

**Simulated Historical Land Use Distribution: 1950-2005**

Appendix 4-P.

# COHYST Simulated Historical Land Use Distribution: 1950-2005

Developed by Rich Kern at NDNR in 2009

## **Introduction**

Simulating the historical distribution of land use patterns from 1950 to 2005 was a sophisticated process involving many inputs and numerous processing and formatting steps. The challenges were to create an annually variable dataset starting with a land use inventory from the University of Nebraska, Lincoln Center for Advanced Land Management Information Technologies (CALMIT), as well as the USDA Agricultural Census inventory, and assign the annual values to each active 160 acre model grid cell in the COHYST area. Values for twenty seven different land uses were estimated using remote sensing technology and manual reporting, respectively. These data were classified as groundwater irrigated, surface water irrigated and non-irrigated for the purpose of generating model inputs.

The CALMIT 1997, 2001 and 2005 land use datasets were developed on 2.5 meter pixels (the imagery resolution) from a set of twenty four Landsat Thematic Mapper images. The spectral pattern of the multi-spectral images is used as the basis of the classification. Locations of known land use were used to develop a description of the spectral attributes of each land cover type. By identifying these areas in the satellite imagery, the computer can be programmed to identify pixels with similar spectral characteristics. The individual pixel data were aggregated to 10-acre cells for use by COHYST. The 10 acre cell dataset was the starting point for the work described herein.

The Census of Agriculture reports county-level crop statistics on approximately a 5-year recurring basis. Beginning with the 1954 Census, irrigated acres by selected crops were reported. For the 1949 Census, total irrigated acres were reported and irrigated acres by crop were estimated. Not all crops were recorded in each report, so estimates are sometimes used. This is typical of minor crops. If more acres of a minor crop came into production, the Census then included these crops in its reporting. For counties that are only partially within the COHYST area, acreage was reduced by a factor based on the proportion of the county that is in the study area. Linear interpolation was used to estimate acres during non-Census years.

Based primarily on these two sources, a simulated detailed historical land use dataset was created for the annual period from 1950 to 1997, and from 1997 to 2005. The 1950 to 1997 portion utilized the Agricultural Census inventory and the CALMIT 1997 land use, while the 1997 to 2005 crops were defined using a detailed land use inventory from CALMIT developed for 1997, 2001 and 2005. These annual data developed for each period were appended to create a seamless

dataset of historic land use from 1950 to 2005. Finally, please note that throughout this documentation, the terms land use and crops are used synonymously.

Prior to choosing Agricultural Census data for the county-wide distribution of crops, the Agricultural Statistics annual dataset was also evaluated and rejected. The principle difference is that the Agricultural Statistics represents irrigable acres and the Agricultural Census is harvested acres. Using irrigable acres overestimates irrigated lands because the irrigation listed is those acres only considers a source of irrigation water, not if the lands are actually irrigated. Agricultural Census acres may underestimate acres that were planted and cultivated part of the season but may have failed due to hail, drought, freezing, etc. While the Agricultural Census dataset may not be perfect, it was felt it was the best available to help distribute the crops both in a temporal and spatial sense.

In addition to the general results, this documentation consists primarily of three major components: the process used, illustrated in a flow diagram, intended to aid the reader in understanding the workflow and process employed to develop the data; an inventory of databases (and associated files and applications), to provide the data at various stages of development; and program documentation of the custom applications developed within NDNR. When reviewing this data, the reader will sometimes find variants, replicates, or near replicates of a number of the data sets. These were developed in conjunction with the primary products such that the steps could be compared in a stepwise fashion to help ensure that each step in the process was completed and that the calculations were conducted in the way intended.

## **Results**

The results of all acres calculations are contained in two databases, which are then replicated in three text files. The text files are provided for convenience as the databases are somewhat unwieldy when developing the information further. These files contain approximately 48 million records and include:

- Acres1950-2005Final.mdb
- Acres1950-2005FinalNo.mdb
- 1950-2005GWAcre.txt
- 1950-2005SWAcre.txt
- 1950-2005NoAcre.txt

The files represent acres for each 160 acre grid cell by land use, year, and whether it is surface water irrigated, ground water irrigated, or non-irrigated lands.

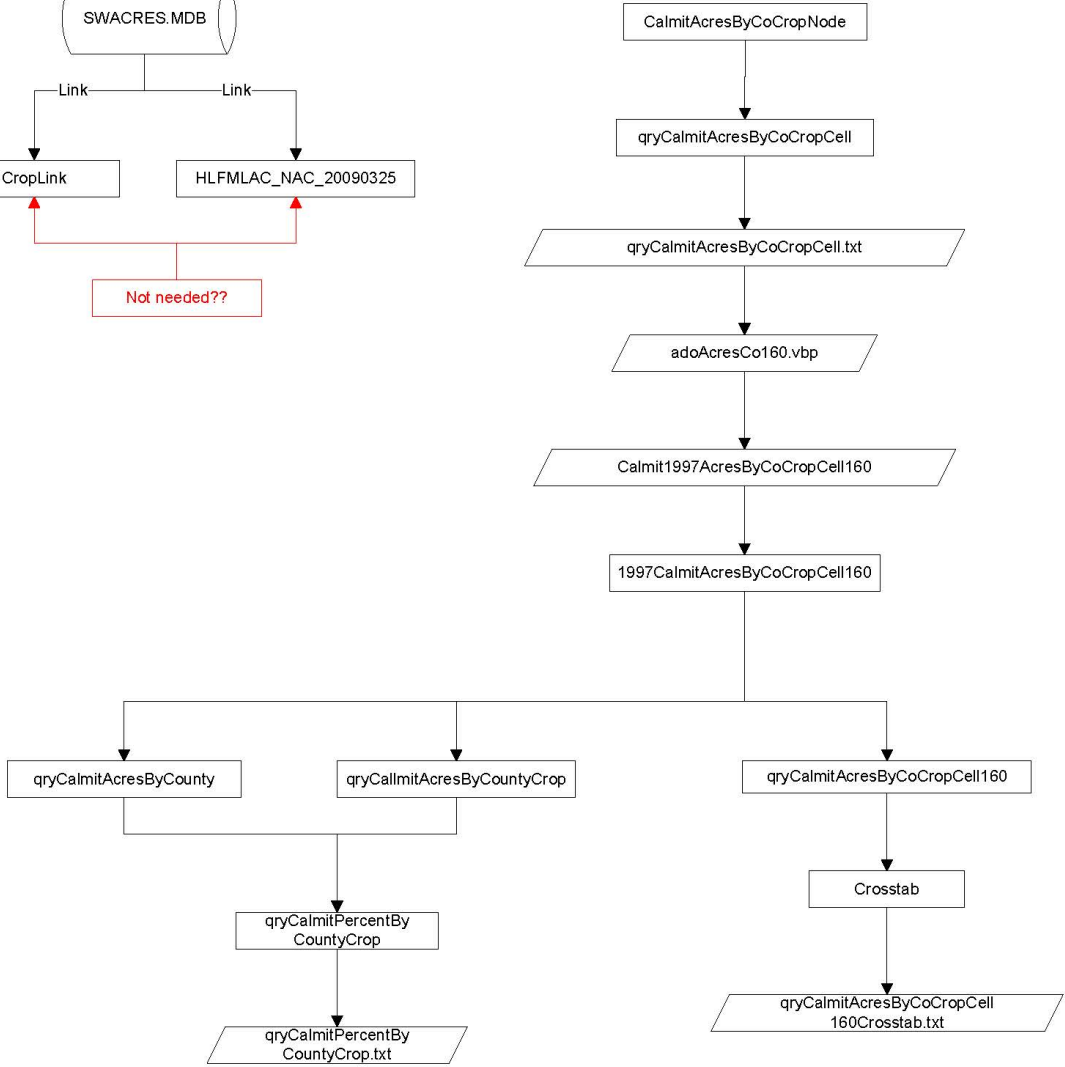
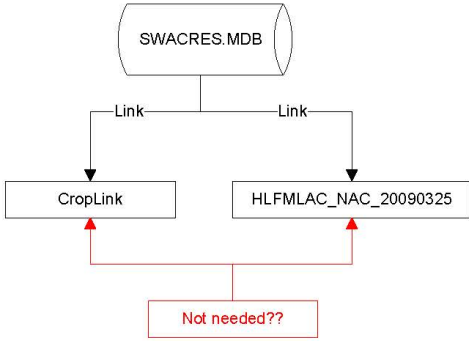
## **Process**

The process started with county-wide Ag Census data from annual figures during reporting years, computed the land uses for the portions within the COHYST area, distributed acres into individual grid cells by year based on defined weighting criteria while noting irrigated or non-irrigated classification, and finished by separating surface water irrigated acres from groundwater irrigated acres. This process employed 17 visual basic applications and 17 databases and

associated tabular data and query tools, as well as a variety of text and tabular inputs and text outputs that were then used inputs during subsequent steps.

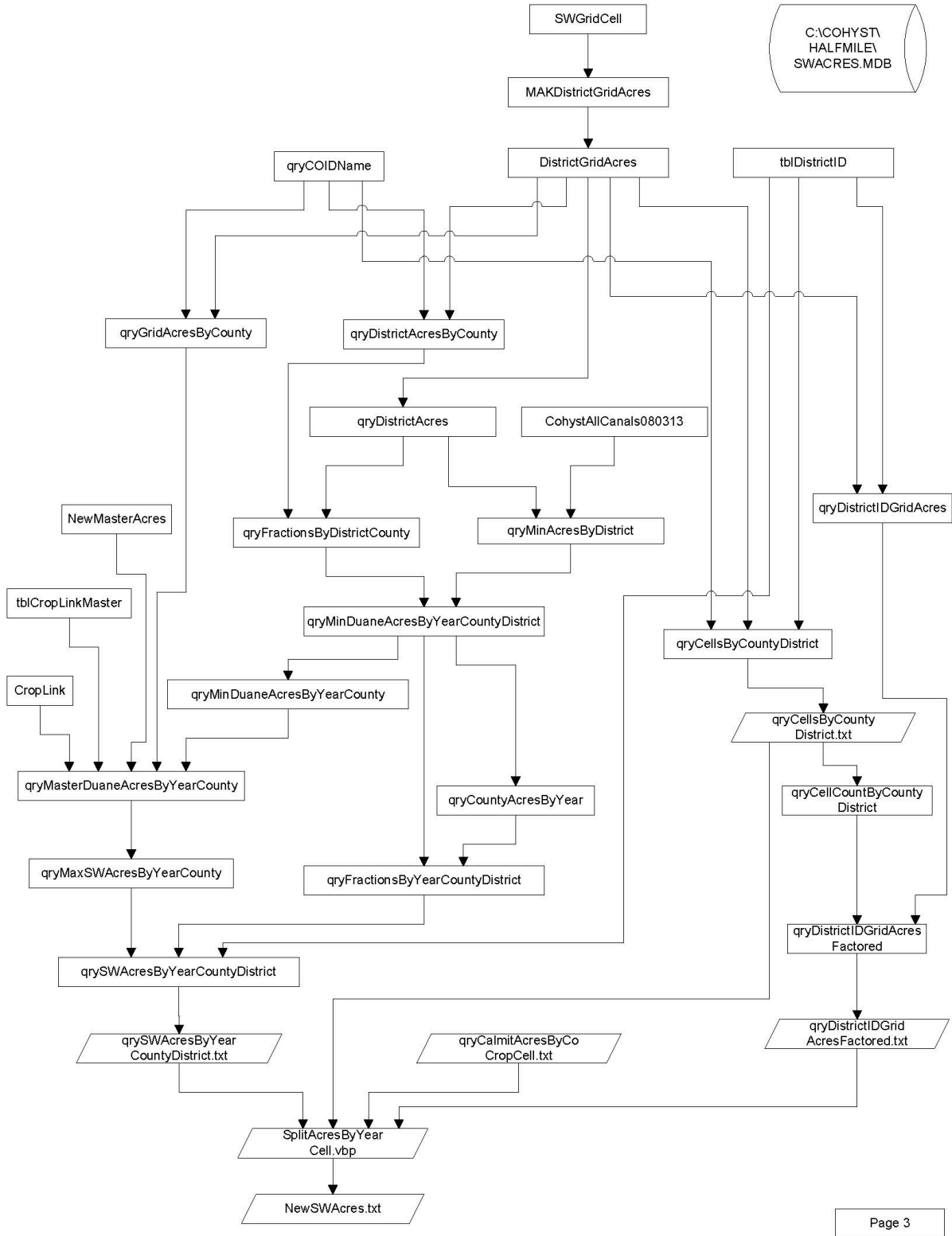
With two sources of data for 1997 (Ag Census and CALMIT Land Use Inventory) and methods of quantification used before and after 1997 that were not identical, it was assumed that the CALMIT data development process was the most accurate technique to estimate land use spatially in 1997 and for the subsequent surveys in 2001 and 2005. This created the need to force the Ag Census data to fit the CALMIT data in 1997. A difference factor for each crop and county for 1997 was developed. There other assumption was that the 1950 Ag Census data was the best available data for that year, requiring the adjustment of available data for every intervening year. This single challenge necessitates many of the steps outlined below.

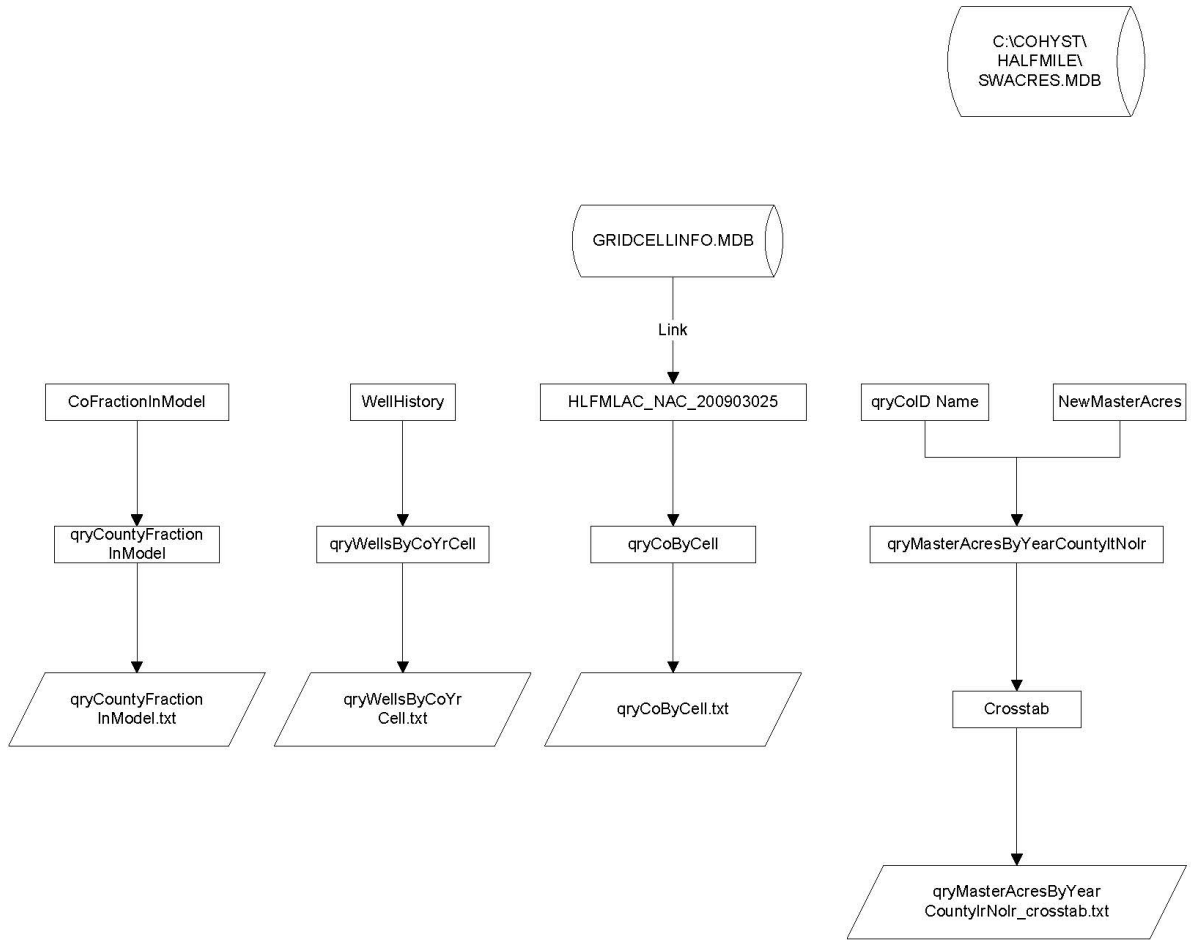
The process is illustrated in the following flow diagram:



