# Combined Sampling Errors

P.R. Smith, RPF, ATE

Bruce's

BA Sample Error %

Vbar Sample Error %

| | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0 | 6.5 | 7.0 | 7.5 | 8.0 | 8.5 | 9.0 | 9.5 | 10.0 | 10.5 | 11.0 | 11.5 | 12.0 | 12.5 | 13.0 | 13.5 | 14.0 | 14.5 | 15.0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0.5** | 0.71 | 1.12 | 1.58 | 2.06 | 2.55 | 3.04 | 3.54 | 4.03 | 4.53 | 5.02 | 5.52 | 6.02 | 6.52 | 7.02 | 7.52 | 8.02 | 8.51 | 9.01 | 9.51 | 10.01 | 10.51 | 11.01 | 11.51 | 12.01 | 12.51 | 13.01 | 13.51 | 14.01 | 14.51 | 15.01 |
| **1.0** | 1.12 | 1.41 | 1.80 | 2.24 | 2.69 | 3.16 | 3.64 | 4.12 | 4.61 | 5.10 | 5.59 | 6.08 | 6.58 | 7.07 | 7.57 | 8.06 | 8.56 | 9.06 | 9.55 | 10.05 | 10.55 | 11.05 | 11.54 | 12.04 | 12.54 | 13.04 | 13.54 | 14.04 | 14.53 | 15.03 |
| **1.5** | 1.58 | 1.80 | 2.12 | 2.50 | 2.92 | 3.35 | 3.81 | 4.27 | 4.74 | 5.22 | 5.70 | 6.18 | 6.67 | 7.16 | 7.65 | 8.14 | 8.63 | 9.12 | 9.62 | 10.11 | 10.61 | 11.10 | 11.60 | 12.09 | 12.59 | 13.09 | 13.58 | 14.08 | 14.58 | 15.07 |
| **2.0** | 2.06 | 2.24 | 2.50 | 2.83 | 3.20 | 3.61 | 4.03 | 4.47 | 4.92 | 5.39 | 5.85 | 6.32 | 6.80 | 7.28 | 7.76 | 8.25 | 8.73 | 9.22 | 9.71 | 10.20 | 10.69 | 11.18 | 11.67 | 12.17 | 12.66 | 13.15 | 13.65 | 14.14 | 14.64 | 15.13 |
| **2.5** | 2.55 | 2.69 | 2.92 | 3.20 | 3.54 | 3.91 | 4.30 | 4.72 | 5.15 | 5.59 | 6.04 | 6.50 | 6.96 | 7.43 | 7.91 | 8.38 | 8.86 | 9.34 | 9.82 | 10.31 | 10.79 | 11.28 | 11.77 | 12.26 | 12.75 | 13.24 | 13.73 | 14.22 | 14.71 | 15.21 |
| **3.0** | 3.04 | 3.16 | 3.35 | 3.61 | 3.91 | 4.24 | 4.61 | 5.00 | 5.41 | 5.83 | 6.26 | 6.71 | 7.16 | 7.62 | 8.08 | 8.54 | 9.01 | 9.49 | 9.96 | 10.44 | 10.92 | 11.40 | 11.88 | 12.37 | 12.85 | 13.34 | 13.83 | 14.32 | 14.81 | 15.30 |
| **3.5** | 3.54 | 3.64 | 3.81 | 4.03 | 4.30 | 4.61 | 4.95 | 5.32 | 5.70 | 6.10 | 6.52 | 6.95 | 7.38 | 7.83 | 8.28 | 8.73 | 9.19 | 9.66 | 10.12 | 10.59 | 11.07 | 11.54 | 12.02 | 12.50 | 12.98 | 13.46 | 13.95 | 14.43 | 14.92 | 15.40 |
| **4.0** | 4.03 | 4.12 | 4.27 | 4.47 | 4.72 | 5.00 | 5.32 | 5.66 | 6.02 | 6.40 | 6.80 | 7.21 | 7.63 | 8.06 | 8.50 | 8.94 | 9.39 | 9.85 | 10.31 | 10.77 | 11.24 | 11.70 | 12.18 | 12.65 | 13.12 | 13.60 | 14.08 | 14.56 | 15.04 | |
| **4.5** | 4.53 | 4.61 | 4.74 | 4.92 | 5.15 | 5.41 | 5.70 | 6.02 | 6.36 | 6.73 | 7.11 | 7.50 | 7.91 | 8.32 | 8.75 | 9.18 | 9.62 | 10.06 | 10.51 | 10.97 | 11.42 | 11.88 | 12.35 | 12.82 | 13.29 | 13.76 | 14.23 | 14.71 | 15.18 | |
