APPENDIX A. GEOCHRONOLOGIC DATA FOR GLACIAL ADVANCES, WESTERN UNITED STATES

Rocky Mountain Region

Age control for glacier fluctuations in the Rocky Mountain region is provided by obsidian hydration, radiocarbon, U/Th, and ^{10}Be ages, and age estimates based on weathering rinds. U/Th ages from Sturchio et al. (1994, Figure 10) are not listed here for Figure 2A. Ages listed here are keyed to ages in Figure 2B based on numbers in parentheses following each age. Pierce (in Porter et al., 1983) compiled many of these data with the exception of ages reported since that publication. Evenson et al. (1994) reported a ^{10}Be age of 10.9 $\pm$ 0.5 (1) for a moraine from the Wind River Mountains, Wyoming. Pierce (1979) reported a ^{14}C of 11,600 $\pm$ 350 (W-2767) (2) on deglaciation from an advance in the Yellowstone region, Wyoming. Reasoner et al. (1994) reported radiocarbon ages of 10,070 $\pm$ 420 yr B.P. (CAMS-3177) (3) and 11,330 $\pm$ 220 yr B.P. (CAMS-3065) (3) that bracket a glacial advance in the Canadian Rockies of Alberta. Pierce (1979) reported a radiocarbon age of 13,140 $\pm$ 700 yr B.P. (W-2037) (4) that predates a glacial advance in the Yellowstone region, Wyoming. Pierce (1979) reported two radiocarbon ages of 14,490 $\pm$ 350 (W-3183) (5) and 14,360 $\pm$ 400 yr B.P. (W-2780) (6) that date deglaciation of the Yellowstone Plateau, Wyoming. Pierce et al. (1976) obtained ages from obsidian hydration rinds that suggest an age of 10-15 ka (7) for readvance of the Yellowstone ice cap, whereas Colman and Pierce (1986) suggested an age of about 14 ka (7) for glacier readvance at McCall, Idaho, from weathering rinds. Evenson et al. (1994) reported a ^{10}Be age of 15.5 $\pm$ 0.6 ka (8) for a moraine from the Wind River Mountains, Wyoming. Weathering rinds suggest an age of about 20 ka (9) for a glacier advance at McCall, Idaho (Colman and Pierce, 1986). Pierce (in Porter et al., 1983) reported a radiocarbon age of 20,800 $\pm$ 1200 yr B.P. (W-998) (10) that provides a minimum age for glacier advance in the Wind River Mountains. Evenson et al. (1994) reported a ^{10}Be age of 21 $\pm$ 1.5 ka (11) for a moraine from the Wind River Mountains, Wyoming. Madole (1986) reported a radiocarbon age of 22,400 +1070/-1320 yr B.P. (DIC-870) (12) on lake sediments dammed by an

advance of ice in the Colorado Front Range. Nelson et al. (1979) reported radiocarbon ages of 30,050 ± 1200 yr B.P. (SI-2912) (13) and 30,480 +2800/-4300 yr B.P. (DIC-482) (14) on organic matter separating tills in the Colorado Front Range, Colorado. Obsidian hydration rinds suggest an age of 30-40 ka (15) for deposits in the West Yellowstone area (Pierce et al., 1976): Pierce (in Porter et al, 1979) suggests an age of 35 ka. Similar ages are suggested from calibrated age from weathering rinds (16) (Colman and Pierce, 1981). Colman and Pierce (1986) suggest an age of 50 ka for glacial deposits associated with the Williams Creek advance at McCall, Idaho, based on calibrated ages from weathering rinds (17).

Puget Lobe, Cordilleran Ice Sheet

Age control for advances of the Puget Lobe is provided entirely by radiocarbon dating. Hicock and Armstrong (1981) reported a radiocarbon age of 11,000 ± 170 yr B.P. (I-5346) (1) on organic matter that post-dates the Sumas advance, and radiocarbon ages of 11,300 ± 100 yr B.P. (GSC-2523) (2) and 11,700 ± 150 yr B.P. (L-3313) (3) on organic matter associated with the Sumas advance. Radiocarbon ages that postdate the Vashon advance are 13,500 ± 200 yr B.P. (GSC-3124) (4), 13,650 ± 350 yr B.P. (Beta-1319) (5), and 13,650 ± 550 yr B.P. (L-346A) (6) (Clague, 1981; Booth, 1987). Radiocarbon ages that predate the Vashon advance are 15,000 ± 400 yr B.P. (W-1227) (7), 16,070 ± 600 yr B.P. (W-2125) (8), and 17,800 ± 150 yr B.P. (GSC-2297) (9) (Clague, 1981; Booth, 1987). A radiocarbon age that postdates Coquitlam Drift is 18,700 ± 170 yr B.P. (GSC-2344) (10), whereas radiocarbon ages that predate the advance that deposited Coquitlam Drift are 21,500 ± 240 yr B.P. (GSC-2536) (11), 21,600 ± 200 yr B.P. (GSC-2203) (12), and 28,800 ± 310 yr B.P. (GSC-95) (13) (Clague, 1981). Radiocarbon ages from the Olympia Nonglacial Interval are 25,800 ± 310 yr B.P. (GSC-2273) (14), 40,500 ± 1700 yr B.P. (GSC-2167) (15), and 58,800 +2900/-2100 yr B.P. (QL-195) (16) (Clague, 1981).

Cascade Range

Glacial deposits from the Cascade Range are very poorly dated, and the suggested age for much of this record is inferred from parallelism with other, better dated sequences. Porter (1978) reported a

radiocarbon age of 11,050 ± 50 yr B.P. (UW-321) (1) on organic matter that postdates a glacial advance, and a radiocarbon age of 13,570 ± 130 yr B.P. (UW-35) (2) for retreat of a glacier thought to have advanced at the same time as the Vashon advance of the Puget lobe (Porter, 1976). No direct age control is available for this event and its age is inferred on the basis of stratigraphic relations and correlation to ^{14}C-dated Coquitlam Drift (3) (Crandell and Miller, 1974). Weathering rinds indicate that an advance in the Cascade Range is >>28 ka and <45 ka (4), and may be correlative with the 30-40 ka advance of the Yellowstone ice cap (Colman and Pierce, 1981).