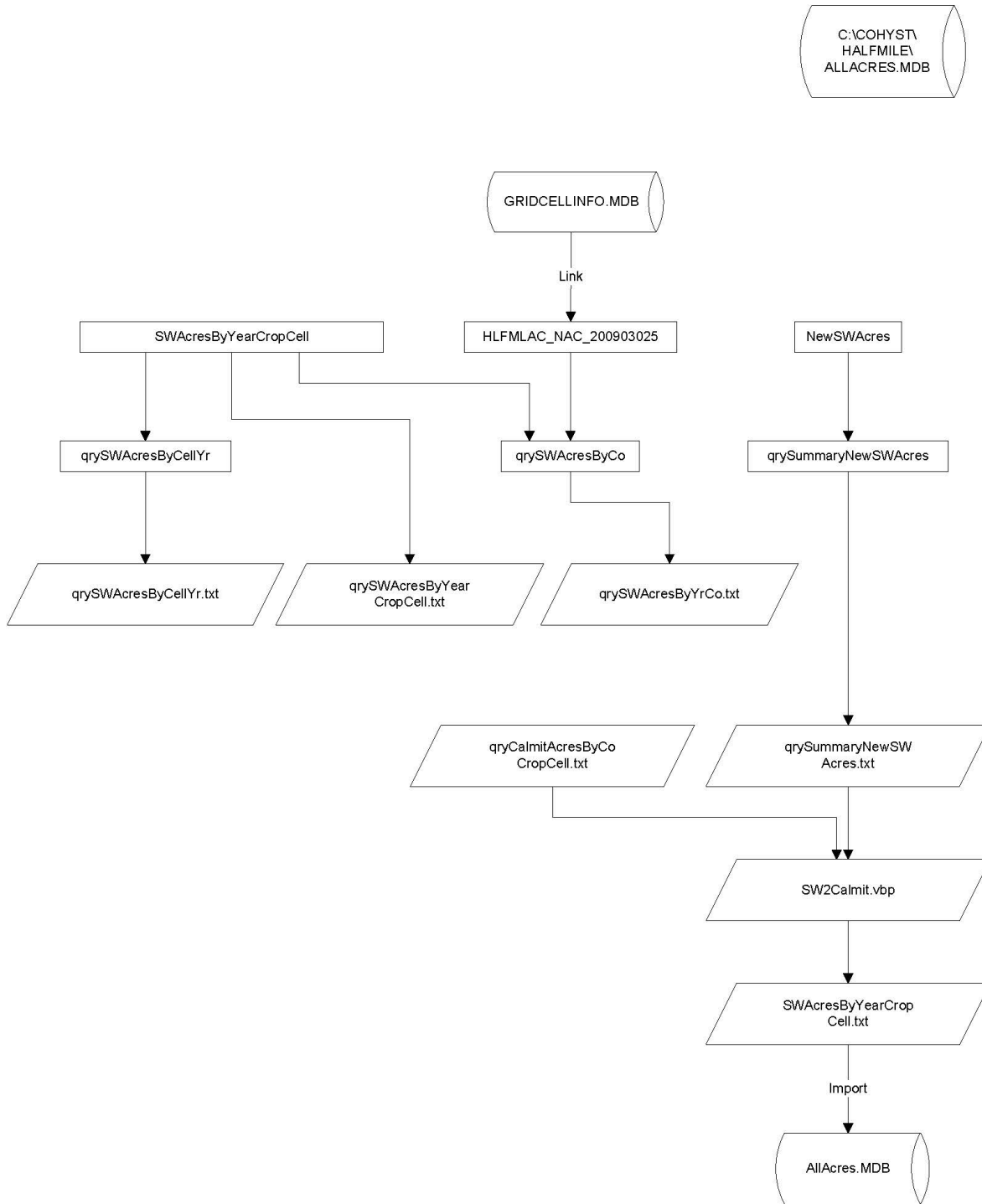
C:\COHYST\HALFMILE\  
MASTERSTATS.MDB



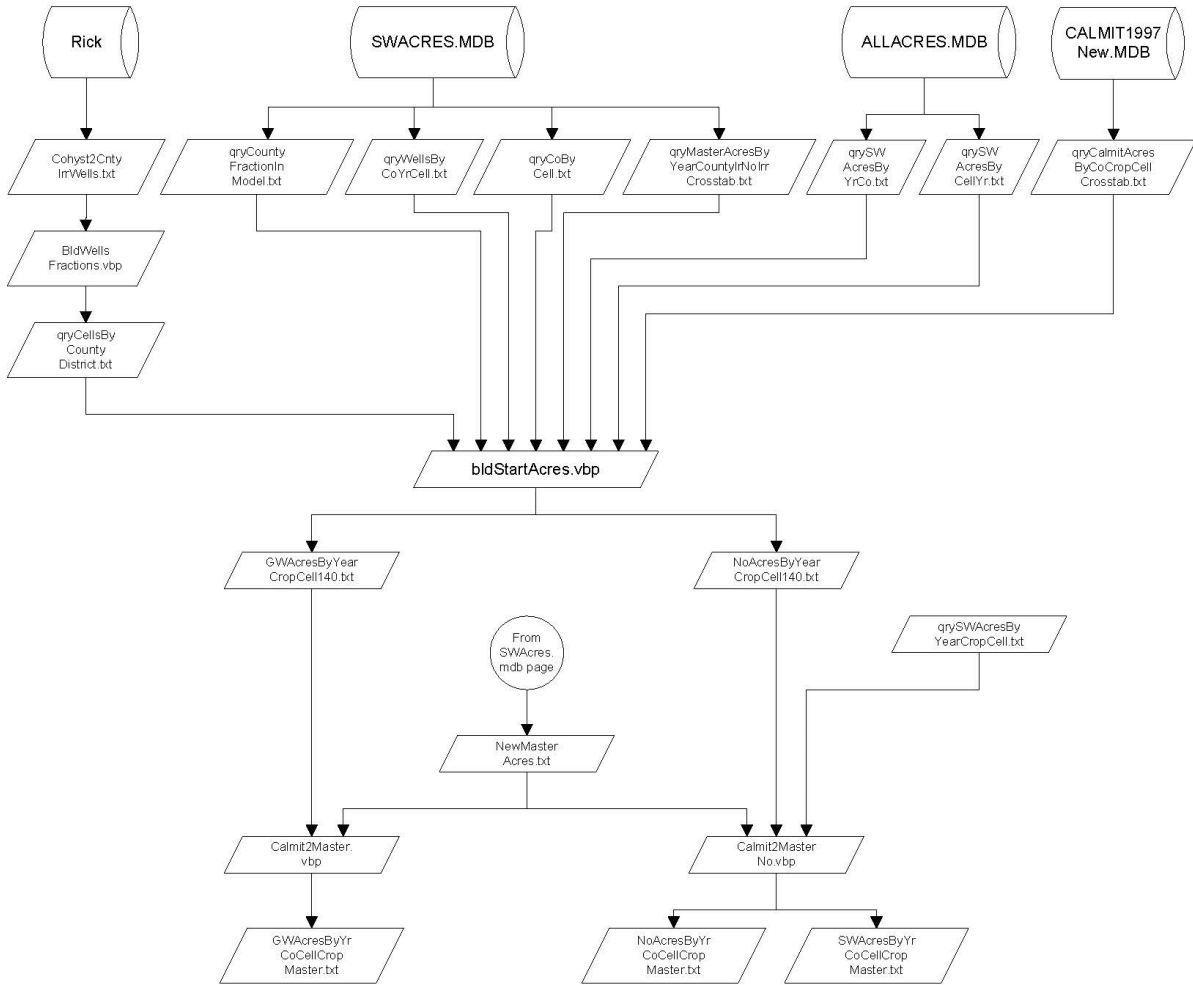




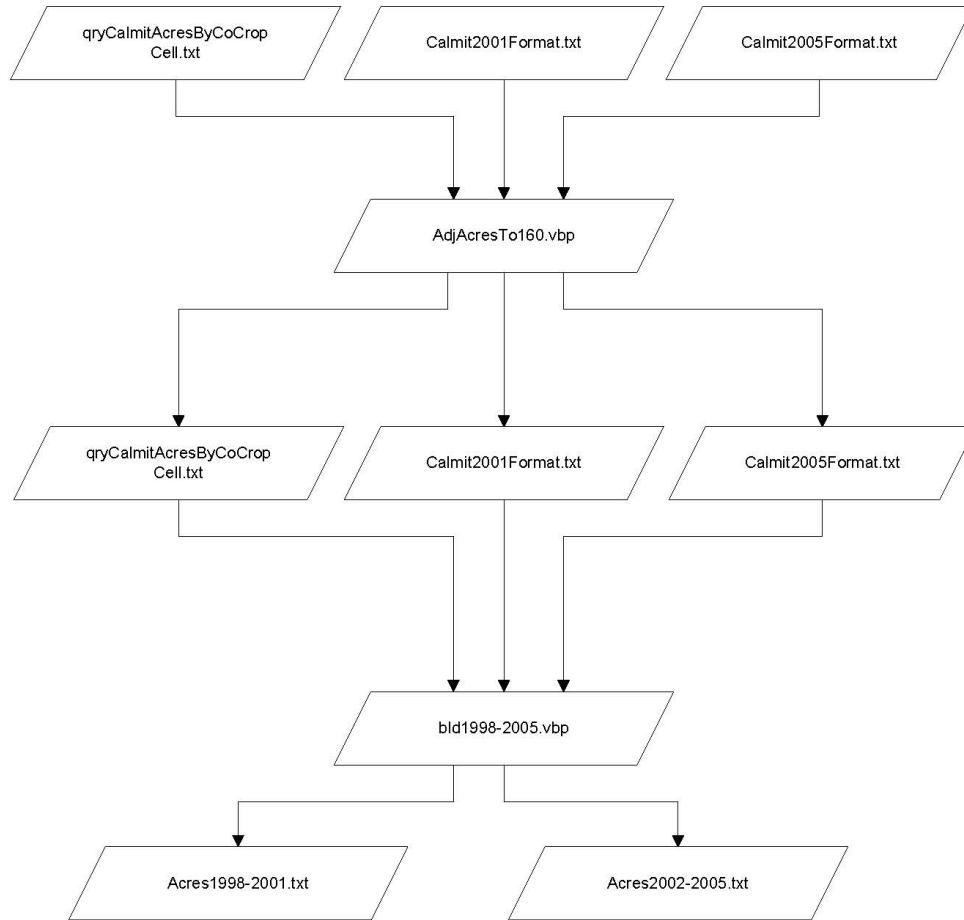


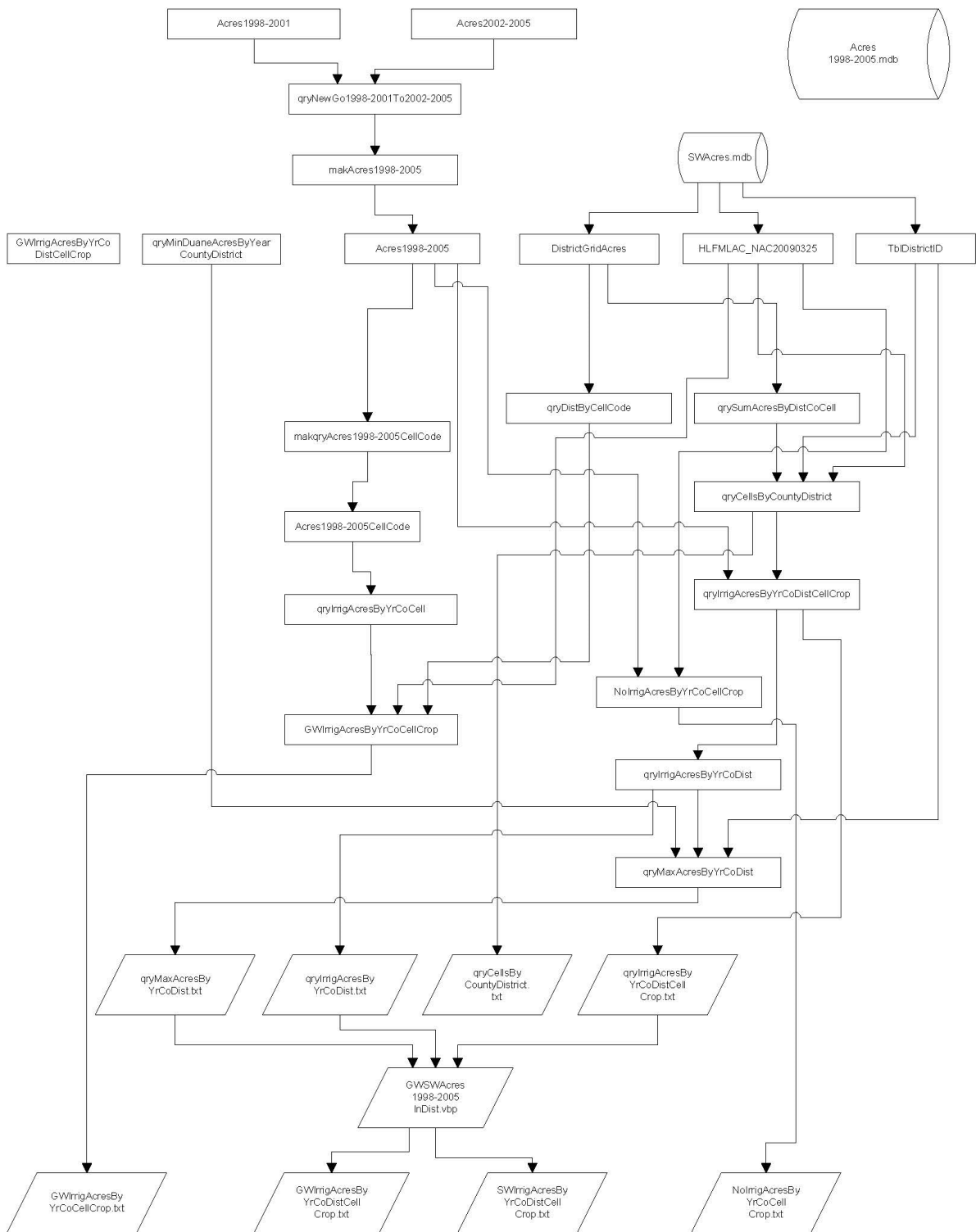


C:\COHYSTHALFMILE\  
BLDSTARTACRES.VBP

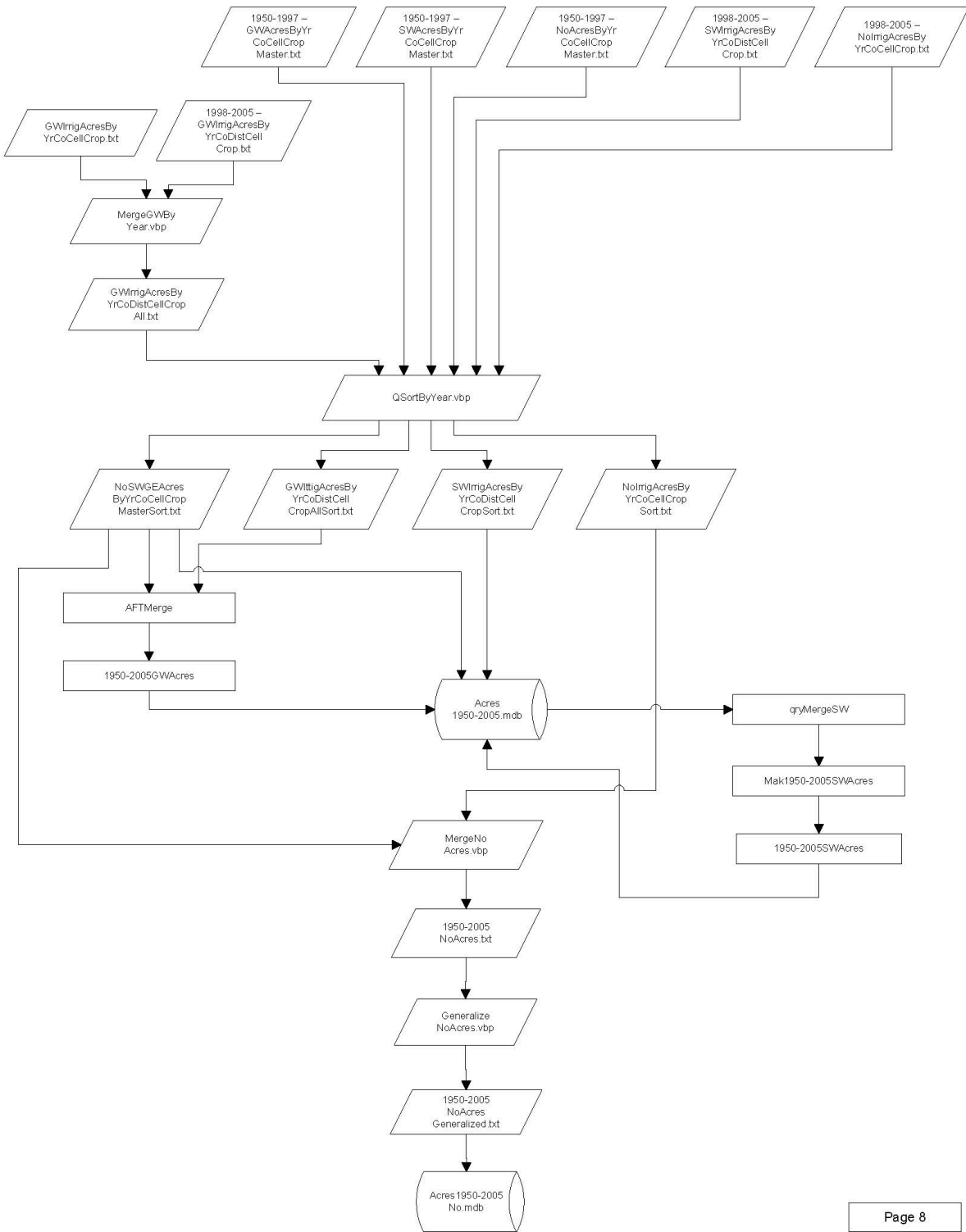


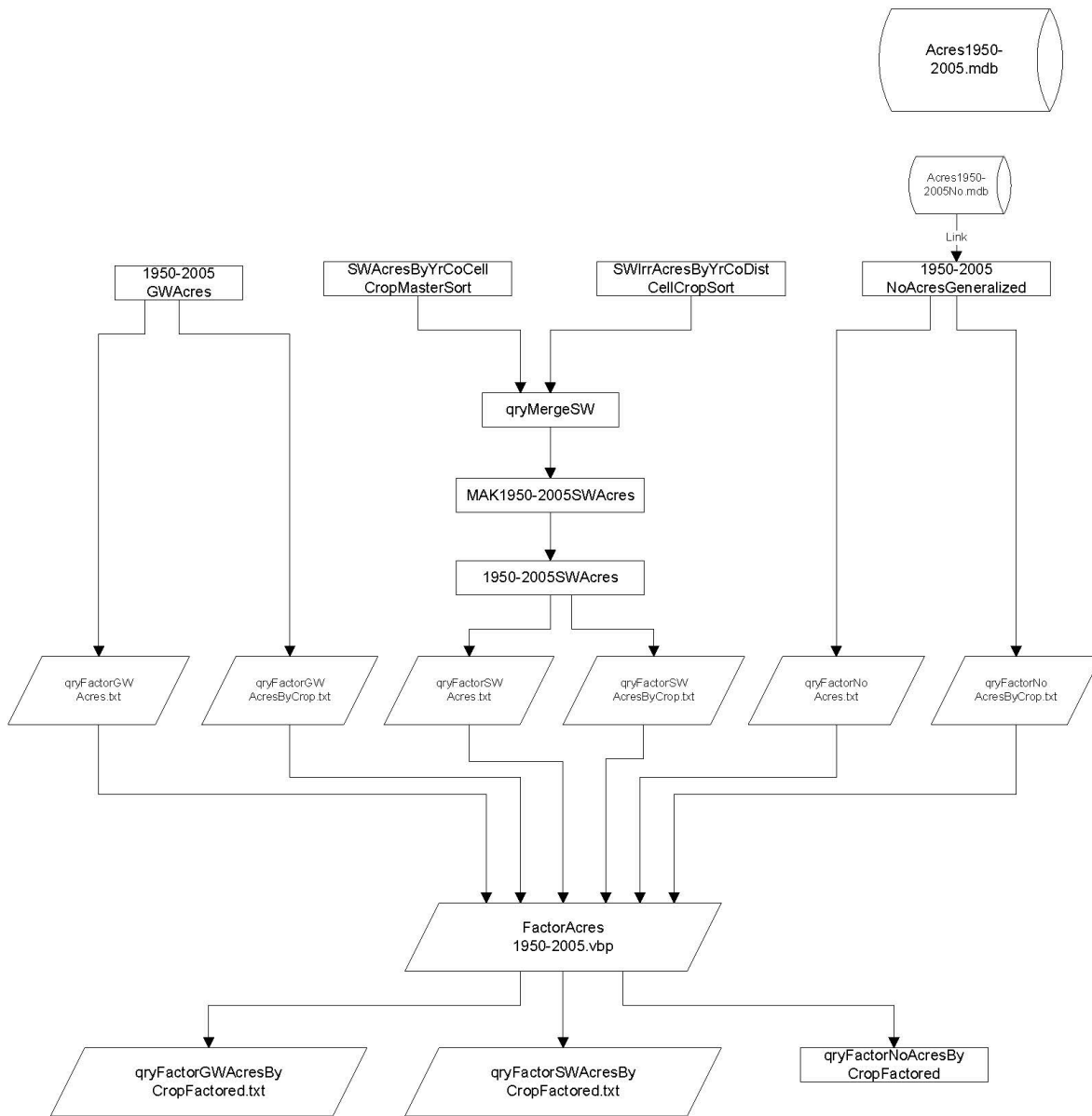
# 1998-2005 Acres

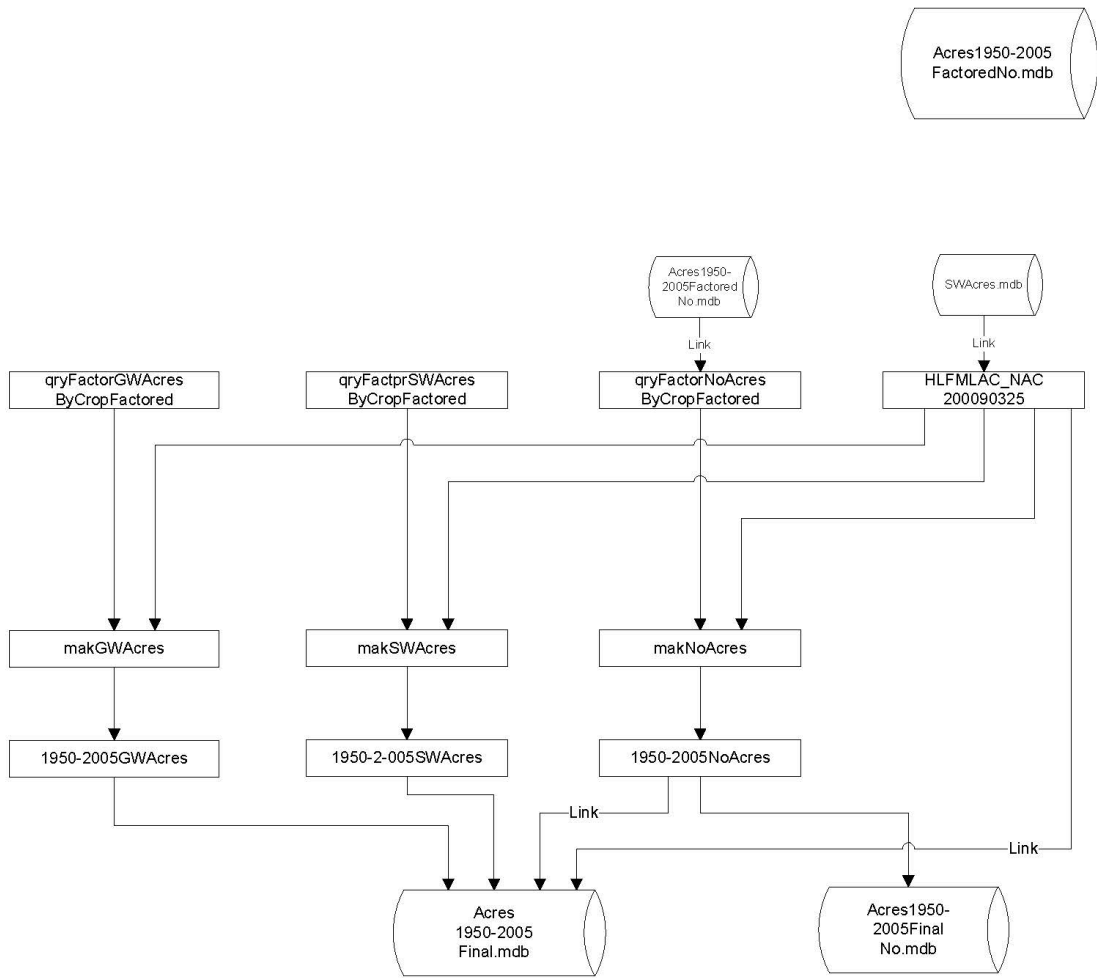




# 1950-2005 Acres

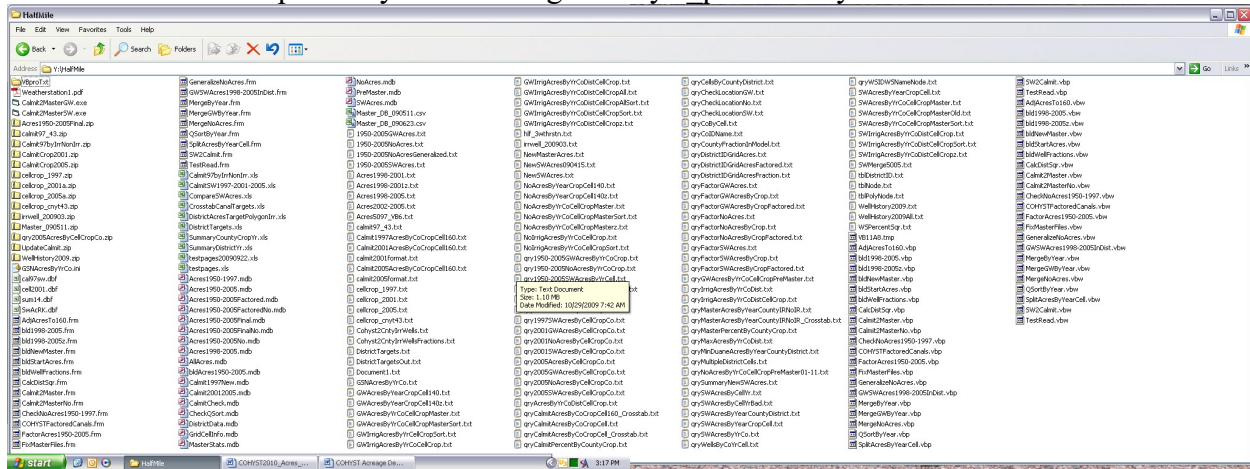






## Inventory

All files associated with acres development are included in a directory called HalfMile. This directory is available upon request to the Cooperative Hydrology Study. Within this directory are 257 files and one folder, totaling 28.7GB of data. A screenshot of the directory is included here and is available at [https://cohyst.nebraska.gov/cohyst\\_preliminarydata.html](https://cohyst.nebraska.gov/cohyst_preliminarydata.html)



Database (flowchart page), number of tables, number of queries, and number of outputs for major databases included in the flow diagram are noted in the following table:

Database	# of Tables	# of Queries	# of Outputs
Calmit1997New.mdb (F-1)	4	14	3
MasterStats.mdb (F-2)	1	3	2
SWAcres.mdb (F-3, 4, 5, 7b)	18	51	17
AllAcres.mdb (F-5)	2	4	3
Acres1998-2005.mdb (F-7b)	9	14	6
Acres1950-2005.mdb (F-9)	4	15	6
Acres1950-2005Factored.mdb (F-10)	2	6	3

Database name, number of tables and number of queries, providing supporting data and QA/QC of databases and inputs not included in the flow diagram are noted in the following table:

Database	# of Tables	# of Queries
Acres1950-1997.mdb	8	6
Acres1950-2005FactoredNo.mdb	1	0
Acres1950-2005No.mdb	1	2
Calmit20012005.mdb	4	4
CalmitCheck.mdb	5	3
CheckQSort.mdb	5	0
DistrictData.mdb	2	5
GridCellInfo.mdb	16	24
NoAcres.mdb	1	0



### Input Files

The principle inputs to the calculations described here are the CALMIT landuse estimates and the Agricultural Census data, however, the process also includes a number of other sources of data that were used to provide necessary information. These include the registered wells database (<http://dnrdata.dnr.ne.gov/wellscs/Menu.aspx>), MasterStats.mdb, GridCellInfo.mdb and the Croplink table.

The Nebraska Department of Natural Resources maintains a database of registered wells for the state of Nebraska. Wells were used in the acres development process to help determine the most reasonable and likely distribution of groundwater irrigated acres.

MasterStats.mdb is a database of acres from 1950 to 1997 for each land use identified and summarized by county. This database was created from a textfile containing the same information. Each record contains the year, county name, crop name, and the acres of that crop, which was repeated for all crops in all counties.

GridCellInfo.mdb is a database of tables and extensive queries representing many of the structural aspects of the numerical models constructed over the area. The attributes contained herein were created by the individuals developing the various models that correspond to the area. Model grid cells in the COHYST area are registered to a statewide model grid created by the DNR. The data describe the relationships and relative areas of overlapping features and provide the means to parse proportions from data reported by county, ranging from the model area, to counties to model grid cells.

Croplink correlates crop names and numbers used by CALMIT, Ag Census, and COHYST. CALMIT originally had classifications for 42 land use categories. This file shows the COHYST and Agricultural Census numbering systems and how they correlate to the classifications used by CALMIT and the land uses, with an abbreviation that is sometimes used in data files to identify the land use.

## Documentation of Applications

Included here is a brief overview of applications developed in Visual Basic 6 and included in the workflow used to develop the acres data. Also included is each respective input and output, fields created in the output, calculations conducted within the program, and text of the code. (Note that program text provided here is unedited and has not been edited in any way, this includes all lines found in the original code verbatim):

Application: AdjAcresto160 (Page F-1 & F-7A)

Overview: AdjAcresto160 checks all cells to determine if total acres assigned to a model cell sum to 160 acres. It adjusts any that are not 160 acres, for years 1997, 2001 and 2005. AdjAcresto160 creates text files of the adjusted values for years 1997, 2001 and 2005.

Input files: gryCalmitAcresByCoCropcell.txt  
