**Appendix B. Alaska gross cubic-foot volume equation forms**

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| **Table 6.** Gross cubic-foot volume equation forms for southeast (SE), south central (CN), and Kodiak and Afognak Islands (KA), Alaska | | | |
| Region/States (species codea) | Form of the model:  VOLCFGRS = f(x1,x2,….,xn) | Observed items:  (x1,x2,….,xn) | Referenceb |
| AK(SECN&KA) (11, 19, 71, 98, 231, 263, 264, 999) -- **IF (x1 < 9 OR x2 < 40)**  AK(SECN&KA) (42) -- **IF (x1 >=38 AND x2 < 40)**  AK(SECN&KA) (242) -- **IF (x1 >=56 AND x2 < 40)** | VOLCFGRS = b1x12x2 +  **(IF x2 = 0, SET VOLCFGRS TO 0)** | x1 = dbh  x2 = ht | Embry and Haack 1965 |
| AK(SECN) (11, 19, 71, 98, 231, 263, 264, 999) -- **IF (x1 >= 9 AND x2 >= 40)**  AK(KA) (11, 19, 71, 98, 231, 263, 264, 999) -- **IF (x1 >= 9 AND x2 > 110)**  AK(SECN) (42) -- **IF (x1 >=38 AND x2 >= 40)**  AK(KA) (42) -- **IF (x1 >= 38 AND x2 > 110)**  AK(SECN) (242) -- **IF (x1 >=56 AND x2 >= 40)**  AK(KA) (242) -- **IF (x1 >= 56 AND x2 > 110)** | VOLCFGRS = (V12.5 + V2(V12.5 – V14) + V3(V12.5 - V133)V4) – (V52.5 + V2(V52.5 – V54) + V3(V52.5 - V533)V4),  where V1 = (x2 - V6) / (x2 – b1),  V2 = b2x2 + b3x22 + b4,  V3 = + b6x22 + b7,  V4 = b8x12(x2 – b1)V7,  V5 = (x2 – (x2 – (V8(x2 – b1)))) / (x2 – b1),  V6 = top of stump = 1,  V7 = b9 + b10x1 + b11x2,  V8 = estimate for top diameter inside bark obtained by iterating the following two equations (for V8 and V9) up to 10 times or until V9 <= (V10 – 0.0001) or until V9 >= (V10 + 0.0001):  V8 = V8 + (V10 – V9) / (((V111.5 + V2(V111.5 – V113) + V3(V111.5 – V1132)) – (V121.5 + V2(V121.5 – V123) + V3(V121.5 – V1232))) / ());  V9 = V81.5 + V2(V81.5 – V83) + V3(V81.5 – V832),  Where V10 = V132 / (V7x12),  V11 = ((x2 – (x2(1 – ()()))) / (x2 – b1)),  V12 = b12V11,  V13 = top diameter outside bark = 4  **(IF x2 = 0, SET VOLCFGRS TO NULL)** | x1 = dbh  x2 = ht | Bruce and Demars unpublished,  Bruce 1984 |
| AK(KA) (11, 19, 71, 98, 231, 263, 264, 999) -- **IF (x1 >= 9 AND x2 >= 40 AND x2 <= 110)**  AK(KA) (42) -- **IF (x1 >= 38 AND x2 > 110)**  AK(KA) (242) -- **IF (x1 >= 56 AND x2 > 110)** | VOLCFGRS = (V12.5 + V2(V12.5 – V14) + V3(V12.5 - V133)V4) – (V52.5 + V2(V52.5 – V54) + V3(V52.5 - V533)V4),  where V1 = (x2 - V6) / (x2 – b1),  V2 = b2x2 + b3x22 + b4,  V3 = b5 + b6x22 + b7,  V4 = b8x12(x2 – b1)V7,  V5 = (x2 – (x2 – (V8(x2 – b1)))) / (x2 – b1),  V6 = top of stump = 1,  V7 = b9 + b10x1 + b11x2,  V8 = estimate for top diameter inside bark obtained by iterating the following two equations (for V8 and V9) up to 10 times or until V9 <= (V10 – 0.0001) or until V9 >= (V10 + 0.0001):  V8 = V8 + (V10 – V9) / (((V111.5 + V2(V111.5 – V113) + V3(V111.5 – V1132)) – (V121.5 + V2(V121.5 – V123) + V3(V121.5 – V1232))) / ());  V9 = V81.5 + V2(V81.5 – V83) + V3(V81.5 – V832),  Where V10 = V132 / (V7x12),  V11 = ((x2 – (x2(1 – ()()))) / (x2 – b1)),  V12 = b12V11,  V13 = top diameter outside bark = 4  **(IF x2 = 0, SET VOLCFGRS TO NULL)** | x1 = dbh  x2 = ht | Bruce and Demars unpublished, Bruce 1984 |