| **5.0** | 5.02 | 5.10 | 5.22 | 5.39 | 5.59 | 5.83 | 6.10 | 6.40 | 6.73 | 7.07 | 7.43 | 7.81 | 8.20 | 8.60 | 9.01 | 9.43 | 9.86 | 10.30 | 10.74 | 11.18 | 11.63 | 12.08 | 12.54 | 13.00 | 13.46 | 13.93 | 14.40 | 14.87 | 15.34 | |
| **5.5** | 5.52 | 5.59 | 5.70 | 5.85 | 6.04 | 6.26 | 6.52 | 6.80 | 7.11 | 7.43 | 7.78 | 8.14 | 8.51 | 8.90 | 9.30 | 9.71 | 10.12 | 10.55 | 10.98 | 11.41 | 11.85 | 12.30 | 12.75 | 13.20 | 13.66 | 14.12 | 14.58 | 15.04 | | |
| **6.0** | 6.02 | 6.08 | 6.18 | 6.32 | 6.50 | 6.71 | 6.95 | 7.21 | 7.50 | 7.81 | 8.14 | 8.49 | 8.85 | 9.22 | 9.60 | 10.00 | 10.40 | 10.82 | 11.24 | 11.66 | 12.09 | 12.53 | 12.97 | 13.42 | 13.87 | 14.32 | 14.77 | 15.23 | | |
| **6.5** | 6.52 | 6.58 | 6.67 | 6.80 | 6.96 | 7.16 | 7.38 | 7.63 | 7.91 | 8.20 | 8.51 | 8.85 | 9.19 | 9.55 | 9.92 | 10.31 | 10.70 | 11.10 | 11.51 | 11.93 | 12.35 | 12.78 | 13.21 | 13.65 | 14.09 | 14.53 | 14.98 | 15.44 | | |
| **7.0** | 7.02 | 7.07 | 7.16 | 7.28 | 7.43 | 7.62 | 7.83 | 8.06 | 8.32 | 8.60 | 8.90 | 9.22 | 9.55 | 9.90 | 10.26 | 10.63 | 11.01 | 11.40 | 11.80 | 12.21 | 12.62 | 13.04 | 13.46 | 13.89 | 14.33 | 14.76 | 15.21 | | | |
| **7.5** | 7.52 | 7.57 | 7.65 | 7.76 | 7.91 | 8.08 | 8.28 | 8.50 | 8.75 | 9.01 | 9.30 | 9.60 | 9.92 | 10.26 | 10.61 | 10.97 | 11.34 | 11.72 | 12.10 | 12.50 | 12.90 | 13.31 | 13.73 | 14.15 | 14.58 | 15.01 | | | | |
| **8.0** | 8.02 | 8.06 | 8.14 | 8.25 | 8.38 | 8.54 | 8.73 | 8.94 | 9.18 | 9.43 | 9.71 | 10.00 | 10.31 | 10.63 | 10.97 | 11.31 | 11.67 | 12.04 | 12.42 | 12.81 | 13.20 | 13.60 | 14.01 | 14.42 | 14.84 | 15.26 | | | | |
| **8.5** | 8.51 | 8.56 | 8.63 | 8.73 | 8.86 | 9.01 | 9.19 | 9.39 | 9.62 | 9.86 | 10.12 | 10.40 | 10.70 | 11.01 | 11.34 | 11.67 | 12.02 | 12.38 | 12.75 | 13.12 | 13.51 | 13.90 | 14.30 | 14.71 | 15.12 | | | | | |
| **9.0** | 9.01 | 9.06 | 9.12 | 9.22 | 9.34 | 9.49 | 9.66 | 9.85 | 10.06 | 10.30 | 10.55 | 10.82 | 11.10 | 11.40 | 11.72 | 12.04 | 12.38 | 12.73 | 13.09 | 13.45 | 13.83 | 14.21 | 14.60 | 15.00 | 15.40 | | | | | |
| **9.5** | 9.51 | 9.55 | 9.62 | 9.71 | 9.82 | 9.96 | 10.12 | 10.31 | 10.51 | 10.74 | 10.98 | 11.24 | 11.51 | 11.80 | 12.10 | 12.42 | 12.75 | 13.09 | 13.44 | 13.79 | 14.16 | 14.53 | 14.92 | 15.31 | | | | | | |