Calmit2001Format.txt  
Calmit2005Format.txt

Output files: Calmit1997AcresbyCoCropCell160.txt  
Calmit2001AcresbyCoCropCell160.txt  
Calmit2005Acresby CoCropCell160.txt

Fields: Year, X, Y, Crop, Acres

Calculations: N/A

Text:

```
Private Sub Form_Load()  
    Dim Calmit(188 To 899, 26 To 381, 27), CalmitPC(188 To 899, 26 To 381, 27)  
  
    Open "gryCalmitAcresByCoCropCell.txt" For Input As #1  
    Line Input #1, lin  
    Do Until EOF(1)  
        Input #1, dummyCounty, crop, Acres, x, y  
        If crop < 9 Or crop = 15 Or crop = 27 Then  
            Calmit(x, y, crop) = Calmit(x, y, crop) + Acres  
            Calmit(x, y, 0) = Calmit(x, y, 0) + Acres  
        End If  
    Loop  
    Close  
  
    For x = 188 To 899  
        For y = 26 To 381  
            DoEvents  
            If Calmit(x, y, 0) > 0 Then  
                For crop = 1 To 27  
                    If crop < 9 Or crop = 15 Or crop = 27 Then  
                        CalmitPC(x, y, crop) = Calmit(x, y, crop) / Calmit(x, y, 0)  
                    End If  
                Next  
            End If  
        Next  
    Next  
Next
```

```
Open "grySummaryNewSWAcres.txt" For Input As #1
Open "SWAcresByYearCropCell.txt" For Output As #2
Line Input #1, lin
Do Until EOF(1)
  Input #1, yr, x, y, Acres
  DoEvents
  For crop = 1 To 27
    If (crop < 9 Or crop = 15 Or crop = 27) Then
      If CalmitPC(x, y, crop) > 0 Then
        NewAcres = CalmitPC(x, y, crop) * Acres
        Write #2, yr, crop, x, y, Int(NewAcres * 100 + 0.5) / 100, "S"
      End If
    End If
  Next
Loop
End
End Sub
```

Application: Bld1998-2005 (Page F-7A)

Overview: Stores input files in an array. Bld1998-2005 checks all cells to determine if total acres assigned to a model cell sum to 160 acres. Arrays are reformatted and outputs files created.

Input files: Calmit2001format.txt  
Calmit2005format.txt

Output files: Acres2002-2005.txt  
Acres1998-2001.txt

Fields: Year, X, Y, Crop, Acres

Calculations: N/A

Text:

```
Private Sub Form_Load()
    Dim lus(188 To 899, 26 To 381, 27), lue(188 To 899, 26 To 381, 27)
    years = Array(1997, 2001, 2005)

    Open "Acres2002-2005.txt" For Output As #2
    Print #2, "Year,X,Y,Crop,Acres"

    Open "Calmit2001AcresByCoCropCell160.txt" For Input As #1
    Line Input #1, lin
    Do Until EOF(1)
        Input #1, dummy, x, y, crop, acres
        lus(x, y, crop) = acres
        lus(x, y, 0) = lus(x, y, 0) + acres
    Loop
    Close #1

    Open "Calmit2005AcresByCoCropCell160.txt" For Input As #1
    Line Input #1, lin
    Do Until EOF(1)
        Input #1, dummy, x, y, crop, acres
        lue(x, y, crop) = acres
        lue(x, y, 0) = lue(x, y, 0) + acres
    Loop
    Close #1

    For yr = 1 To 1
        For x = 188 To 899
            Debug.Print x;
            For y = 26 To 381
                If y = 160 Then Stop
                DoEvents
                If lue(x, y, 0) > 0 Then
                    If yr = 0 And lus(x, y, 0) = 0 Then
                        For k = 1 To 4
                            For c = 1 To 27
                                If lue(x, y, c) > 0 Then
                                    NewAcres = Format(lue(x, y, c), "0.0") * 1
                                    If NewAcres > 0 Then Write #2, years(yr) + k, x, y, c, NewAcres
                                End If
                            Next
                        Next
                    Else
                        For c = 1 To 27
                            For k = 1 To 4
```

```

        If lus(x, y, c) > 0 Or lue(x, y, c) > 0 Then
'If IsEmpty(lus(x, y, c)) Then Stop ' Or IsEmpty(lue(x, y, c)) Then Stop
        NewAcres = Format(lus(x, y, c) + (lue(x, y, c) - lus(x, y, c)) * k / 4, "0.0")
* 1
        If NewAcres > 0 Then Write #2, years(yr) + k, x, y, c, NewAcres
        End If
    Next
Next
End If
End If

'
'   If yr = 0 Then
'       For c = 1 To 27
'           lus(x, y, c) = lue(x, y, c)
'       Next
'   End If
Next
Next
'   If yr = 0 Then
'       Open "Calmit2005AcresByCoCropCell1160.txt" For Input As #1
'       Line Input #1, lin
'       Do Until EOF(1)
'           Input #1, dummy, x, y, crop, acres
'           lue(x, y, crop) = acres
'           lue(x, y, 0) = lue(x, y, 0) + acres
'       Loop
'       Close #1
'   End If
Next
Close
Debug.Print
Debug.Print "done"
End
End Sub

```

Application: Bld1998-2005z (Page F-7A)

Overview: Stores input files in an array. Bld1998-2005 checks all cells to determine if total acres assigned to a model cell sum to 160 acres. Arrays are reformatted and outputs files created.

