding quotation: *ibid.*, p. 295.

¹⁴⁵74 Stat. L., 425, July 12, 1960. The statute authorized a total of nearly \$73.5 million for Federal Office Buildings 8, 9, and 10 in the District of Columbia.

¹⁴⁶73 Stat. L., 708, September 28, 1959.

¹⁴⁷This and the four preceding quotations: Kirwan, *in* House hearing, January 14, 1960, 86th Cong., 2d sess., p. 326.

¹⁴⁸This and the preceding quotation: *ibid.*, p. 327.

¹⁴⁹*Ibid.*, p. 329.

¹⁵⁰DDE, budget message to Congress, January 18, 1960: Reid and others, 1961a, p. 37–110; PPPUS 1960/13.

¹⁵¹74 Stat. L., 918, September 13, 1960. The Helium Act, authorizing the “conservation, production, and exploitation of helium gas,” but prohibiting its export without permission from the President, is 43 Stat. L., 1110, March 3, 1925.

¹⁵²74 Stat. L., 336, July 7, 1960. Doherty, 1971, p. 783–785, reprinted the statute.

¹⁵³This and the two preceding quotations: 74 Stat. L., 506, July 14, 1960.

¹⁵⁴74 Stat. L., 108, May 13, 1960.

¹⁵⁵74 Stat. L., 828, September 8, 1960.

¹⁵⁶75 Stat. L., 37, March 31, 1961.

¹⁵⁷Yergin, 1991, p. 518.

¹⁵⁸See Rockefeller, N.A., and Rockefeller, L.S. (1961).

¹⁵⁹See Kistiakowsky (1976).

¹⁶⁰Morris, J.B., and Morris, R.B., 1996, p. 510, 1185. For a recent analysis of the 1960 election, see Sorabaugh (2009).

¹⁶¹Nolan, 1960, p. III.

¹⁶²Ibid.

¹⁶³This and the five preceding quotations: *ibid.*

¹⁶⁴USGS Pick and Hammer Club show program, Menlo Park, 1961, cover 1; copy in the RBR.

¹⁶⁵Glen, 1982, p. 162.

¹⁶⁶Eckel, E.B. (1968), summarized the increased knowledge of the NTS geology.

¹⁶⁷See Cox, A.V., and Doell (1960).

¹⁶⁸This and the three preceding quotations: Doell and Cox, A.V., 1960, p. B426.

¹⁶⁹Ibid.

¹⁷⁰This and the preceding quotation: *ibid.*

¹⁷¹This and the preceding quotation: *ibid.*, p. B427. See also the retrospective in Verhoogen (1985).

¹⁷²This and the two preceding quotations: Nolan, *in* House hearing, March 1, 1961, 87th Cong., 1st sess., p. 471.

¹⁷³Ibid., p. 448.

¹⁷⁴This and the three preceding quotations: *ibid.*, p. 471.

¹⁷⁵USGS Pick and Hammer Club show program, Washington, D.C., May 5, 1961, p. 11; copy in the RBR. Charles (“Andy”) Anderson, like Wilmot (“Bill”) Bradley, strongly supported basic research in the Geologic Division: Glen, 1982, p. 368.

¹⁷⁶McKelvey (1916–87) completed his tour as an ACG in 1965; he later served as Chief Geologist (1971) and Director (1971–78) of the USGS. For a career summary, see Nelson, C.M. (2002a).

¹⁷⁷Keith, March 9, 1959, *in* Cong. Rec., v. 105, pt. 19, p. A1950.

¹⁷⁸The USGS established an Office of Marine Geology in fiscal year 1962–63.

¹⁷⁹In addition, Hubbert and William Rubey collaborated in evaluating the role of fluid pressure in the mechanics of overthrust faulting; see Hubbert and Rubey (1959, 1960) and Rubey and Hubbert (1959).

¹⁸⁰Cressman and Noger, 1981, p. 4.

¹⁸¹Ibid., p. 2.

¹⁸²For the return on the investment, see Bhagwat and Ipe (2000).

¹⁸³U.S. National Science Foundation, 1962, p. 173.