| AK(SECN&KA) (42) -- **IF (x1 < 9) OR (x1 >= 9 AND x1 < 38 AND x2 < 40)**  AK(SECN&KA) (242) -- **IF (x1 < 9) OR (x1 >= 9 AND x1 < 56 AND x2 < 40)** | VOLCFGRS = (( / ((b5(1 + b6))(b8x12 + b9) + b10))((b11x12 – b9) / b4) | x1 = dbh  x2 = ht | Brackett 1973, Browne 1962 |
| AK(SECN&KA) (42) -- **IF (x1 >= 9 AND x1 < 38 AND x2 >= 40)** | VOLCFGRS = (V12.5 + V2(V12.5 – V14) + V3(V12.5 - V133)V4) – (V52.5 + V2(V52.5 – V54) + V3(V52.5 - V533)V4),  where V1 = (x2 - V6) / (x2 - b1),  V2 = b2x1 + b3x22 + b4,  V3 = + b6x22 + b7 + b8x1,  V4 = b9x12(x2 - b1)V7,  V5 = (x2 – V8) / (x2 – b1),  V6 = top of stump = 1,  V7 = b10 + b11x1 + ,  V8 = estimate for height to top diameter inside bark obtained by iterating the following equations (for V8, V9, V10, V11, V12 and V13) until the two closest estimates are made where V12 <= (V14 – 0.001) and V13 >= (V14 + 0.001):  [initially, set V8 = (x2 – V14)(x2 – b1) / x2 and skip to equation for V9]  V8 = (V12 + V13) / 2  V9 = (x2 – V8) / (x2 – b1)  V10 = (V91.5 + V2(V91.5 – V93) + V3(V91.5 – V932)  V11 = x1**--if V10 < 0, set V11 to 0**  IF V11 <= V14, SET V12 = V11  IF V11 > V14, SET V13 = V11,  Where V14 = top diameter outside bark = 4  **(IF x2 = 0, SET VOLCFGRS TO NULL)** | x1 = dbh  x2 = ht | Bruce and Demars unpublished |
| AK(Coastal-SECN) (94, 95, 375, 746, 747, 920) | **IF (x1 > 1 AND x2 > 0)**  VOLCFGRS = b0 + b1x12x2  (**IF VOLCFGRS <= 0, SET VOLCFGRS TO V1**, where V1 = (b2() + (b2(b6) – (b7b8) **if V1 > original VOLCFGRS**; **otherwise, do not change**)  **OTHERWISE**  VOLCFGRS = NULL | x1 = dbh  x2 = ht | Larson and Winterberger 1988, Campbell, unpublished 2009 |
| AK(SECN&KA (108)  AK(SECN&KA) (310, 660, 661)  AK(SECN&KA) (351) | VOLCFGRS = (( / ((b5(1 + b6))(b8x12 + b9) + b10))((b11x12 – b9) / b4) | x1 = dbh  x2 = ht | Brackett 1973, Browne 1962 |
| AK(SECN&KA)  (242) -- **IF (x1 >= 9 AND x1 < 56 AND x2 >= 40)** | VOLCFGRS = (V12.5 + V2(V12.5 – V14) + V3(V12.5 - V133)V4) – (V52.5 + V2(V52.5 – V54) + V3(V52.5 - V533)V4),  where V1 = (x2 - V6) / (x2 - b1),  V2 = + b3x1 + b4x2 + b5x22 + b6x12,  V3 = + b8x22,  V4 = b9x12(x2 - b1)V7,  V5 = (x2 – V8) / (x2 – b1),  V6 = top of stump = 1,  V7 = b10 + b11x2 + ,  V8 = estimate for height to top diameter inside bark obtained by iterating the following equations (for V8, V9, V10, V11, V12 and V13) until the two closest estimates are made where V12 <= (V14 – 0.001) and V13 >= (V14 + 0.001):  [initially, set V8 = (x2 – V14)(x2 – b1) / x2 and skip to equation for V9]  V8 = (V12 + V13) / 2  V9 = (x2 – V8) / (x2 – b1)  V10 = (V91.5 + V2(V91.5 – V93) + V3(V91.5 – V932)  V11 = x1**--if V10 < 0, set V11 to 0**  IF V11 <= V14, SET V12 = V11  IF V11 > V14, SET V13 = V11,  Where V14 = top diameter outside bark = 4  **(IF x2 = 0, SET VOLCFGRS TO NULL)** | x1 = dbh  x2 = ht | Bruce and Demars unpublished |

a Species numbers refer to the codes used by FIA (Woudenberg et al., 2010)

b References are listed in a separate Literature Cited section at the end of the Appendix A.