Input files: Calmit1997AcresByCoCropCell160.txt  
Calmit2001AcresByCoCropCell160.txt  
Calmit2005AcresByCoCropCell160.txt

Output files: Acres1998-2005.txt

Fields: Year, X, Y, Crop, Acres

Calculations: N/A

Text:

```
Private Sub Form_Load()
    Dim lus(188 To 899, 26 To 381, 27), lue(188 To 899, 26 To 381, 27)
    years = Array(1997, 2001, 2005)

    Open "Acres1998-2005.txt" For Output As #2
    Print #2, "Year,X,Y,Crop,Acres"

    Open "Calmit1997AcresByCoCropCell160.txt" For Input As #1
    Line Input #1, lin
    Do Until EOF(1)
        Input #1, dummy, x, y, crop, acres
        lus(x, y, crop) = acres
        lus(x, y, 0) = lus(x, y, 0) + acres
    Loop
    Close #1

    Open "Calmit2001AcresByCoCropCell160.txt" For Input As #1
    Line Input #1, lin
    Do Until EOF(1)
        Input #1, dummy, x, y, crop, acres
        lue(x, y, crop) = acres
        lue(x, y, 0) = lue(x, y, 0) + acres
    Loop
    Close #1

    For yr = 0 To 1
        For x = 188 To 899
            Debug.Print x;
            For y = 26 To 381
                If y = 160 Then Stop
                DoEvents
                If lue(x, y, 0) > 0 Then
                    If yr = 0 And lus(x, y, 0) = 0 Then
                        For k = 1 To 4
                            For c = 1 To 27
                                If lue(x, y, c) > 0 Then
                                    NewAcres = Format(lue(x, y, c), "0.0") * 1
                                    If NewAcres > 0 Then Write #2, years(yr) + k, x, y, c, NewAcres
                                End If
                            Next
                        Next
                    Else
                        For k = 1 To 4
                            For c = 1 To 27
```

```

        If lus(x, y, c) > 0 Or lue(x, y, c) > 0 Then
            NewAcres = Format(lus(x, y, c) + (lue(x, y, c) - lus(x, y, c)) * k / 4, "0.0")
* 1
            If NewAcres > 0 Then Write #2, years(yr) + k, x, y, c, NewAcres
            End If
        Next
    Next
End If
End If

If yr = 0 Then
    For c = 1 To 27
        lus(x, y, c) = lue(x, y, c)
    Next
End If
Next
Next
Next
If yr = 0 Then
    Open "Calmit2005AcresByCoCropCell160.txt" For Input As #1
    Line Input #1, lin
    Do Until EOF(1)
        Input #1, dummy, x, y, crop, acres
        lue(x, y, crop) = acres
        lue(x, y, 0) = lue(x, y, 0) + acres
    Loop
    Close #1
End If
Next
Close
Debug.Print
Debug.Print "done"
End
End Sub

```

Application: BldNewMaster (Page F-2)

Overview: Stores input files in an array. Creates a summary table by Year County Crop  
Total acres

Input files: qryCalmitPercentByCountyCrop.txt

Output files: NewMasterAcres.txt

Fields: Year, County, Crop, Acres

Calculations: N/A

Text:

```
Private Sub Form_Load()  
    Dim Master(1950 To 1997, 43, 27), Calmit(43, 27), CountyAcres(43)  
    Dim PCErr(43, 27)  
  
    Open "qryCalmitPercentByCountyCrop.txt" For Input As #1  
    Line Input #1, lin  
    Do Until EOF(1)  
        Input #1, co, cr, coac, crac, pc  
        CountyAcres(co) = coac  
        Calmit(co, cr) = pc  
    Loop  
    Close  
  
    Open "qryMasterPercentByCountyCrop.txt" For Input As #1  
    Line Input #1, lin  
    Do Until EOF(1)  
        Input #1, yr, co, cr, crac, coac, pc  
        Master(yr, co, cr) = pc  
    Loop  
    Close  
  
    For co = 1 To 43  
        For cr = 1 To 27  
            PCE = Calmit(co, cr) - Master(1997, co, cr)  
            PCErr(co, cr) = (Calmit(co, cr) - Master(1997, co, cr)) / 47  
        Next  
    Next  
  
    Open "NewMasterAcres.txt" For Output As #1  
    Write #1, "Year", "County", "Crop", "Acres"  
    For yr = 1950 To 1997  
        yrFactor = yr - 1950  
        For co = 1 To 43  
            For cr = 1 To 27  
                NewPC = yrFactor * PCErr(co, cr) + Master(yr, co, cr)  
                NewAcres = NewPC * CountyAcres(co)  
                Write #1, yr, co, cr, Int(NewAcres * 10 + 0.5) / 10  
            Next  
        Next  
    Next  
    Close  
End Sub
```



Application: BldStartAcres (Page F-6)

Overview: BldStartAcres takes each input file and stores in an array and builds summary to calculate by County, Years, Cells, and crops and creates text output files for years 1950 to 1997. This application assigns county level acreage data to the cells by preferentially assigning to cells where groundwater wells exist, or to random cells if there are not enough acres in those cells to assign all the reported acres. See notes in text for additional detail.

Input files: qryCoIDName.txt  
qryCountyFractionInModel.txt  
qrySWAcresByYrCo.txt  
Cohyst2CntyIrrWellsFractions.txt  
qryWellsByCoYrCell.txt  
qryCoByCell.txt  
qrySWAcresByCellYr.txt  
qryMasterAcresByYearCountyIrNoIR\_Crosstab.txt  
qryCalmitAcresByCoCropCell160\_Crosstab.txt

Output files: GWAcresByYearCropCell140.txt  
NoAcresByYearCropCell140.txt  
GSNAcresByYrCo.txt

Fields:

Calculations:  $CalmitFraction(k, crop) = Calmit(k, crop) / CalmitGW IrrigAcresByCrop(crop)$   
 $fraci = fraci + CalmitFraction(k, crop)$   
 $CalmitFraction(k, crop) = Calmit(k, crop) / Calmit(k, 29)$   
 $fracn = fracn + CalmitFraction(k, crop)$   
 $CellFraction = 1 - SWAcresByCellYr(x, y, yr) / Calmit(k, 28)$   
 $CellGW Irrig = AcresPerWell * WellCnt$   
 $MaxCellGW Irrig = AcresPerCell * 0.875 - SWAcresByCellYr(x, y, Yr)$   
 $SWAcresByCellCrop(x, y, crop) = SWAcresByCellCrop(x, y, crop) +$   
 $Int(Acres2Add(crop) * 100 + 0.5) / 100$   
 $GWAcres(Yr, co) = GWAcres(Yr, co) - Int(Acres2Add(crop) * 100 + 0.5) / 100$   
 $' Acres2Add(crop)$   
 $CoGWAcres = CoGWAcres + Acres2Add(crop)$   
 $GWAcres2Add = GWAcres2Add + Int(Acres2Add(crop) * 100 + 0.5) / 100$   
 $' Acres2Add(crop)$   
 $SWAcresByCellCrop(x, y, crop) = SWAcresByCellCrop(x, y, crop) +$   
 $Int(Acres2Add(crop) * 100 + 0.5) / 100$   
 $NoAcres2Add = NoAcres2Add + Int(Acres2Add(crop) * 100 + 0.5) / 100$   
 $SWAcresByCellCrop(x, y, 9) = CellNoIrrig - NoAcres2Add$   
 $SWAcresByCellCrop(x, y, crop) = SWAcresByCellCrop(x, y, crop) +$   
 $Int(Acres2Add(crop) * 100 + 0.5) / 100$   
 $NoAcres2Add = NoAcres2Add + Int(Acres2Add(crop) * 100 + 0.5) / 100$

## Text:

```
Private Sub Form_Load()
    Dim SWAcres(1950 To 1997, 43), TotalCo(1950 To 1997, 43), TotalIrrig(1950 To 1997, 43)
    Dim GWAcres(1950 To 1997, 43), NonIRAcres(1950 To 1997, 43)

    Dim Calmit(150000, 31), CalmitBnd(43, 1), CalmitCntByCells(188 To 899, 26 To 381),
    CalmitFraction(150000, 27)
    Dim CalmitGWIrrigAcresByCrop(27)

    Dim SWAcresByCellYr(188 To 899, 26 To 381, 1950 To 1997)
    Dim SWAcresByCellCrop(188 To 899, 26 To 381, 27)

    Dim Acres2Add(27)
    Dim CoName(43), IrrNon(27)

    Dim Wells(1000000, 2) As Integer, WellsBnd(43, 1950 To 1997, 1), WellsByCell(188 To 899, 26 To
381)

' MAY NOT NEED CoByCell

    Dim CoByCell(188 To 899, 26 To 381, 1)
    Dim County(140000, 1), CountyBnd(43, 1)

    Dim FractionByCoYR(43, 1950 To 1997), Fraction(43), AcresPerCell

    AcresPerCell = 160

    For crop = 1 To 27
        If crop < 9 Or crop = 15 Or crop = 27 Then
            IrrNon(crop) = 2
        Else
            IrrNon(crop) = 3
        End If
    Next

' Read in qryCoIDName

    Open "qryCoIDName.txt" For Input As #1
    Line Input #1, lin
    Do Until EOF(1)
        Input #1, co43, co93, CoNameTemp
        CoName(co43) = CoNameTemp
    Loop
    Close

' Read in qryCountyFractionInModel

    Open "qryCountyFractionInModel.txt" For Input As #1
    Line Input #1, lin
    Do Until EOF(1)
        Input #1, co, dummyco, Frac
        Fraction(co) = Frac
    Loop
    Close

' Read in Cohyst2CntyIrrWellsFractions

    Open "Cohyst2CntyIrrWellsFractions.txt" For Input As #1
    Do Until EOF(1)
        Input #1, co, dummyco, Yr, Frac
        FractionByCoYR(co, Yr) = Frac
    Loop
    Close

' Read in qrySWAcresByYrCo
```

```

Open "qrySWAcresByYrCo.txt" For Input As #1
Line Input #1, lin
Do Until EOF(1)
    Input #1, Yr, co, dummyco, Acres
    SWAcres(Yr, co) = Acres
Loop
Close

' Read in qryMasterAcresByYearCountyIrNoIR_Crosstab

Open "qryMasterAcresByYearCountyIrNoIR_Crosstab.txt" For Input As #1
Open "GSNAcresByYrCo.txt" For Output AS #2

Line Input #1, lin
Do Until EOF(1)
    Input #1, Yr, co, dummyco, Total, Irrig, NonIrrig
'If co = 7 Then Stop
'    TotalCo(Yr, co) = Total * Fraction(co)
'    TotalIrrig(Yr, co) = Irrig * FractionByCoYR(co, Yr)

    TotalCo(Yr, co) = Total
    TotalIrrig(Yr, co) = Irrig

    If IsEmpty(SWAcres(Yr, co)) Then
        SW = 0
    Else
        SW = SWAcres(Yr, co)
    End If

    GWAcres(Yr, co) = TotalIrrig(Yr, co) - SW

    If GWAcres(Yr, co) < 0 Then
        GWAcres(Yr, co) = 0
    End If
    If GWAcres(Yr, co) < 0 Then Stop ' ===== TEMP Statement

    IrrigTotal = GWAcres(Yr, co) + SW

    NonIRAcres(Yr, co) = TotalCo(Yr, co) - IrrigTotal
    If NonIRAcres(Yr, co) < 0 Then Stop

    Write #2, Yr, co, dummyco, TotalCo(Yr, co), GWAcres(Yr, co), SW, NonIRAcres(Yr, co)
Loop
Close

' Read in qrySWAcresByCellYr

Open "qrySWAcresByCellYr.txt" For Input As #1
Line Input #1, lin
Do Until EOF(1)
    Input #1, x, y, Yr, Acres
    SWAcresByCellYr(x, y, Yr) = Acres
Loop
Close

' Read in qryCalmitAcresByCoCropCell_Crosstab

Open "qryCalmitAcresByCoCropCell160_Crosstab.txt" For Input As #1
Line Input #1, lin

k = 1

Input #1, oldCo, x, y, TotalCalmit
' If x = 125 And y = 156 Then Stop
CalmitCntByCells(x, y) = k
CalmitBnd(co, 0) = k
Calmit(k, 0) = TotalCalmit
Calmit(k, 30) = x
Calmit(k, 31) = y

```

```

For crop = 1 To 27
  Input #1, Calmit(k, crop)
  If crop < 9 Or crop = 15 Or crop = 27 Then
    Calmit(k, 28) = Calmit(k, 28) + Calmit(k, crop)
  Else
    Calmit(k, 29) = Calmit(k, 29) + Calmit(k, crop)
  End If
End If
Next

Do Until EOF(1)
  Input #1, co, x, y, TotalCalmit
'If x = 300 And y = 214 Then Stop
  k = k + 1
  CalmitCntByCells(x, y) = k
  Calmit(k, 0) = TotalCalmit
  Calmit(k, 30) = x
  Calmit(k, 31) = y

'If x = 779 And y = 87 Then Stop
'If k = 6666 Then Stop

  For crop = 1 To 27
    Input #1, Calmit(k, crop)
    If crop < 9 Or crop = 15 Or crop = 27 Then
      Calmit(k, 28) = Calmit(k, 28) + Calmit(k, crop)
    Else
      Calmit(k, 29) = Calmit(k, 29) + Calmit(k, crop)
    End If
  End If
Next

  If co <> oldCo Then
    CalmitBnd(oldCo, 1) = k - 1
    CalmitBnd(co, 0) = k
    oldCo = co
  End If
Loop
CalmitBnd(co, 1) = k
CalmitMax = k
Close

' Read in qryWellsByCoYrCell

Open "qryWellsByCoYrCell.txt" For Input As #1
Line Input #1, lin

k = 1

Input #1, oldCo, dummyco, oldYr, x, y, WellCnt
WellsBnd(oldCo, oldYr, 0) = k
Wells(k, 0) = WellCnt
Wells(k, 1) = x
Wells(k, 2) = y

Do Until EOF(1)
  Input #1, co, dummyco, Yr, x, y, WellCnt
  If Yr < 1998 Then
'If x = 120 And y = 126 Then Stop
  k = k + 1
  Wells(k, 0) = WellCnt
  Wells(k, 1) = x
  Wells(k, 2) = y
  WellsBnd(co, Yr, 1) = k

  If Yr <> oldYr Then
    WellsBnd(oldCo, oldYr, 1) = k - 1
    WellsBnd(co, Yr, 0) = k
    oldCo = co
    oldYr = Yr
  End If
End If
Loop

```

```

If Yr < 1998 Then WellsBnd(co, Yr, 1) = k
Close

' Read in qryCoByCell

Open "qryCoByCell.txt" For Input As #1
Line Input #1, lin

k = 1

Input #1, oldCo, dummyco93, dummyco, x, y
CoByCell(x, y, 0) = oldCo
CountyBnd(oldCo, 0) = k
County(k, 0) = x
County(k, 1) = y

Do Until EOF(1)
    Input #1, co, dummyco93, dummyco, x, y
'If x = 120 And y = 126 Then Stop
    CoByCell(x, y, 0) = co

    k = k + 1
    County(k, 0) = x
    County(k, 1) = y

    If co <> oldCo Then
        CountyBnd(oldCo, 1) = k - 1
        CountyBnd(co, 0) = k
        oldCo = co
    End If
Loop
CountyBnd(co, 1) = k
Close

' Show

'
' Start BIG LOOP HERE
' Start BIG LOOP HERE
' Start BIG LOOP HERE
'

Open "GWAcresByYearCropCell140.txt" For Output As #2
Open "NoAcresByYearCropCell140.txt" For Output As #3
For Yr = 1950 To 1997
    Debug.Print
    Debug.Print Yr
    DoEvents
    For x = 188 To 899
        For y = 26 To 381
            CoByCell(x, y, 1) = CoByCell(x, y, 0)
            WellsByCell(x, y) = 0
        Next
    Next

    For k = 1 To CalmitMax
        DoEvents
        fraci = 0
        fracn = 0
        For crop = 1 To 27
            DoEvents
            If crop < 9 Or crop = 15 Or crop = 27 Then
                x = Calmit(k, 30)
                y = Calmit(k, 31)
'If x = 771 And y = 98 Then Stop
                CalmitGWIrrigAcresByCrop(crop) = Calmit(k, 28)
                If CalmitGWIrrigAcresByCrop(crop) < 0 Then CalmitGWIrrigAcresByCrop(crop) = 0

                If CalmitGWIrrigAcresByCrop(crop) > 0 Then
                    CalmitFraction(k, crop) = Calmit(k, crop) / CalmitGWIrrigAcresByCrop(crop)
                    fraci = fraci + CalmitFraction(k, crop)
                Else