¹⁸⁴Headland, 1989, p. 397–398.

¹⁸⁵Meunier, 2007a, p. 5–6.

¹⁸⁶Ibid.

¹⁸⁷See Radlinski (1961).

¹⁸⁸Sørensen (2007) summarized the meeting.

¹⁸⁹Whitmore, G.D., Thompson, and Speert (1959) reported the status of the photogrammetric-electronic system that speeded map production. McHaffie (2002) analyzed the development of the “automated map factory” in the USGS during 1950–74.

¹⁹⁰363 U.S. 1, May 31, 1960; formal decree, 354 US 502, December 12.

¹⁹¹363 U.S. 121, May 31, 1960; formal decree, 364 US 502, December 12.

¹⁹²74 Stat. L., 781, September 2, 1960.

¹⁹³74 Stat. L., 1024, September 14, 1960.

¹⁹⁴74 Stat. L., 1028, September 14, 1960.

¹⁹⁵DDE, budget message to Congress, January 16, 1961: Reid and others, 1961a, p. 934–1028; PPPUS 1961/414.

¹⁹⁶U.S. National Science Foundation, 1954, p. 59, and U.S. NSF, 1962, p. 173.

¹⁹⁷This and the six preceding quotations: DDE, farewell address, January 17, 1961: Reid and others, 1961a, p. 1038; PPPUS 1961/421. For historical perspective on the military-industrial complex, see Koistinen (1980).

¹⁹⁸This and the preceding quotation: DDE, farewell address, January 17, 1961: Reid and others, 1961a, p. 1039; PPPUS 1961/421. Eisenhower mentioned later in the 1960s that in 1961 he had von Braun and Teller in mind as representatives of the “scientific-technological elite”: Neufeld, 2007, p. 352–353. For an analysis, see Ledbetter (2011).

¹⁹⁹This and the two preceding quotations: DDE, farewell address, January 17, 1961: Reid and others, 1961a, p. 1039; PPPUS 1961/421.

Chapter 11. Epilogue: The U.S. Geological Survey, 1939–1961

¹Shakespeare, “A Midsummer Night’s Dream,” Act 5, Scene 1: Wells, Stanley, and others, 1987, v. 2, p. 598, lines 349–350 (reproduced by permission of Oxford University Press).

²During 1887–92, three Congresses and Presidents Grover Cleveland and Benjamin Harrison marked John Powell’s failures by requiring the line itemization of USGS budget requests, terminating the agency’s Irrigation Survey for lack of promised results, and cutting half of the agency’s appropriations and one-third of its statutory scientific positions. Powell responded by conducting a 15-percent, USGS-wide reduction in force, one that fell most heavily on the agency’s geologic unit. Powell resigned in 1894, just before Congress and President Cleveland reduced his statutory salary from \$6,000 to \$5,000. Charles Walcott, Powell’s successor as Director, quickly restored congressional and executive confidence in the USGS; gained continuous funding for water-resources investigations; acquired responsibilities in reclamation, minerals research and technology, and other missions; and kept only those in which a basic-science component existed or could be developed. By fiscal year 1899–1900, the agency’s total funds rose to a level higher than that of any year under Powell. For details of this transition, see the narrative analyses in chapters 5–11 of volume 2 (Rabbitt, M.C., 1980) of this history, based principally on published sources, and the summaries and extensions in Nelson, C.M. (2007a,b), the latter based primarily on unpublished sources.

³Of the geologists, hydrologists, and paleontologists hired for full- or part-time work by the USGS during Mendenhall’s 13 years as Director, 14 were elected to the NAS. Members hired during 1930–43 and inducted by the NAS during and after that interval include Charles Anderson (1957), Milton Bramlette (1954), Arthur Buddington (1943), Preston Cloud, Jr. (1961), Robert Garrels (1962), Harold James (1962), Konrad Krauskopf (1959), Walter Langbein (1970), William Pecora (1965), Francis Pettijohn (1966), John Rodgers (1969), Chester Stock (1948), Aaron Waters (1964), and Donald White (1973).