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!   Stand Cruise Compiler           Forest Biometrics Research Institute
!   Version: 7.0 20-Jun-2000        4033 SW Canyon Road
!   Forest Projection & Planning System  Portland, Oregon 97221
!   Copyright by James D. Arney, 2001  (406) 649-0040
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! 30-Jun-95 V4.0 Build cruise compiler based on standard methods
! 30-Nov-95      Upgrade Microsoft ODBC SQL drivers
! 23-Nov-96      Add a plot based-only estimate of variance (CVTS)
! 10-Jul-97 V5.0 Update to 32-bit Fortran PowerStation
! 10-Nov-97 V5.1 Incorporate larger path fields and clumpiness update
! 16-Nov-97      Modified Plots.Plot & .Tree fields to Integer*4
!                Re-set Name%nsc to Region Library count if new Stand
! 02-Dec-97      Restricted Defect/Dbh regression to Dbh>3 and Ht>3
!                Add logging costs and npv to database update
! 10-Jan-98 V5.2 Convert to SQLPrepare & SQLExecute for SQLInsert
!                Makes random format available to table structure
! 23-Apr-98      Add command line arguments as option
! 20-Aug-98 V5.3 Upgrade DLLs and Windows functions
!                Refine Ht/Dbh regressions and others, site defaults
!                Set designated site tree option, Status = 8
!                Set taper height to estimate total height
! 23-Nov-98 5.3a Load Species table (SP and SPname) after Species.Lib
!                Species.lib fills all 96 species arrays as before.
!                Now Name%slsp comes from Species table with merch.
!                Min Dbh has tolerance of 0.25cm (0.1-inch) accuracy.
!                Mixed Regions within one run now flush old library.
!                Old version kept some unknown species in new Region.
! 28-Nov-98 5.3b Modified FPSTree.dll for Form Class taper inputs.
!                Also allows wider range of acceptable taper inputs.
! 26-Jan-99      Added default siteprep effect for total age estimate
!                Also added temporary Cruise Year input request
! 12-Jul-99      Accept Htt > 2.0 meters w/o Dbh as valid sample
! 16-Mar-00      Add DownWoody as plot sample option vs transect
!                Transect length must = 0 to invoke plot sample
!                VegPlot must = 0 to invoke plot sample from prism
! 22-Jun-00 6.0  Version update to 6.0 ***
! 22-Jun-00      Add PLOGS, DIBCLS tables, log grade, log defect
!                Set order to compile all years sequentially
! 06-Aug-00      Add default total height to trees in PLOGS tables
!                if no total height had been sampled.
! 15-Aug-00      Add regression estimates loaded back to PLOTS table
! 25-Nov-00      Update to automatic ODBC FPSSData.dsn
! 27-Mar-01 6.1  Added identity of ".0" group codes to ".1",".2".etc.
!                Auto Allocate regression arrays = obs + 100
!                Changed Stand Table report label to "Crown Comp Fac"
! 25-Oct-01 6.1b Remove Auto Memory Allocation of array sizes.
!                Could not rely on Win98,WinNT,WinMe,Win2000,WinXP
!                to DeAllocate memory consistantly.
!                Removed '.D' and '.C' groups from stand summaries
! 19-Nov-01      Reset Ht/Dbh regression stats for small samples
! 05-Feb-02      Ht/Dbh regression bypass if zero observations
! 26-Mar-02 6.1c Dbhcls Debug print bypass if dbh<Log_Dbh (Win2000)
!                Always fill Dibcls table. If Plogs used, then only
!                Species+Group from Plogs fills Dibcls table.
!                Caution: Plogs table limits log distribution output.
!                Dead/Down Logs: Write to DibCls table, not Dbhcls
!                User may record dob (Dbh) and/or length (Height)
! 08-Apr-02      Modify Ht/Dbh regressions to float Hmax and show ?
! 01-May-02 6.1d If Dbh>=Baf_Dbh, then dbh class is incremented by 1
!                to separate fixed plot expansion from prism within
!                the same 1-inch dbh class when Baf_Dbh is midrange.
!                Regression defaults exclude DD,SN,ST groups
! 28-May-02      Ignore defect columns in PLOTS if tree exists in
!                PLOGS table, then write (-1) into Defect_b column.
!                Log position defect is allocated to 1/3rds by height
!                percentage of log mid-point / total height.
! 27-Jun-02 6.2  Convert to 4-byte structure
! 28-Aug-02      Correct Taper limit from 0.05 to 0.5 max est value
! 21-Nov-02 6.22 Correct Dbh=0,Ht=2.0 output records (error=4.9)
!                Version update to read Species.Lib with adjusters.

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! 21-Nov-02 6.22 Compatible with 6.3 Species Library structure.