```

```

        CalmitFraction(k, crop) = 0
    End If
Else
    If Calmit(k, 29) > 0 Then
        CalmitFraction(k, crop) = Calmit(k, crop) / Calmit(k, 29)
        fracn = fracn + CalmitFraction(k, crop)
        If CalmitFraction(k, crop) > 1 Then CalmitFraction(k, crop) = 1
    Else
        CalmitFraction(k, crop) = 0
    End If
End If
'
    Debug.Print crop, CalmitFraction(k, crop)
Next
Next

'
    For co = 18 To 18

        For co = 1 To 43
            Debug.Print co;
'If co = 43 And Yr = 1997 Then Stop
            If GWAcres(Yr, co) < 0 Then Stop ' ===== TEMP Statement
                CoGWAcres = 0
'If Yr = 1997 And co = 43 Then Stop
                lstWells.Clear
                WellsInCounty = 0
                W1 = WellsBnd(co, Yr, 0)
                W2 = WellsBnd(co, Yr, 1)
                If IsEmpty(W1) Then
                    W1 = 0
                    W2 = -1
                End If
                For w = W1 To W2
                    WellsByCell(Wells(w, 1), Wells(w, 2)) = Wells(w, 0)
                    WellsInCounty = WellsInCounty + Wells(w, 0)
                Next
                NewWellsInCounty = WellsInCounty

                Tot = 0
                For w = CountyBnd(co, 0) To CountyBnd(co, 1)
                    x = County(w, 0)
                    y = County(w, 1)
'If x = 790 And y = 85 Then Stop
'If x = 791 And y = 85 Then Stop
'If x = 771 And y = 98 Then Stop
                    RandNo = Rnd
                    lstWells.AddItem Right("00" & WellsByCell(x, y), 3) & Right("0000" & Int(RandNo * 10000),
4) & Right("00" & x, 3) & Right("00" & y, 3)
                    Tot = Tot + WellsByCell(x, y)
                Next

                Do Until lstWells.ListCount = 0
                    DoEvents

                    If NewWellsInCounty > 0 Then
                        AcresPerWell = GWAcres(Yr, co) / NewWellsInCounty
                    Else
                        AcresPerWell = 0
                    End If

                    cnt = lstWells.ListCount
'                    If cnt < 50 Then Stop
                    If cnt > 64000 Then Stop
'                    r1 = Rnd
'                    rnd1 = Int((Cnt * r1) + 1)
'                    If Mid(lstWells.List(Cnt - 1), 3, 1) <> "0" Then
'                        r2 = Rnd
'                        rnd2 = Int(((Cnt - rnd1) * r2) + rnd1)
'                        r3 = Rnd
'                        rnd3 = Int(((Cnt - rnd2) * r3) + rnd2) - 1
'                    Else

```

```

'      rnd3 = rnd1
'      End If
      rnd3 = cnt - 1
      lin = lstWells.List(rnd3)
      WellCnt = Left(lin, 3) * 1
      If GWAcres(Yr, co) < 0 Then Stop ' ===== TEMP Statement
      If WellCnt = 0 And GWAcres(Yr, co) > 0.5 Then
      Stop
      WellCnt = 1
      End If
      x = Mid(lin, 8, 3) * 1
      y = Right(lin, 3) * 1
'If x = 779 And y = 87 Then Stop
'If x = 790 And y = 85 Then Stop
'If x = 791 And y = 85 Then Stop
'If x = 771 And y = 98 Then Stop
'If x = 723 And y = 87 Then Stop

      k = CalmitCntByCells(x, y)

' MAY NOT NEED CELLFRACTION
'      If Calmit(k, 28) = 0 Then
'          CellFraction = 0
'      Else
'          CellFraction = 1 - SWAcresByCellYr(x, y, yr) / Calmit(k, 28)
'          If CellFraction < 0 Then CellFraction = 0
'      End If

      If WellsInCounty > 0 Then
          CellGWIrrig = AcresPerWell * WellCnt
      Else
          CellGWIrrig = 0
      End If

      If SWAcresByCellYr(x, y, yr) > 0 Then Stop
      MaxCellGWIrrig = AcresPerCell * 0.875 - SWAcresByCellYr(x, y, Yr)
      If MaxCellGWIrrig < 0 Then MaxCellGWIrrig = 0
      If CellGWIrrig > MaxCellGWIrrig Then CellGWIrrig = MaxCellGWIrrig

      If GWAcres(Yr, co) < 0 Then Stop ' ===== TEMP Statement

      GWAcres2Add = 0
      If GWAcres(Yr, co) > 0.5 Then
          For crop = 1 To 27
              If crop < 9 Or crop = 15 Or crop = 27 Then
                  Acres2Add(crop) = 0
                  Acres2Add(crop) = CellGWIrrig * CalmitFraction(k, crop) ' * CellFraction
<-- Not needed???'
                  If Acres2Add(crop) > GWAcres(Yr, co) Then Acres2Add(crop) = GWAcres(Yr, co)
                  If Acres2Add(crop) > 0 Then
'                      Write #2, Yr, crop, x, y, Int(Acres2Add(crop) * 100 + 0.5) / 100, "G", co
                      SWAcresByCellCrop(x, y, crop) = SWAcresByCellCrop(x, y, crop) +
Int(Acres2Add(crop) * 100 + 0.5) / 100
                      GWAcres(Yr, co) = GWAcres(Yr, co) - Int(Acres2Add(crop) * 100 + 0.5) / 100 '
Acres2Add(crop)
                      If GWAcres(Yr, co) < 0 Then GWAcres(Yr, co) = 0
                      CoGWAcres = CoGWAcres + Acres2Add(crop)
                      GWAcres2Add = GWAcres2Add + Int(Acres2Add(crop) * 100 + 0.5) / 100 '
Acres2Add(crop)
                      End If
                  End If
              Next
              Acres2Add(15) = 0
              Acres2Add(15) = CellGWIrrig * CalmitFraction(k, 15) ' * CellFraction <-- Not
needed???'
              If Acres2Add(15) > GWAcres(Yr, co) Then Acres2Add(15) = GWAcres(Yr, co)
              If Acres2Add(15) > 0 Then
                  Write #2, Yr, 15, x, y, Int(Acres2Add(15) * 100 + 0.5) / 100, "G", co
                  GWAcres(Yr, co) = GWAcres(Yr, co) - Acres2Add(15)
                  CoGWAcres = CoGWAcres + Acres2Add(crop)
                  GWAcres2Add = GWAcres2Add + Acres2Add(15)
              End If
          End For
      End If

```

```

'      End If

      CellNoIrrig = AcresPerCell - SWAcresByCellYr(x, y, Yr) - GWAcres2Add
      NoAcres2Add = 0
      For crop = 9 To 26
        Acres2Add(crop) = 0
        If crop <> 15 Then
          Acres2Add(crop) = CellNoIrrig * CalmitFraction(k, crop)
          If Acres2Add(crop) > 0 Then
            Write #3, Yr, crop, x, y, Int(Acres2Add(crop) * 100 + 0.5) / 100, "N", co
            SWAcresByCellCrop(x, y, crop) = SWAcresByCellCrop(x, y, crop) +
            Int(Acres2Add(crop) * 100 + 0.5) / 100
            NoAcres2Add = NoAcres2Add + Int(Acres2Add(crop) * 100 + 0.5) / 100
          End If
        End If
      Next

      If CellNoIrrig - NoAcres2Add > 0.5 Then
        SWAcresByCellCrop(x, y, 9) = CellNoIrrig - NoAcres2Add
      End If
      DoEvents
    Else
      tmp = 0
      NoAcres2Add = 0
      CellNoIrrig = AcresPerCell - SWAcresByCellYr(x, y, Yr) - GWAcres2Add
      For crop = 9 To 26
        If crop <> 15 Then
          Acres2Add(crop) = CellNoIrrig * CalmitFraction(k, crop)
          tmp = tmp + CalmitFraction(k, crop)
          If Acres2Add(crop) > 0 Then
            Write #3, Yr, crop, x, y, Int(Acres2Add(crop) * 100 + 0.5) / 100, "N", co
            SWAcresByCellCrop(x, y, crop) = SWAcresByCellCrop(x, y, crop) +
            Int(Acres2Add(crop) * 100 + 0.5) / 100
            NoAcres2Add = NoAcres2Add + Int(Acres2Add(crop) * 100 + 0.5) / 100
          End If
        End If
      Next
      Debug.Print tmp, crop, CalmitFraction(k, crop), Acres2Add(crop)
    Next
    If CellNoIrrig - NoAcres2Add > 0.5 Then
      SWAcresByCellCrop(x, y, 9) = CellNoIrrig - NoAcres2Add
    End If
    If Int(tmp * 1000000 + 0.5) / 1000000 <> 0 And Int(tmp * 1000000 + 0.5) / 1000000 <> 1
  Then Stop
  End If
'  If Cnt < 5 Then Stop
  NewWellsInCounty = NewWellsInCounty - WellCnt
  lstWells.RemoveItem rnd3
Loop

  For x = 188 To 899
    For y = 26 To 381
'If x = 779 And y = 87 Then Stop
'If x = 790 And y = 85 Then Stop
'If x = 791 And y = 85 Then Stop
'If x = 771 And y = 98 Then Stop
'If x = 723 And y = 87 Then Stop
      For crop = 1 To 27
        DoEvents
        If SWAcresByCellCrop(x, y, crop) > 0 Then
          Write #IrrNon(crop), Yr, co, CoName(co), x, y, crop, SWAcresByCellCrop(x, y, crop),
          ""
          SWAcresByCellCrop(x, y, crop) = 0
        End If
      Next
    Next
  Next
Next
Next
Next

' Get wells into storage similar to below then start cycle at bottom and put wells in lstWells
for priority. Next cycle through selected cells and compute new target acres by cell by removing

```



SWAcresByCellYr from irrigated acres. Use irrigated acres in cell and continue until all irrigated acres are completed. Assign non-irrigated acres in same cells as you go. If not enough cells with wells, randomly select other cells (will have to read in qryCoByCell.txt and store as wells below so can retrieve all cells by county). Store also by CoByCell(x,y)=Co so you can remove as used for irrigated cells. Set to 0 as used Add list of cells to lstCoCells (Create listbox - sorted using RandNo system). check CoCells and only use if >0. Assign acres by year and crop and cell. Identify with G or N. When all done, should have SWAcres (from previous data), GWAcres, and NonIrrigAcres by cell according to Calmit and with correct number of county acres for each group. Next program will move acres (not SW) according to Master Stats groups of both G and N.

```
    Debug.Print "Done"  
End
```

```
End Sub
```

Application: BldWellsFraction (Page F-6)

Overview: Calculates new percent – fraction base on irrigation wells. Data 1950 to 1997

Input files: Cohyst2CntyIrrWells.txt

Output files: Cohyst2CntyIrrWellsFractions.txt

Calculations:  $\text{Fraction} = \text{Fr}(k1) + \text{DiffFrac} * (y - \text{yrs}(k1)) / \text{DiffYr}$   
 $\text{NewFraction} = \text{Int}(\text{Fraction} * 1000000 + 0.5) / 1000000$

Fields: CountyID CountyName Year NewFraction

Text:

```
Private Sub Form_Load()  
    Dim Fr(5), yrs(5)  
  
    Open "Cohyst2CntyIrrWells.txt" For Input As #1  
    Open "Cohyst2CntyIrrWellsFractions.txt" For Output As #2  
  
    Input #1, dummyCounty43, dummyCountyName  
    For k = 1 To 5  
        Input #1, yrs(k)  
    Next  
    Do Until EOF(1)  
        Input #1, County43, CountyName  
        k1 = 1  
        Input #1, Fr(k1)  
        For k = 2 To 5  
            Input #1, Fr(k)  
            DiffYr = yrs(k) - yrs(k1)  
            DiffFrac = Fr(k) - Fr(k1)  
            For y = yrs(k1) + 1 To yrs(k)  
                If y > 1949 Then  
                    Fraction = Fr(k1) + DiffFrac * (y - yrs(k1)) / DiffYr  
                    NewFraction = Int(Fraction * 1000000 + 0.5) / 1000000  
                    Write #2, County43, CountyName, y, NewFraction  
                End If  
            Next  
            k1 = k  
        Next  
    Loop  
End  
End Sub
```

Application: Calmit2Master (Page F-6)

Overview: Calmit2Master moves acres (not SW) according to Master Stats groups of both G and N.

Input files: NewMasterAcres.txt  
qryGWAcresByYrCoCellCropPreMaster.txt  
qryNoAcresByYrCoCellCropPreMaster.txt  
qrySWAcresByYrCoCellCropPreMaster.txt

Output files: GWAcresByYrCoCellCropMaster.txt  
NoAcresByYrCoCellCropMaster.txt  
SWAcresByYrCoCellCropMaster.txt

Calculations: N/A

Fields:

Text:

```
Private Sub Form_Load()
    Dim Master(1950 To 1997, 43, 27), MasterSummary(1950 To 1997, 43), MasterPC(27)
    Dim Target(27), Shift(27)
    Dim CropAcres(27), SaveCropAcres(27)

    DoEvents
    Open "NewMasterAcres.txt" For Input As #1
    Line Input #1, lin
    Do Until EOF(1)
        Input #1, Yr, Co, Crop, Acres
        If Crop < 9 Or Crop = 15 Or Crop = 27 Then      ' <-----Use this line for
GWAcres
'   If Crop > 8 And Crop <> 15 And Crop <> 27 Then      ' <-----Use this line
for NoAcres
        Master(Yr, Co, Crop) = Acres
        MasterSummary(Yr, Co) = MasterSummary(Yr, Co) + Acres
    End If
    Loop
    Close

    DoEvents
    Flag = 0
    Open "qryGWAcresByYrCoCellCropPreMaster.txt" For Input As #1      ' <-----
Use this line for GWAcres
    Open "GWAcresByYrCoCellCropMaster.txt" For Output As #2      ' <-----Use
this line for GWAcres
'   Open "qryNoAcresByYrCoCellCropPreMaster.txt" For Input As #1      ' <-----
Use this line for NoAcres
'   Open "NoAcresByYrCoCellCropMaster.txt" For Output As #2      ' <-----Use
this line for NoAcres
'   Open "qrySWAcresByYrCoCellCropPreMaster.txt" For Input As #1      ' <-----
Use this line for GWAcres
'   Open "SWAcresByYrCoCellCropMaster.txt" For Output As #2      ' <-----Use
this line for GWAcres
    Line Input #1, Header
    Print #2, Header
    Input #1, Yr, Co, CoName, X, Y, Crop, Acres, GSN
    oldYr = Yr
    oldCo = Co
    oldCoName = CoName
```

```

    lstCropAcres(Crop).AddItem Right("00000" & Int(Acres * 100 + 0.5), 5) & "," & Right("00" & X,
3) & "," & Right("00" & Y, 3)
    CropAcres(Crop) = CropAcres(Crop) + Acres
    Do
        If EOF(1) Then
            Flag = 1
        Else
            Input #1, Yr, Co, CoName, X, Y, Crop, Acres, GSN
        'If Co = 6 Then Stop
        'If X = 438 And Y = 75 Then Stop
        End If

        If oldCo <> Co Or Flag = 1 Then
            Debug.Print oldYr, oldCo
            ' If oldYr = 1955 And oldCo = 17 Then Stop
        'If Co = 43 Then Stop
        TotalPreMaster = 0
        For Cr = 1 To 27
            TotalPreMaster = TotalPreMaster + CropAcres(Cr)
        Next
        For Cr = 1 To 27
            MasterPC(Cr) = Master(oldYr, oldCo, Cr) / MasterSummary(oldYr, oldCo)
            Target(Cr) = TotalPreMaster * MasterPC(Cr)
            Shift(Cr) = Int((Target(Cr) - CropAcres(Cr)) * 100 + 0.5) + 500000000
            SaveCropAcres(Cr) = CropAcres(Cr)
            CropAcres(Cr) = 0
            lstShift.AddItem Shift(Cr) & "," & Right("0" & Cr, 2)
        ' Debug.Print Shift(Cr) & "," & Right("0" & Cr, 2)
        Next

        Do Until Left(lstShift.List(0), 9) > 500000000
            ShiftAcres = -(Left(lstShift.List(0), 9) - 500000000) / 100
            Cr = Right(lstShift.List(0), 2)
            Do Until ShiftAcres < 1 Or lstCropAcres(Cr).ListCount = 0
                DoEvents
                rnd1 = Int(lstCropAcres(Cr).ListCount * Rnd + 1)
                rnd2 = Int(rnd1 * Rnd)
                lin = lstCropAcres(Cr).List(rnd2)
                CellAcres = Left(lin, 5) / 100
                Rest = Mid(lin, 6)
            'If Rest = ",438,075" Then Stop
            If CellAcres <= ShiftAcres Then
                lstCropAcres(0).AddItem Mid(Rest, 2) & "," & Right("00000" & Int(CellAcres * 100 +
0.5), 5)
                ShiftAcres = ShiftAcres - CellAcres
                lstCropAcres(Cr).RemoveItem rnd2
            Else
                lstCropAcres(0).AddItem Mid(Rest, 2) & "," & Right("00000" & Int(ShiftAcres * 100 +
0.5), 5)
                lstCropAcres(Cr).RemoveItem rnd2
                lstCropAcres(Cr).AddItem Right("00000" & Int((CellAcres - ShiftAcres) * 100 + 0.5),
5) & Rest
                ShiftAcres = 0
            End If
            Loop
            lstShift.RemoveItem 0
        Loop

        If lstCropAcres(0).ListCount > 0 Then
            lin = lstCropAcres(0).List(0)
            CellAcres = Right(lin, 5) * 1
            Rest = Left(lin, 7)
            lstCropAcres(0).RemoveItem 0
            Do Until lstCropAcres(0).ListCount = 0
            'If Left(lstCropAcres(0).List(0), 7) = ",438,075" Then Stop
            If Rest = Left(lstCropAcres(0).List(0), 7) Then
                NewAcres = Right(lstCropAcres(0).List(0), 5) * 1
                CellAcres = CellAcres + NewAcres
            Else
                lstTemp.AddItem Right("00000" & CellAcres, 5) & "," & Rest
                CellAcres = Right(lstCropAcres(0).List(0), 5) * 1
            End If
        End If
    End Do