| **10.0** | 10.01 | 10.05 | 10.11 | 10.20 | 10.31 | 10.44 | 10.59 | 10.77 | 10.97 | 11.18 | 11.41 | 11.66 | 11.93 | 12.21 | 12.50 | 12.81 | 13.12 | 13.45 | 13.79 | 14.14 | 14.50 | 14.87 | 15.24 | | | | | | | |
| **10.5** | 10.51 | 10.55 | 10.61 | 10.69 | 10.79 | 10.92 | 11.07 | 11.24 | 11.42 | 11.63 | 11.85 | 12.09 | 12.35 | 12.62 | 12.90 | 13.20 | 13.51 | 13.83 | 14.16 | 14.50 | 14.85 | 15.21 | | | | | | | | |
| **11.0** | 11.01 | 11.05 | 11.10 | 11.18 | 11.28 | 11.40 | 11.54 | 11.70 | 11.88 | 12.08 | 12.30 | 12.53 | 12.78 | 13.04 | 13.31 | 13.60 | 13.90 | 14.21 | 14.53 | 14.87 | 15.21 | | | | | | | | | |
| **11.5** | 11.51 | 11.54 | 11.60 | 11.67 | 11.77 | 11.88 | 12.02 | 12.18 | 12.35 | 12.54 | 12.75 | 12.97 | 13.21 | 13.46 | 13.73 | 14.01 | 14.30 | 14.60 | 14.92 | 15.24 | | | | | | | | | | |
| **12.0** | 12.01 | 12.04 | 12.09 | 12.17 | 12.26 | 12.37 | 12.50 | 12.65 | 12.82 | 13.00 | 13.20 | 13.42 | 13.65 | 13.89 | 14.15 | 14.42 | 14.71 | 15.00 | 15.31 | | | | | | | | | | | |
| **12.5** | 12.51 | 12.54 | 12.59 | 12.66 | 12.75 | 12.85 | 12.98 | 13.12 | 13.29 | 13.46 | 13.66 | 13.87 | 14.09 | 14.33 | 14.58 | 14.84 | 15.12 | 15.40 | | | | | | | | | | | | |
| **13.0** | 13.01 | 13.04 | 13.09 | 13.15 | 13.24 | 13.34 | 13.46 | 13.60 | 13.76 | 13.93 | 14.12 | 14.32 | 14.53 | 14.76 | 15.01 | 15.26 | | | | | | | | | | | | | | |
| **13.5** | 13.51 | 13.54 | 13.58 | 13.65 | 13.73 | 13.83 | 13.95 | 14.08 | 14.23 | 14.40 | 14.58 | 14.77 | 14.98 | 15.21 | | | | | | | | | | | | | | | | |
| **14.0** | 14.01 | 14.04 | 14.08 | 14.14 | 14.22 | 14.32 | 14.43 | 14.56 | 14.71 | 14.87 | 15.04 | 15.23 | 15.44 | | | | | | | | | | | | | | | | | |
| **14.5** | 14.51 | 14.53 | 14.58 | 14.64 | 14.71 | 14.81 | 14.92 | 15.04 | 15.18 | 15.34 | | | | | | | | | | | | | | | | | | | | |
| **15.0** | 15.01 | 15.03 | 15.07 | 15.13 | 15.21 | 15.30 | 15.40 | | | | | | | | | | | | | | | | | | | | | | | |

Comb. SE = SQRT($SE_{BA}^2$+$SE_{VBAR}^2$)

Ideally the BA and VBAR Sampling Errors should be balanced, but it is not necessary; an imbalance may be worth while based on the relative costs of counting trees (BA) and measuring trees (VBAR).

**When using this table for Appraisal Cruising in British Columbia, allow an EXTRA 1 to 2% Sampling Error buffer; Bruce's formula tends to return a slightly lower Combined SE than does Johnson's formula, which is currently used for appraisal compilations.**