! 06-Dec-02 6.30 Updated Species.Lib and FPS Tools
! 17-Jan-03 6.32 Modify Age/Dbh regression to trend instead of average
!           Default to averages when Rsq < 40% for all components
!           Always pass total age to site/ht/age functions
!           Default to 100% site preparation, 0% brush, 0% pest
! 20-Oct-03 6.40 Add HabDens statistics and capture matherr problems
!           Write snags and down woody debris to separate tables
!           Species Group = 'CU' defaults to 100% cull tree volume
!           Height regression uses Dbh/Ht = f(Dbh) to represent
!           all-aged long-term density effects on Ht = f(Dbh)
!           as a two-step regression estimation of unsampled hts.
!           Write update date & time to History table.
!           Age regression uses Age = B0*Exp(-B1*Dbh**B2) with linear
!           regression default for small samples.
! 15-Mar-04 6.41 Update Dbh/Ht = f(Dbh) regression and test for zero variance.
!           Pass 5 obs to Ht = f(Dbh) regression for improved trend line.
!           Species with large # of measured heights will override trend.
! 08-Apr-04 6.42 Corrected defect regression offset by one-dbh class when assigned.
!           Verify cost computations for harvest, haul, area and /mbf.
!           No site index estimation, if no measured ages.
!           Always write out taper index, whether measured or library default.
!           Optional update of HABDENS table.
! 30-Apr-04           Modify PLOGS and DIBCLS tables to accept 2-digit Grade (sort/grade)
! 12-Sep-04 6.43 Close SQL handles instead of dropping them.
!           Compute averages of regeneration height for 0-dbh classes
!           Leave 'RT' reserve trees out of stand summary table statistics
! 06-Jan-05 6.44 Build in capability for all ht samples with ht_code = 2
!           in which case no regression estimates are produced.
!           Also applies to tap_code = 2 on all samples, no regressions.
!           A tree with tap_code = 2 will use obs height even when ht_code = 2.
! 31-Jan-05 6.44 Fix minor bugs, expand 20 spp/grp & 100 sorts.
! 10-Mar-05           Update Site Index only if observed > 0
! 20-Jul-05 6.45 Bind only known FPS Tables and Columns in database
! 18-Aug-05           Check for Status codes 1=Cut,2=Dead,3=Ingrowth as Group codes
! 29-Aug-05           Log values from Sorts table only if Species Sort#3 achieved
!           Sort table applies grade/sort multipliers on Species Sort#3 values
! 18-Oct-05 6.46 If Plogs table has sort/grade values, then apply Sorts table values
!           If no sort/grade input, then use log - species,dib,len,def,position
!           to assign log values and sort/grade labels
! 20-Feb-06 6.50 Upgrade to FBRI Lib species library database
! 20-Feb-06 6.50 Convert to two-pass compiler:
!           Pass 1 estimates missing parameters
!           Pass 2 compiles all volumes and statistics
! 11-May-06 6.51 Delete old CASHFLOW records and update Stand.AreaRpt
!           Provide for minimum log dib as absolute or % of Dbh
!           Taper Rh defaults to zero if not sampled in cruise
! 22-May-06           Provide for average forest Ht/Dbh defaults in Cruise compilation
! 04-Jul-06 6.52 Compute and load non-tree average height into VegCls table.
!           Display field plot errors and estimates in Cruise.Rpt file.
!           Debug count-only plots by species (no dbh). Inadequate method!
! 05-Oct-06 6.53 Incorporate biomass estimation into DbhCls, DibCls tables
! 10-Jan-07 6.60 Biomass, Thinning, Fill-Plant, %Sort, 100 Periods
! 16-Mar-07 6.61 Age/Dbh Regression defaults to average age for small samples
!           Field taper msmts accepted from 5% to 55% of tree height
!           Field taper msmts should be between 10%-50% of tree height
!           Taper defaults to FBRI Library when no field msmt, not to other spp
!           Designated site trees (Status = 8) always return reference spp site
! 15-Apr-07 6.62 Removed Age/Dbh regression bug for zero Dbh condition
!           If Crn_code=3/4/5, then defect recorded without ht msmt (14-Jul-07)
! 24-Mar-08 6.72 Convert to temporary indexed binary files for processing speed.
!           Data are read from indexed database files out to binary files.
!           Database indexes are removed for loading Stand, DbhCls, DibCls
!           After database loading, primary indexes are re-assigned.
!           The standard FBRI primary key is "Fps_Key" in all tables
! 02-May-08 6.73 Fix total ht estimated from merch height with ht_code = 4
! 10-Jun-08 6.80 Incorporate primary keys into tables for SQL Server.