```

```

        Rest = Left(lstCropAcres(0).List(0), 7)
    End If
    lstCropAcres(0).RemoveItem 0
Loop
lstTemp.AddItem Right("00000" & CellAcres, 5) & "," & Rest

    For k = 0 To lstTemp.ListCount - 1
'If Mid(lstTemp.List(k), 6) = ",438,075" Then Stop
        lstCropAcres(0).AddItem lstTemp.List(k)
    Next
    lstTemp.Clear
End If

    For k = 0 To lstShift.ListCount - 1
ShiftAcres = (Left(lstShift.List(k), 9) - 500000000) / 100
Cr = Right(lstShift.List(k), 2)
Do Until ShiftAcres < 1 Or lstCropAcres(0).ListCount = 0
    DoEvents
    rnd1 = Int(lstCropAcres(0).ListCount * Rnd + 1)
    rnd2 = Int(rnd1 * Rnd)
    lin = lstCropAcres(0).List(rnd2)
    CellAcres = Left(lin, 5) / 100
    Rest = Mid(lin, 6)
'If Rest = ",438,075" Then Stop
    If CellAcres <= ShiftAcres Then
        lstCropAcres(Cr).AddItem Right("00000" & Int(CellAcres * 100 + 0.5), 5) & "," &
Mid(Rest, 2)
        lstCropAcres(0).RemoveItem rnd2
        ShiftAcres = ShiftAcres - CellAcres
    Else
        lstCropAcres(Cr).AddItem Right("00000" & Int(ShiftAcres * 100 + 0.5), 5) & "," &
Mid(Rest, 2)
        lstCropAcres(0).RemoveItem rnd2
        lstCropAcres(0).AddItem Right("00000" & Int((CellAcres - ShiftAcres) * 100 + 0.5), 5)
& Rest
        ShiftAcres = 0
    End If
'    If lstCropAcres(0).ListCount < 5 Then Stop
Loop
Next

    If lstCropAcres(0).ListCount > 0 Then
MaxCA = 0
MaxCrop = 0
For Cr = 1 To 27
    If SaveCropAcres(Cr) > MaxCA Then
        MaxCA = SaveCropAcres(Cr)
        MaxCrop = Cr
    End If
Next
For k = 0 To lstCropAcres(0).ListCount - 1
    lin = lstCropAcres(0).List(k)
    CellAcres = Left(lin, 5) / 100
    Rest = Mid(lin, 6)
    lstCropAcres(MaxCrop).AddItem Right("00000" & Int(CellAcres * 100 + 0.5), 5) & "," &
Mid(Rest, 2)
Next
End If
lstCropAcres(0).Clear

    For Cr = 1 To 27
For k = 0 To lstCropAcres(Cr).ListCount - 1
    If Cr < 9 Or Cr = 15 Or Cr = 27 Then
        GSN = "G"
    Else
        GSN = "N"
    End If
'If Mid(lstCropAcres(Cr).List(k), 7) = "438,075" Then Stop
        Write #2, oldYr, oldCo, oldCoName, Mid(lstCropAcres(Cr).List(k), 7, 3) * 1,
Mid(lstCropAcres(Cr).List(k), 11, 3) * 1, Cr, Left(lstCropAcres(Cr).List(k), 5) / 100, GSN
Next

```

```
        lstCropAcres(Cr).Clear
    Next
    lstShift.Clear

End If

If Flag = 1 Then
    Debug.Print "Done"
End
End If

    lstCropAcres(Crop).AddItem Right("00000" & Int(Acres * 100 + 0.5), 5) & "," & Right("00" & X,
3) & "," & Right("00" & Y, 3)
    CropAcres(Crop) = CropAcres(Crop) + Acres
    oldYr = Yr
    oldCo = Co
    oldCoName = CoName
Loop
End Sub
```

Application: FactorAcres1950-2005 (Page F-9)

Overview: Takes input files stores into array. Data 1950 to 2005

Input files: qryFactorSWAcres.txt  
qryFactorGWAcre.txt  
qryFactorNoAcres.txt  
qryFactorSWAcresByCrop.txt  
qryFactorGWAcreByCrop.txt  
qryFactorNoAcresByCrop.txt

Output files: qryFactorNoAcresByCropFactored.txt  
qryFactorGWAcreByCropFactored.txt  
qryFactorSWAcresByCropFactored.txt

Calculations: N/A

Fields:

Text:

```
Private Sub Form_Load()  
    Dim acres(1950 To 2005, 188 To 899, 26 To 381)  
    Open "qryFactorSWAcres.txt" For Input As #1  
    Line Input #1, lin  
    Do Until EOF(1)  
        DoEvents  
        Input #1, yr, x, y, acre  
        Do Until x = 999 Or x = 99  
            acres(yr, x, y) = acres(yr, x, y) + acre  
            Input #1, yr, x, y, acre  
        Loop  
        Debug.Print "SW " & yr  
    Loop  
    Close  
    Open "qryFactorGWAcre.txt" For Input As #1  
    Line Input #1, lin  
    Do Until EOF(1)  
        DoEvents  
        Input #1, yr, x, y, acre  
        Do Until x = 999 Or x = 99  
            acres(yr, x, y) = acres(yr, x, y) + acre  
            Input #1, yr, x, y, acre  
        Loop  
        Debug.Print "GW " & yr  
    Loop  
    Close  
    Open "qryFactorNoAcres.txt" For Input As #1  
    Line Input #1, lin  
    Do Until EOF(1)  
        DoEvents  
        Input #1, yr, x, y, acre  
        Do Until x = 999 Or x = 99  
            acres(yr, x, y) = acres(yr, x, y) + acre  
            Input #1, yr, x, y, acre  
        Loop  
        Debug.Print "No " & yr  
    Loop  
    Close  
    Open "qryFactorSWAcresByCrop.txt" For Input As #1
```

```

Open "qryFactorSWAcresByCropFactored.txt" For Output As #2
Line Input #1, lin
Print #2, lin
Input #1, yr, CoID, CoName, x, y, crop, acre
Do Until EOF(1)
  DoEvents
  Input #1, yr, CoID, CoName, x, y, crop, acre
  If x = 999 Or x = 99 Then
    Write #2, yr, CoID, CoName, x, y, crop, acre
    Debug.Print "SW2 " & yr
  Else
    If acres(yr, x, y) < 159 Then Stop
    Write #2, yr, CoID, CoName, x, y, crop, Int(acre * 160 / acres(yr, x, y) * 100 + 0.5) / 100
  End If
Loop
Close
Open "qryFactorGWAcresByCrop.txt" For Input As #1
Open "qryFactorGWAcresByCropFactored.txt" For Output As #2
Line Input #1, lin
Print #2, lin
Input #1, yr, CoID, CoName, x, y, crop, acre
Do Until EOF(1)
  DoEvents
  Input #1, yr, CoID, CoName, x, y, crop, acre
  If x = 999 Or x = 99 Then
    Write #2, yr, CoID, CoName, x, y, crop, acre
    Debug.Print "GW2 " & yr
  Else
    Write #2, yr, CoID, CoName, x, y, crop, Int(acre * 160 / acres(yr, x, y) * 100 + 0.5) / 100
  End If
Loop
Close

Open "qryFactorNoAcresByCrop.txt" For Input As #1
Open "qryFactorNoAcresByCropFactored.txt" For Output As #2
Line Input #1, lin
Print #2, lin
Input #1, yr, CoID, CoName, x, y, crop, acre
Do Until EOF(1)
  DoEvents
  Input #1, yr, CoID, CoName, x, y, crop, acre
  If x = 999 Or x = 99 Then
    Write #2, yr, CoID, CoName, x, y, crop, acre
    Debug.Print "No2 " & yr
  Else
    Write #2, yr, CoID, CoName, x, y, crop, Int(acre * 160 / acres(yr, x, y) * 100 + 0.5) / 100
  End If
Loop
Close
End Sub

```



Application: Calmit2MasterNo (Page F-6)

Overview: Takes input files stores into array. Moves acres (not SW) according to Master Stats groups of both G and N.

Input files: GWAcresByYearCropCell140.txt  
qrySWAcresByYearCropCell.txt  
NoAcresByYearCropCell140.txt

Output files: GWAcresByYrCoCellCropMaster.txt  
SWAcresByYrCoCellCropMaster.txt  
NoAcresByYrCoCellCropMaster.txt

Calculations:  $lstCropCount(Crop) = lstCropCount(Crop) + 1$   
 $lstCropAcres(Crop, lstCropCount(Crop)) = Right("00000" & Int(Acres 100 + 0.5), 5) & "," & Right("00" & x, 3) & "," & Right("00" & Y, 3)$   
 $CropAcres(Crop) = CropAcres(Crop) + Acres$

Fields:

Text:

```
Dim lstCropAcres(27, 650000), lstCropCount(27)
Private Sub Form_Load()
    Dim Master(1950 To 1997, 43, 27), MasterSummary(1950 To 1997, 43), MasterPC(27)
    Dim Target(27), Shift(27)
    Dim CropAcres(27), SaveCropAcres(27)
    ' Show

    For k = 0 To 27
        lstCropCount(k) = -1
    Next

    DoEvents
    Open "NewMasterAcres.txt" For Input As #1
    Line Input #1, lin
    Do Until EOF(1)
        Input #1, Yr, Co, Crop, Acres
        If Crop < 9 Or Crop = 15 Or Crop = 27 Then ' <-----Use this line
for GWAcres & SWAcres
' If Crop > 8 And Crop <> 15 And Crop <> 27 Then ' <-----Use this
line for NoAcres
            Master(Yr, Co, Crop) = Acres
            MasterSummary(Yr, Co) = MasterSummary(Yr, Co) + Acres
        End If
    Loop
    Close

    Open "GWAcresByYearCropCell140.txt" For Input As #1 ' <-----Use this line
for GWAcres
    Open "GWAcresByYrCoCellCropMaster.txt" For Output As #2 ' <-----Use this line
for GWAcres

' Open "qrySWAcresByYearCropCell.txt" For Input As #1 ' <-----Use this
line for SWAcres
' Open "SWAcresByYrCoCellCropMaster.txt" For Output As #2 ' <-----Use this
line for SWAcres
' Line Input #1, Header ' <-----Use this
line for SWAcres
```

```

' Open "NoAcresByYearCropCell140.txt" For Input As #1      ' <-----Use this
line for NoAcres
' Open "NoAcresByYrCoCellCropMaster.txt" For Output As #2 ' <-----Use this
line for NoAcres

Flag = 0
Input #1, Yr, Co, CoName, x, Y, Crop, Acres, GSN
oldYr = Yr
oldCo = Co
oldCoName = CoName
lstCropCount(Crop) = lstCropCount(Crop) + 1
lstCropAcres(Crop, lstCropCount(Crop)) = Right("00000" & Int(Acres * 100 + 0.5), 5) & "," &
Right("00" & x, 3) & "," & Right("00" & Y, 3)
CropAcres(Crop) = CropAcres(Crop) + Acres
Do
  If EOF(1) Then
    Flag = 1
  Else
    Input #1, Yr, Co, CoName, x, Y, Crop, Acres, GSN
  'If Co = 6 Then Stop
  'If X = 779 And Y = 87 Then Stop
  End If

  If oldCo <> Co Or Flag = 1 Then
    Debug.Print oldYr, oldCo
    ' If oldYr = 1953 And oldCo = 23 Then Stop
  'If Co = 43 Then Stop
  TotalPreMaster = 0
  For Cr = 1 To 27
    TotalPreMaster = TotalPreMaster + CropAcres(Cr)
  Next
  For Cr = 1 To 27
    If MasterSummary(oldYr, oldCo) <> 0 Then
      MasterPC(Cr) = Master(oldYr, oldCo, Cr) / MasterSummary(oldYr, oldCo)
    Else
      MasterPC(Cr) = 0
    End If
    Target(Cr) = TotalPreMaster * MasterPC(Cr)
    Shift(Cr) = Int((Target(Cr) - CropAcres(Cr)) * 100 + 0.5) + 500000000
    SaveCropAcres(Cr) = CropAcres(Cr)
    CropAcres(Cr) = 0
    lstShift.AddItem Shift(Cr) & "," & Right("0" & Cr, 2)
  ' Debug.Print Shift(Cr) & "," & Right("0" & Cr, 2)
  Next

  MinRnd = 999999999
  Do Until Left(lstShift.List(0), 9) > 500000000
    ShiftAcres = -(Left(lstShift.List(0), 9) - 500000000) / 100
    Cr = Right(lstShift.List(0), 2)
    Do Until ShiftAcres < 1 Or lstCropCount(Cr) <= 0
      DoEvents
      rnd1 = Int(lstCropCount(Cr) * Rnd + 1)
      rnd2 = Int(rnd1 * Rnd)
      If MinRnd < rnd2 Then MinRnd = rnd2
      lin = lstCropAcres(0, rnd2)
      If lin = "" Then
        RemItem2 0, MinRnd
        If lstCropCount(0) = -1 Then
          Exit Do
        End If
        rnd1 = Int(lstCropCount(0) * Rnd + 1)
        rnd2 = Int(rnd1 * Rnd)
        lin = lstCropAcres(0, rnd2)
      End If
      CellAcres = Left(lin, 5) / 100
      Rest = Mid(lin, 6)
  'If Rest = ",779,087" Then Stop
      If CellAcres <= ShiftAcres Then
        lstCropCount(0) = lstCropCount(0) + 1

```

```

    lstCropAcres(0, lstCropCount(0)) = Mid(Rest, 2) & "," & Right("00000" & Int(CellAcres
* 100 + 0.5), 5)
    ShiftAcres = ShiftAcres - CellAcres
    RemItem Cr, rnd2
'
    lstCropAcres(Cr).RemoveItem rnd2
Else
    lstCropCount(0) = lstCropCount(0) + 1
    lstCropAcres(0, lstCropCount(0)) = Mid(Rest, 2) & "," & Right("00000" &
Int(ShiftAcres * 100 + 0.5), 5)
    RemItem Cr, rnd2
'
    lstCropAcres(Cr).RemoveItem rnd2
    lstCropCount(Cr) = lstCropCount(Cr) + 1
    lstCropAcres(Cr, lstCropCount(Cr)) = Right("00000" & Int((CellAcres - ShiftAcres) *
100 + 0.5), 5) & Rest
    ShiftAcres = 0
End If
Loop
lstShift.RemoveItem 0
Loop

If lstCropCount(0) > -1 Then
'
    If lstCropAcres(0).ListCount > 0 Then
        lin = lstCropAcres(0, 0)
'
        lin = lstCropAcres(0).List(0)
        CellAcres = Right(lin, 5) * 1
        Rest = Left(lin, 7)
'If Rest = ",779,087" Then Stop
        RemItem 0, 0
'
        lstCropAcres(0).RemoveItem 0
'
        Do Until lstCropCount(0) = -1
            For k = 0 To lstCropCount(0)
'If Left(lstCropAcres(0).List(0), 7) = ",779,087" Then Stop
                If Rest = Left(lstCropAcres(0, k), 7) Then
'If Left(lstCropAcres(0, 0), 7) = ",779,087" Then Stop
                    NewAcres = Right(lstCropAcres(0, k), 5) * 1
                    CellAcres = CellAcres + NewAcres
                Else
                    lstTemp.AddItem Right("00000" & CellAcres, 5) & "," & Rest
                    CellAcres = Right(lstCropAcres(0, k), 5) * 1
                    Rest = Left(lstCropAcres(0, k), 7)
                End If
'
                RemItem 0, 0
'
                lstCropAcres(0).RemoveItem 0
            Next
'
            Loop
            lstTemp.AddItem Right("00000" & CellAcres, 5) & "," & Rest
            lstCropCount(0) = -1

            For k = 0 To lstTemp.ListCount - 1
'If Mid(lstTemp.List(k), 6) = ",779,087" Then Stop
                lstCropCount(0) = lstCropCount(0) + 1
                lstCropAcres(0, lstCropCount(0)) = lstTemp.List(k)
            Next
            lstTemp.Clear
        End If

        For k = 0 To lstShift.ListCount - 1
            ShiftAcres = (Left(lstShift.List(k), 9) - 500000000) / 100
            Cr = Right(lstShift.List(k), 2)
            If lstCropCount(0) > -1 Then
                Do Until ShiftAcres < 1 Or lstCropAcres(0, lstCropCount(0)) = 0
                    DoEvents
                    rnd1 = Int(lstCropCount(0) * Rnd + 1)
                    rnd2 = Int(rnd1 * Rnd)
                    If MinRnd < rnd2 Then MinRnd = rnd2
                    lin = lstCropAcres(0, rnd2)
                    If lin = "" Then
                        RemItem2 0, MinRnd
                        If lstCropCount(0) = -1 Then
                            Exit Do
                        End If
                    End If
                End Do
            End If
        End For
    End If

```

```

        rnd1 = Int(lstCropCount(0) * Rnd + 1)
        rnd2 = Int(rnd1 * Rnd)
        lin = lstCropAcres(0, rnd2)
    End If
    CellAcres = Left(lin, 5) / 100
    Rest = Mid(lin, 6)
'If Rest = ",779,087" Then Stop
    If CellAcres <= ShiftAcres Then
        lstCropCount(Cr) = lstCropCount(Cr) + 1
        lstCropAcres(Cr, lstCropCount(Cr)) = Right("00000" & Int(CellAcres * 100 + 0.5), 5)
& ", " & Mid(Rest, 2)
    '
        RemItem 0, rnd2
        lstCropAcres(0).RemoveItem rnd2
        ShiftAcres = ShiftAcres - CellAcres
    Else
        lstCropCount(Cr) = lstCropCount(Cr) + 1
        lstCropAcres(Cr, lstCropCount(Cr)) = Right("00000" & Int(ShiftAcres * 100 + 0.5),
5) & ", " & Mid(Rest, 2)
    '
        RemItem 0, rnd2
        lstCropAcres(0).RemoveItem rnd2
        lstCropCount(0) = lstCropCount(0) + 1
        lstCropAcres(0, lstCropCount(0)) = Right("00000" & Int((CellAcres - ShiftAcres) *
100 + 0.5), 5) & Rest
        ShiftAcres = 0
    End If
    lstCropAcres(0, rnd2) = ""
    If lstCropCount(0) = -1 Then
        Exit Do
    End If
    '
        If lstCropAcres(0).ListCount < 5 Then Stop
    Loop
End If
Next

'
    If lstCropCount(0) > -1 Then
'
        MaxCA = 0
        MaxCrop = 0
        For Cr = 1 To 27
            If SaveCropAcres(Cr) > MaxCA Then
                MaxCA = SaveCropAcres(Cr)
                MaxCrop = Cr
            End If
        Next
        For k = 0 To lstCropCount(0)
            lin = lstCropAcres(0, k)
            CellAcres = Left(lin, 5) / 100
            Rest = Mid(lin, 6)
            lstCropCount(MaxCrop) = lstCropCount(MaxCrop) + 1
            lstCropAcres(MaxCrop, lstCropCount(MaxCrop)) = Right("00000" & Int(CellAcres * 100 +
0.5), 5) & ", " & Mid(Rest, 2)
        Next
    End If
    lstCropCount(0) = -1
    lstCropAcres(0).Clear

    For Cr = 1 To 27
        For k = 0 To lstCropCount(Cr)
            If Cr < 9 Or Cr = 15 Or Cr = 27 Then
                GSN = "G"
            Else
                GSN = "N"
            End If
'If Mid(lstCropAcres(Cr, k), 6) = ",779,087" Then Stop
            Write #2, oldYr, oldCo, oldCoName, Mid(lstCropAcres(Cr, k), 7, 3) * 1,
Mid(lstCropAcres(Cr, k), 11, 3) * 1, Cr, Left(lstCropAcres(Cr, k), 5) / 100, GSN
        Next
        lstCropCount(Cr) = -1
        lstCropAcres(Cr).Clear
    Next
    lstShift.Clear

```

```

End If

If Flag = 1 Then
    Debug.Print "Done"
End
End If

lstCropCount(Crop) = lstCropCount(Crop) + 1
lstCropAcres(Crop, lstCropCount(Crop)) = Right("00000" & Int(Acres * 100 + 0.5), 5) & "," &
Right("00" & x, 3) & "," & Right("00" & Y, 3)
CropAcres(Crop) = CropAcres(Crop) + Acres
oldYr = Yr
oldCo = Co
oldCoName = CoName
Loop
End Sub

Sub RemItem(Cr, start)
    For k = start To lstCropCount(Cr) - 1
        DoEvents
        lstCropAcres(Cr, k) = lstCropAcres(Cr, k + 1)
    Next
    If lstCropCount(Cr) > -1 Then lstCropCount(Cr) = lstCropCount(Cr) - 1
End Sub

Sub RemItem2(Cr, MinRnd)
    j = -1
    For k = MinRnd To lstCropCount(Cr)
        DoEvents
        If lstCropAcres(Cr, k) <> "" Then
            j = j + 1
            lstCropAcres(Cr, j) = lstCropAcres(Cr, k)
        ' Else
        '     Stop
        End If
    Next
    lstCropCount(Cr) = j
    MinRnd = 999999999
End Sub

```

Application: SplitAcresbyYearCell (Page F-3)

Overview: Stores input files in array for the years 1950 to 1997.

Input files: qryCellsByCountyDistrict.txt  
qryDistrictIDGridAcresFactored.txt  
qrySWAcresByYearCountyDistrict.txt  
qryCalmitAcresByCoCropCell.txt

Output files: NewGwAcres.txt  
NewSWAcres.txt  
NewIRAcres.txt  
NewNoAcres.txt

Calculations: TotalCoDistAcres = TotalCoDistAcres + Acres  
AddAcres = Right("00000" & Int(Acres \* 100 + 0.5), 5)  
If AddAcres <> "00000" Then lstCoDistAcres.AddItem Right("00000" &  
Int(Acres \* 100 + 0.5), 5) & "|" & Right("000" & x, 3) & "|" &  
Right("000" & y, 3)  
GWAcrees = GWAcrees + Acres

Fields:

Text:

```
Private Sub Form_Load()  
' Randomize  
Dim CellsByCoDist(43, 56, 2), Cells(20000, 1), AcresByCoDistYr(43, 56, 1950 To 1997)  
Dim AcresByXYIrrNoIrr(188 To 899, 26 To 381, 2)  
Dim DistrictCellPointers(56, 2), DistrictCellAcres(20000, 2), Grid(188 To 899, 26 To 381)  
  
Open "qryCellsByCountyDistrict.txt" For Input As #1  
Line Input #1, lin  
Input #1, x, y, County, dummyCounty, District, dummyDistrict  
CellsByCoDist(County, District, 1) = 1  
k = 1  
Cells(k, 0) = x  
Cells(k, 1) = y  
oldCounty = County  
oldDistrict = District  
Do Until EOF(1)  
k = k + 1  
Input #1, x, y, County, dummyCounty, District, dummyDistrict  
If County <> oldCounty Or District <> oldDistrict Then  
CellsByCoDist(oldCounty, oldDistrict, 2) = k - 1  
CellsByCoDist(County, District, 1) = k  
oldCounty = County  
oldDistrict = District  
End If  
Cells(k, 0) = x  
Cells(k, 1) = y  
Loop  
CellsByCoDist(County, District, 2) = k  
Close  
  
Open "qryDistrictIDGridAcresFactored.txt" For Input As #1  
Line Input #1, lin  
Input #1, District, dummyDistrict, x, y, UnfactoredAcres, DistPerCell, Acres
```

```

DistrictCellPointers(District, 1) = 1
k = 1
DistrictCellAcres(k, 0) = x
DistrictCellAcres(k, 1) = y
DistrictCellAcres(k, 2) = Acres
oldDistrict = District
Do Until EOF(1)
    k = k + 1
    Input #1, District, dummyDistrict, x, y, UnfactoredAcres, DistPerCell, Acres
'If X = 341 And Y = 64 Then Stop
    If District <> oldDistrict Then
        DistrictCellPointers(oldDistrict, 2) = k - 1
        DistrictCellPointers(District, 1) = k
        oldDistrict = District
    End If
    DistrictCellAcres(k, 0) = x
    DistrictCellAcres(k, 1) = y
    DistrictCellAcres(k, 2) = Acres
Loop
DistrictCellPointers(District, 2) = k
Close

Open "qrySWAcresByYearCountyDistrict.txt" For Input As #1
Line Input #1, lin
Do Until EOF(1)
    Input #1, County, dummyCounty, District, dummyDistrict, yr, dummyAcres, dummyFraction,
PrelimAcres, dummyAcres, Acres
    AcresByCoDistYr(County, District, yr) = Acres
Loop
Close

Open "qryCalmitAcresByCoCropCell.txt" For Input As #1
Line Input #1, lin
Do Until EOF(1)
    Input #1, dummyCounty, Crop, Acres, x, y
    If Crop < 9 Or Crop = 15 Or Crop = 27 Then
        NewCrop = 0
    Else
        NewCrop = 2
    End If
    If Not IsEmpty(dummyCounty) Then
        AcresByXYIrrNoIrr(x, y, NewCrop) = AcresByXYIrrNoIrr(x, y, NewCrop) + Acres
    End If
Loop
Close

' Show
' Open "NewGWAcre.txt" For Output As #1
Open "NewSWAcres.txt" For Output As #2
' Open "NewIRAcres.txt" For Output As #3
' Open "NewNoAcres.txt" For Output As #4
For co = 1 To 43
    Debug.Print co
'    If co = 31 Then Stop
    For dist = 1 To 56
'        If dist = 44 Then Stop
        If CellsByCoDist(co, dist, 1) > 0 Then
            For k = DistrictCellPointers(dist, 1) To DistrictCellPointers(dist, 2)
                x = DistrictCellAcres(k, 0)
'If x = 289 Then Stop
                y = DistrictCellAcres(k, 1)
'If y = 280 Then Stop
                Acres = DistrictCellAcres(k, 2)
                Grid(x, y) = Acres
            Next
            lstCoDistAcres.Clear
            TotalCoDistAcres = 0
            GWAcre = 0
            For k = CellsByCoDist(co, dist, 1) To CellsByCoDist(co, dist, 2)
                x = Cells(k, 0)
                y = Cells(k, 1)

```

```

'      If x = 289 And y = 280 Then Stop
      Acres = AcresByXYIrrNoIrr(x, y, 0)
      If Grid(x, y) < Acres Then
        Acres = Grid(x, y)
      End If
      TotalCoDistAcres = TotalCoDistAcres + Acres
      AddAcres = Right("00000" & Int(Acres * 100 + 0.5), 5)
      If AddAcres <> "00000" Then
        lstCoDistAcres.AddItem Right("00000" & Int(Acres * 100 + 0.5), 5) & "|" & Right("000"
& x, 3) & "|" & Right("000" & y, 3)
        GWAcres = GWAcres + Acres
      End If
    Next
    TotalGWAcres = GWAcres

    For yr = 1950 To 1997
      DoEvents
      '      If yr = 1971 Then Stop
      NeedSWAcres = AcresByCoDistYr(co, dist, yr)
      If NeedSWAcres > 0 Then
        TotalCoDistAcres = 0
        lstCoDistAcresYrGW.Clear
        lstCoDistAcresYrSW.Clear
        GWAcres = TotalGWAcres
        SWAcres = 0
      '      Debug.Print yr, co, dist, AcresByCoDistYr(co, dist, yr), NeedSWAcres, GWAcres,
SWAcres

      If GWAcres <= NeedSWAcres Then
        For k = 0 To lstCoDistAcres.ListCount - 1
          items = Split(lstCoDistAcres.List(k), "|")
          Acres = items(0) / 100
          x = items(1) * 1
          y = items(2) * 1
          lstCoDistAcresYrSW.AddItem Right("00000" & Int((Acres) * 100 + 0.5), 5) & "|" &
Right("000" & x, 3) & "|" & Right("000" & y, 3)
        Next

      Else
        For k = 0 To lstCoDistAcres.ListCount - 1
          lstCoDistAcresYrGW.AddItem lstCoDistAcres.List(k)
        Next
        Do Until NeedSWAcres < 1
          Cnt = lstCoDistAcresYrGW.ListCount
          r1 = Rnd
          rnd1 = Int((Cnt * r1) + 1)
          r2 = Rnd
          rnd2 = Int(((Cnt - rnd1) * r2) + rnd1) - 1
          lin = lstCoDistAcresYrGW.List(rnd2)
          items = Split(lin, "|")
          Acres = items(0) / 100
          x = items(1) * 1
          y = items(2) * 1
        'If X = 341 And Y = 64 Then Stop
          If Acres > NeedSWAcres Then
            GWAcres = GWAcres - NeedSWAcres
            SWAcres = SWAcres + NeedSWAcres
            lstCoDistAcresYrGW.RemoveItem (rnd2)
            Acres = Acres - NeedSWAcres
            lstCoDistAcresYrGW.AddItem Right("00000" & Int((Acres) * 100 + 0.5), 5) & "|" &
Right("000" & x, 3) & "|" & Right("000" & y, 3)
            lstCoDistAcresYrSW.AddItem Right("00000" & Int(NeedSWAcres * 100 + 0.5), 5) &
"|" & Right("000" & x, 3) & "|" & Right("000" & y, 3)
            NeedSWAcres = 0
          Else
            GWAcres = GWAcres - Acres
            SWAcres = SWAcres + Acres
            lstCoDistAcresYrGW.RemoveItem (rnd2)
            lstCoDistAcresYrSW.AddItem lin
            NeedSWAcres = NeedSWAcres - Acres
          End If
        Loop
      End If
    Next
  End Sub

```



```

End If

'
    For k = 0 To lstCoDistAcresYrGW.ListCount - 1
'
        items = Split(lstCoDistAcresYrGW.List(k), "|")
'
        Write #1, yr; items(1) * 1; items(2) * 1; items(0) / 100; co; dist '
lstCoDistAcresYrGW.List(k)
'
        Write #3, yr; items(1) * 1; items(2) * 1; items(0) / 100; co; dist; "GW" '
lstCoDistAcresYrGW.List(k)
'
        Next
'
        For k = 0 To lstCoDistAcresYrSW.ListCount - 1
'
            items = Split(lstCoDistAcresYrSW.List(k), "|")
'
            Write #2, yr; items(1) * 1; items(2) * 1; items(0) / 100; co; dist '
lstCoDistAcresYrSW.List(k)
'
            Write #3, yr; items(1) * 1; items(2) * 1; items(0) / 100; co; dist; "GW" '
lstCoDistAcresYrSW.List(k)
'
            AcresByXYIrrNoIrr(x, y, 0) = AcresByXYIrrNoIrr(items(1), items(2), 0) - items(0) /
100
'
            Next
'
        Else
'
            Stop
'
            For k = 0 To lstCoDistAcres.ListCount - 1
'
                items = Split(lstCoDistAcres.List(k), "|")
'
                Write #1, yr; items(1) * 1; items(2) * 1; items(0) / 100; co; dist '
lstCoDistAcres.List(k)
'
                Write #3, yr; items(1) * 1; items(2) * 1; items(0) / 100; co; dist; "GW" '
lstCoDistAcres.List(k)
'
            Next
'
        End If

        For k = DistrictCellPointers(dist, 1) To DistrictCellPointers(dist, 2)
            x = DistrictCellAcres(k, 0)
            y = DistrictCellAcres(k, 1)
            Grid(x, y) = 0
        Next
    Next

End If
Next
Next
Debug.Print "Done"
Close

End
End Sub

```

Application: SW2Calmit (Page F-5)

Overview: Stores input file in array

Input files: qryCalmitAcresByCoCropCell.txt  
qrySummaryNewSWAcres.txt

Output files: SWAcresByYearCropCell.txt

Calculations:

Fields:

Text:

```
Private Sub Form_Load()
    Dim Calmit(188 To 899, 26 To 381, 27), CalmitPC(188 To 899, 26 To 381, 27)

    Open "qryCalmitAcresByCoCropCell.txt" For Input As #1
    Line Input #1, lin
    Do Until EOF(1)
        Input #1, dummyCounty, crop, Acres, x, y
        If crop < 9 Or crop = 15 Or crop = 27 Then
            Calmit(x, y, crop) = Calmit(x, y, crop) + Acres
            Calmit(x, y, 0) = Calmit(x, y, 0) + Acres
        End If
    Loop
    Close

    For x = 188 To 899
        For y = 26 To 381
            DoEvents
            If Calmit(x, y, 0) > 0 Then
                For crop = 1 To 27
                    If crop < 9 Or crop = 15 Or crop = 27 Then
                        CalmitPC(x, y, crop) = Calmit(x, y, crop) / Calmit(x, y, 0)
                    End If
                Next
            End If
        Next
    Next

    Open "qrySummaryNewSWAcres.txt" For Input As #1
    Open "SWAcresByYearCropCell.txt" For Output As #2
    Line Input #1, lin
    Do Until EOF(1)
        Input #1, yr, x, y, Acres
        DoEvents
        For crop = 1 To 27
            If (crop < 9 Or crop = 15 Or crop = 27) Then
                If CalmitPC(x, y, crop) > 0 Then
                    NewAcres = Calmit(x, y, crop) * Acres
                    Write #2, yr, crop, x, y, Int(NewAcres * 100 + 0.5) / 100, "S"
                End If
            End If
        Next
    Loop
End Sub
```

Application: GeneralizeNoAcres (Page F-8)

Overview: Stores input file in array from years 1950 to 2005. Generalize the data crop acres and year by cell x & y.