! 01-Nov-08 6.84 Unique ODBC commands between Jet and SQL Server
! 12-Dec-08 6.85 Standardize on 10mSite Library format
! 20-Feb-09 6.86 Incorporate Merch Ht to broken, forked top as permanent limit
! 15-Mar-09 6.87 Correct Designated Site to 10mSite method

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! 02-May-09 6.90 Merge versions 6.76 and 6.87 with all functionality.
! 03-Nov-09 6.91 L Syd = 1 to save topwood volume above Stopper Height???
! 03-Mar-10 6.93 Fix haul cost per kilometer conversion from miles
! 28-Aug-10 6.95 Fix all known bugs for Windows XP 32-bit format only
! 31-Oct-10 6.96 Limit Net to never exceed Gross by log position in DibCls.
!
!           However, sum of logs may be less than Stand & DbhCls tables
! 11-Jan-11 6.99 Modify metric weight & carbon transformations for metric databases
! 10-Mar-11 7.00 Update Database structure for Win7 and overall efficiency
! 24-Jun-12      Update Line Transect volumes and prioritize Plots.Grp over Plots.Status codes
! 26-Sep-12 7.02 Update Stand Table text report with total cuft and log dib outputs.
! 10-Nov-12 7.03 Re-compile all components and insert Verisign Certification
! 27-Nov-12 7.04 Bug fix on DibCls output for less than one log segment per 5 acres.
!
!           Report all segments if more than one log per 25 acres.
! 09-Dec-12 7.05 Remove internal default taper based on Dbh/Ht ratio, use Library defaults.
! 10-Jan-13 7.06 Select by named tables and columns only
! 06-Feb-13 7.07 Bug fix on 1-foot observed heights in field plot records (output was 4.5-ft)
! 10-Mar-13      Bug fix for trees without heights on tree count and defect estimation
! 15-Mar-13 7.08 Bug fix count-only plots (no Dbh or Height observations provided on plot)
!
!           Removed tree tally adjustment from old low-precision methods (Pass1)
! 27-Mar-13      Set default height-to-broken top = total height, unless actual input.
! 14-Aug-13 7.09 Fixed a bug in range of Dbh/Height ratios for sampled heights.
!
!           Sample trees taller in height than average could be truncated previously.
! 15-Aug-13 7.09 Upgrade to hexagon plot dimensions, ingrowth and group selection
! 30-Oct-13 7.09.1 Allow maximum observed site = 1.36 meters/year (4.5-feet/year or 167ft/50yrs)
!
!           Write out cruise definitions in text report for species, groups, defect
! 10-Nov-13 7.10 First release of full FPS Version 7.1 package - Annual Meeting
! 16-Nov-13 7.11 Found count-only by species broken on 15-Mar-2013! Fixed 16-Nov-2013 in v7.1.1
! 14-Jan-14 7.12 Repaired bug in height/age for site carried over from previous stand
! 07-Feb-14 7.13 Correct height over-estimation, when only 1 or 0 trees measured for height.
! 20-Feb-14 7.20 Standardize on 10mSite for all internal parameters. Correct stockability
!
!           of stand for permanent non-stockable openings as separate from clumpiness.
!           Correct volume of down woody debris on line transects (with or without length).
! 25-Mar-14 7.21 Adjust minimum trees/hectare to 1 tree per 10 hectares (24.711 acres)
! 10-Jun-14 7.30 Re-align Species rank - Regional Library, Species table, Sorts table, database
!
!           Causes background tables to load once with proper linkage to Library parameters
! 15-Aug-14 7.31 Update Verisign Certification 2014-2015
! 10-Dec-14 7.32 Correct bug in defect samples on trees without height observations.
!
!           Estimated height is determined first, then observed defect is assigned.
! 12-Jan-15 7.33 Expand outputs for %Regen and %Shape effects on traditional site measurements
! 15-May-15 7.40 Convert to full tree-list output in DbhCls from Plots, DibCls from PLogs
! 18-May-15 7.41 Fix bug in DbhCls output accumulator. Stand & DibCls values were correct.
!
!           Standard function MOD() does not parse ITag = 10001 into Plot = 1, Tree = 1
!           Replaced MOD() with Tree = ITag - (Plot * 10000), all values now returned.
! 30-May-15 7.42 Switch to 1-inch Dbh strata from 1-meter Height strata
! 08-Jun-15 7.43 Fix overlooked count-only (by species) plots from 7.42 update
! 24-Jun-15 7.44 Build in expanded edits for irregular/un-expected Dbh/Htt range in ratios
!
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! Max Species.....96
! Max DBH classes.....96 x 17 (Dbh x Taper Class)
! Max # of plots.....500 (in print list, any number compiled)
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