Input files: 1950-2005NoAcres.txt

Output files: 1950-2005NoAcresGeneralized.txt

Calculations:

Fields:

Text:

```
Private Sub Form_Load()
    Dim SumAcres(9 To 26)
    Open "1950-2005NoAcres.txt" For Input As #1
    Open "1950-2005NoAcresGeneralized.txt" For Output As #2
    MaxCrop = 9
    MaxAcres = 0
    k = 0
    Input #1, oldYr, oldCoID, oldCoName, oldX, oldY, oldCrop, oldAcres
    SumAcres(oldCrop) = oldAcres
    MaxCrop = oldCrop
    MaxAcres = oldAcres
    Do Until EOF(1)
        Input #1, Yr, CoID, CoName, X, Y, Crop, acres
        DoEvents
        If CoID = 99 Then
            If Yr = 2005 Then
                GoTo Complete
            Else
                Input #1, Yr, CoID, CoName, X, Y, Crop, acres
                End If
            End If
        ' If Yr = 1951 Then Stop
        If Yr <> oldYr Or X <> oldX Or Y <> oldY Then
            For cr = 9 To 26
                If SumAcres(cr) > 0 And SumAcres(cr) < 1 Then
                    SumAcres(MaxCrop) = SumAcres(MaxCrop) + SumAcres(cr)
                    SumAcres(cr) = 0
                End If
            Next
            For cr = 9 To 26
                If SumAcres(cr) > 0 Then
                    k = k + 1
                    Write #2, k, oldYr, oldCoID, oldCoName, oldX, oldY, cr, SumAcres(cr)
                    SumAcres(cr) = 0
                End If
            Next
            If oldYr <> Yr Then
                k = k + 1
                Write #2, k, oldYr, 99, "", 999, 999, 99, 99
                Debug.Print oldYr
            End If

            oldYr = Yr
            oldCoID = CoID
            oldCoName = CoName
            oldX = X
            oldY = Y
            MaxCrop = 9
        End If
    Loop
End Sub
```

```

        MaxAcres = 0
    End If
    SumAcres(Crop) = SumAcres(Crop) + acres
    If SumAcres(Crop) > MaxAcres Then
        MaxCrop = Crop
        MaxAcres = SumAcres(Crop)
    End If
Loop

Complete:
For cr = 9 To 26
    If SumAcres(cr) > 0 And SumAcres(cr) < 1 Then
        SumAcres(MaxCrop) = SumAcres(MaxCrop) + SumAcres(cr)
        SumAcres(cr) = 0
    End If
Next
For cr = 9 To 26
    If SumAcres(cr) > 0 Then
        k = k + 1
        Write #2, k, oldYr, oldCoID, oldCoName, oldX, oldY, cr, SumAcres(cr)
        SumAcres(cr) = 0
    End If
Next
k = k + 1
Write #2, k, Yr, 99, "", 999, 999, 99, 99
End
Debug.Print "Done"
End Sub

```

Application: GSWAcres1998-2005InDist (Page F-7b)

Overview: Takes input file stores in array. Data from 1998 to 2005

Input files: qryMultipleDistrictCells.txt  
qryMaxAcresByYrCoDist.txt  
qryIrrigAcresByYrCoDist.txt  
qryIrrigAcresByYrCoDistCellCrop.txt

Output files: SWIrrigAcresByYrCoDistCellCrop.txt  
GWIrrigAcresByYrCoDistCellCrop.txt

Calculations: TotalIrrigAcres(yr, County43, DistrictID) = SumOfAcres  
Fraction(yr, County43, DistrictID) = MaxAcres(yr, County43, DistrictID) /  
TotalIrrigAcres(yr, County43, DistrictID)  
SWAcres = Int((Acres \* Fraction(yr, County43, DistrictID)) \* 100 + 0.5) / 100  
GWAces = Int((Acres - SWAcres) \* 100 + 0.5) / 100

Fields:

Text:

```
Private Sub Form_Load()  
    Dim MaxAcres(1998 To 2005, 43, 56), TotalIrrigAcres(1998 To 2005, 43, 56)  
    Dim Fraction(1998 To 2005, 43, 56)  
    Dim MultipleDistrictCells(188 To 899, 26 To 381)  
  
    ' Open "qryMultipleDistrictCells.txt" For Input As #1  
    ' Line Input #1, lin  
    ' Do Until EOF(1)  
    '     Input #1, X, Y, Cnt  
    '     MultipleDistrictCells(X, Y) = Cnt  
    ' Loop  
    ' Close  
    '  
  
    Open "qryMaxAcresByYrCoDist.txt" For Input As #1  
    Line Input #1, lin  
    Do Until EOF(1)  
        Input #1, yr, County43, CountyName, DistrictID, DistrictName, SumOfAcres,  
        MinDuaneAcresByCounty, MaxSWAcres  
        MaxAcres(yr, County43, DistrictID) = MaxSWAcres  
    Loop  
    Close  
  
    Open "qryIrrigAcresByYrCoDist.txt" For Input As #1  
    Line Input #1, lin  
    Do Until EOF(1)  
        Input #1, yr, County43, CountyName, DistrictID, DistrictName, SumOfAcres  
        TotalIrrigAcres(yr, County43, DistrictID) = SumOfAcres  
        Fraction(yr, County43, DistrictID) = MaxAcres(yr, County43, DistrictID) / TotalIrrigAcres(yr,  
        County43, DistrictID)  
    'If DistrictID = 44 Then Stop  
    Loop  
    Close  
  
    Open "qryIrrigAcresByYrCoDistCellCrop.txt" For Input As #1  
    Open "SWIrrigAcresByYrCoDistCellCrop.txt" For Output As #2  
    Open "GWIrrigAcresByYrCoDistCellCrop.txt" For Output As #3  
  
    Line Input #1, lin
```

```

Do Until EOF(1)
  DoEvents
  Input #1, yr, County43, CountyName, DistrictID, DistrictName, X, Y, Crop, Acres
  '   If MultipleDistrictCells(X, Y) > 1 Then
  '     Acres = Acres / MultipleDistrictCells(X, Y)
  '   End If
  SWAcres = Int((Acres * Fraction(yr, County43, DistrictID)) * 100 + 0.5) / 100
  GWAcres = Int((Acres - SWAcres) * 100 + 0.5) / 100
  'If DistrictID = 44 Then Stop
  Write #2, yr, County43, CountyName, DistrictID, DistrictName, X, Y, Crop, SWAcres
  Write #3, yr, County43, CountyName, DistrictID, DistrictName, X, Y, Crop, GWAcres
Loop
Close
Debug.Print "Done"
End
End Sub

```

Application: MergeByYear (Page F-8)

Overview: Stores input files in an array. Data 1998 to 2005. Develops summary of data

Input files: GWIrrigAcresByYrCoCellCrop.txt  
GWIrrigAcresByYrCoDistCellCrop.txt

Output files: GWIrrigAcresByYrCoDistCellCropAll.txt

Calculations:

Fields:

Text:

```
Private Sub Form_Load()  
    Open "GWIrrigAcresByYrCoCellCrop.txt" For Input As #1  
    Open "GWIrrigAcresByYrCoDistCellCrop.txt" For Input As #2  
    Open "GWIrrigAcresByYrCoDistCellCropAll.txt" For Output As #3  
  
    Line Input #1, lin1  
    k1 = 1  
    Line Input #2, lin2  
    k2 = 1  
    For yr = 1998 To 2005  
        Do While Left(lin1, 4) * 1 = yr And Not EOF(1)  
            Print #3, lin1  
            Line Input #1, lin1  
            k1 = k1 + 1  
        Loop  
  
        Do While Left(lin2, 4) * 1 = yr And Not EOF(2)  
            Print #3, lin2  
            Line Input #2, lin2  
            k2 = k2 + 1  
        Loop  
    Next  
    Print #3, lin1  
    Print #3, lin2  
End  
End Sub
```

Application: MergeNoAcres (Page F-8)

Overview: Stores input files in an array. Data 1998 to 2005. Develops summary of data

Input files: No[SWGWA]AcresByYrCoCellCropMasterSort.txt  
NoIrrigAcresByYrCoCellCropSort.txt

Output files: 1950-2005NoAcres.txt

Calculations:

Fields:

Text:

```
Private Sub Form_Load()  
    Open "NoAcresByYrCoCellCropMasterSort.txt" For Input As #1  
    Open "1950-2005NoAcres.txt" For Output As #2  
    oldYr = 1950  
    Do Until EOF(1)  
        DoEvents  
        Input #1, Yr, CoID, CoName, X, Y, Crop, Acres, GSN  
        If GSN <> "N" And GSN <> "" Then Stop  
        k = k + 1  
        If Yr <> oldYr Then  
            If Yr = oldYr + 1 Then  
                Debug.Print Yr  
                oldYr = Yr  
            Else  
                Debug.Print k  
                Stop  
            End If  
        End If  
        Write #2, Yr, CoID, CoName, X, Y, Crop, Acres  
    Loop  
    Close #1  
    oldYr = 1997  
    k = 0  
    Open "NoIrrigAcresByYrCoCellCropSort.txt" For Input As #1  
    Do Until EOF(1)  
        DoEvents  
        Input #1, Yr, CoID, CoName, X, Y, Crop, Acres  
        If CoID = 99 Then Input #1, dummy  
        k = k + 1  
        If Yr <> oldYr Then  
            If Yr = oldYr + 1 Then  
                Debug.Print Yr  
                oldYr = Yr  
            Else  
                Debug.Print k  
                Stop  
            End If  
        End If  
        Write #2, Yr, CoID, CoName, X, Y, Crop, Acres  
    Loop  
    Close  
    Debug.Print "Done"  
    End  
End Sub
```



Application: MergeGWbyYear (Page F-8)

Overview: Stores input files in an array. Data 1998 to 2005

Input files: GWIrrigAcresByYrCoCellCrop.txt  
GWIrrigAcresByYrCoDistCellCrop.txt

Output files: GWIrrigAcresByYrCoDistCellCropAll.txt

Calculations:

Fields:

Text:

```
Private Sub Form_Load()
    Open "GWIrrigAcresByYrCoCellCrop.txt" For Input As #1
    Open "GWIrrigAcresByYrCoDistCellCrop.txt" For Input As #2
    Open "GWIrrigAcresByYrCoDistCellCropAll.txt" For Output As #3

    Line Input #1, lin1
    Line Input #1, lin1
    k1 = 1
    Line Input #2, lin2
    k2 = 1
    For yr = 1998 To 2005
        DoEvents
        Debug.Print yr
        Do While Left(lin1, 4) * 1 = yr And Not EOF(1)
            spl1 = Split(lin1, ",")
            If spl1(1) = "" Then
                Write #3, spl1(0) * 1, , spl1(2), spl1(5) * 1, spl1(6) * 1, spl1(7) * 1, spl1(8) * 1
            Else
                v = Replace(spl1(2), Chr(34), "")
                Write #3, spl1(0) * 1, spl1(1) * 1, v, spl1(5) * 1, spl1(6) * 1, spl1(7) * 1, spl1(8) * 1
            End If
            ' Write #3, spl1(0) * 1, spl1(1) * 1, spl1(2), spl1(5) * 1, spl1(6) * 1, spl1(7) * 1,
            spl1(8) * 1
            ' Print #3, lin1
            Line Input #1, lin1
            k1 = k1 + 1
        Loop

        Do While Left(lin2, 4) * 1 = yr And Not EOF(2)
            DoEvents
            spl2 = Split(lin2, ",")
            If spl2(1) = "" Then
                Write #3, spl2(0) * 1, , spl2(2), spl2(5) * 1, spl2(6) * 1, spl2(7) * 1, spl2(8) * 1
            Else
                v = Replace(spl2(2), Chr(34), "")
                Write #3, spl2(0) * 1, spl2(1) * 1, v, spl2(5) * 1, spl2(6) * 1, spl2(7) * 1, spl2(8) * 1
            End If
            ' Print #3, lin2
            Line Input #2, lin2
            k2 = k2 + 1
        Loop
    Next
    spl1 = Split(lin1, ",")
    If spl1(1) = "" Then
        Write #3, spl1(0) * 1, , spl1(2), spl1(5) * 1, spl1(6) * 1, spl1(7) * 1, spl1(8) * 1
    Else
```

```

    v = Replace(splt(2), Chr(34), "")
    Write #3, splt(0) * 1, splt(1) * 1, v, splt(5) * 1, splt(6) * 1, splt(7) * 1, splt(8) * 1
End If
If splt(1) = "" Then
    Write #3, splt(0) * 1, , splt(2), splt(5) * 1, splt(6) * 1, splt(7) * 1, splt(8) * 1
Else
    v = Replace(splt(2), Chr(34), "")
    Write #3, splt(0) * 1, splt(1) * 1, v, splt(5) * 1, splt(6) * 1, splt(7) * 1, splt(8) * 1
End If
splt = Split(lin2, ",")
Write #3, splt(0) * 1, splt(1) * 1, splt(2), splt(5) * 1, splt(6) * 1, splt(7) * 1, splt(8) * 1
Debug.Print "Done"
' Print #3, lin1
' Print #3, lin2
End
End Sub

```

Application: QSortbyYear (Page F-8)

Overview: Stores input files in an array. Summary sorts data by year 1998 to 2005.

Input files: (GW & SW & No) AcresByYrCoCellCropMaster.txt  
NoIrrigAcresByYrCoCellCrop.txt  
SWIrrigAcresByYrCoDistCellCrop.txt  
GWIrrigAcresByYrCoDistCellCropAll.txt

Output files: AcresByYrCoCellCropMasterSort.txt  
NoIrrigAcresByYrCoCellCropSort.txt  
SWIrrigAcresByYrCoDistCellCropSort.txt  
GWIrrigAcresByYrCoDistCellCropAllSort.txt

Calculations:

Fields:

Text:

```
Private Sub Form_Load()  
    Dim SortLine(1000000), SortCode(1000000)  
  
    ProcessSource = "SW"  
    ProcessYear = 1998  
  
    If (ProcessSource = "SW") And ProcessYear = 1998 Then  
        nines = ",99," & Chr(34) & Chr(34) & ",99," & Chr(34) & Chr(34) & ",999,999,99,999"  
    Else  
        nines = ",99," & Chr(34) & Chr(34) & ",999,999,99,99," & Chr(34) & Chr(34)  
    End If  
    SortFields = Array(3, 4, 5)  
  
    If ProcessYear = 1950 Then  
        Open ProcessSource & "AcresByYrCoCellCropMaster.txt" For Input As #1  
        Open ProcessSource & "AcresByYrCoCellCropMasterSort.txt" For Output As #2  
    Else  
        Select Case ProcessSource  
            Case "No"  
                Open "NoIrrigAcresByYrCoCellCrop.txt" For Input As #1  
                Open "NoIrrigAcresByYrCoCellCropSort.txt" For Output As #2  
            Case "SW"  
                Open "SWIrrigAcresByYrCoDistCellCrop.txt" For Input As #1  
                Open "SWIrrigAcresByYrCoDistCellCropSort.txt" For Output As #2  
            Case "GW"  
                Open "GWIrrigAcresByYrCoDistCellCropAll.txt" For Input As #1  
                Open "GWIrrigAcresByYrCoDistCellCropAllSort.txt" For Output As #2  
        End Select  
    End If  
  
    If ProcessSource = "No" And ProcessYear = 1998 Then  
        Line Input #1, lin  
    End If  
    Line Input #1, lin  
    yr = Left(lin, 4)  
    Debug.Print yr  
    k = 0  
    splt = Split(lin, ",")  
    SortCode(k) = splt(0) & splt(SortFields(0)) & Right("0" & splt(SortFields(1)), 3) & Right("0" &  
splt(SortFields(2)), 2) & Right("000000" & k, 6)  
    SortLine(k) = lin
```

```

Do Until EOF(1)
  DoEvents

  Line Input #1, lin
  If Left(lin, 4) <> yr Then
    QSort SortCode, 0, k
    For j = 0 To k
      Print #2, SortLine(Right(SortCode(j), 6))
    Next
    Print #2, Format(yr); nines
    k = -1
    yr = Left(lin, 4)
    Debug.Print yr
  End If

  k = k + 1
  splt = Split(lin, ",")
  SortCode(k) = splt(0) & splt(SortFields(0)) & Right("0" & splt(SortFields(1)), 3) & Right("0"
& splt(SortFields(2)), 2) & Right("000000" & k, 6)
  SortLine(k) = lin
Loop

QSort SortCode, 0, k
For j = 0 To k
  Print #2, SortLine(Right(SortCode(j), 6))
Next
Print #2, Format(yr); nines

Debug.Print "Done"
End
End Sub

Function QSort(strList, lLbound, lUbound)

' Routine:QSort
' Author:Mike Shaffer (after Rod Stephens, et al.)
' Date: 21-May-98
' Purpose:Very fast sort of a string array
' Passed:strListString array
' lLboundLower bound to sort (usuallyl)
' lUboundUpper bound to sort (usuallyubound())
' Returns:strList(in sorted order)

' Copyright: Copyright (c) 1998, Mike Shaffer
' ALL RIGHTS RESERVED WORLDWIDE Permission granted to use in any non-commercial product with
credit where due. For free commercial license contact mshaffer@nkn.net Revisions: 22-May-98 Added
and then dropped revision using CopyMemory rather than the simple swap when it was found to not
provide much benefit.

Dim strTemp
Dim strBuffer
Dim lngCurLow
Dim lngCurHigh
Dim lngCurMidpoint

lngCurLow = lLbound ' Start current low and high at actual low/high
lngCurHigh = lUbound

If lUbound <= lLbound Then Exit Function ' Error!
lngCurMidpoint = (lLbound + lUbound) \ 2 ' Find the approx midpoint of the array

strTemp = strList(lngCurMidpoint) ' Pick as a starting point (we are making an assumption that
the data *might* be in semi-sorted order already!

Do While (lngCurLow <= lngCurHigh)
  DoEvents
  Do While strList(lngCurLow) < strTemp
    lngCurLow = lngCurLow + 1
    If lngCurLow = lUbound Then Exit Do
  Loop

```

```

Do While strTemp < strList(lngCurHigh)
  lngCurHigh = lngCurHigh - 1
  If lngCurHigh = lLbound Then Exit Do
Loop

If (lngCurLow <= lngCurHigh) Then ' if low is <= high then swap
  strBuffer = strList(lngCurLow)
  strList(lngCurLow) = strList(lngCurHigh)
  strList(lngCurHigh) = strBuffer

  lngCurLow = lngCurLow + 1
  lngCurHigh = lngCurHigh - 1
End If
Loop

If lLbound < lngCurHigh Then ' Recurse if necessary
  QSort strList, lLbound, lngCurHigh
End If

If lngCurLow < lUbound Then ' Recurse if necessary
  QSort strList, lngCurLow, lUbound
End If

End Function

```

## References

- Dappen, P., and Tooze, M., 2001. Delineation of land use patterns for the Cooperative Hydrology Study in the central Platte River basin. Center for Advanced Land Management Information Technologies (CALMIT), Conservation and Survey Division, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, 73 p.
- Dappen, P., and Merchant, J., 2003. Delineation of 2001 Land use patterns for the Cooperative Hydrology Study in the Central Platte River Basin. Center for Advanced Land Management Information Technologies (CALMIT), School of Natural Resources, University of Nebraska-Lincoln, 83 p.
- Dappen, P., Merchant, J., Ratcliffe, I., and Robbins, C., 2007. Delineation of 2005 Land Use Patterns for the State of Nebraska Department of Natural Resources. Center for Advanced Land Management Information Technologies (CALMIT), School of Natural Resources, University of Nebraska-Lincoln, 80 p.