XCONS2 (modified Blaney Criddle) computes the Net Irrigation Requirement (NIR)
NIR = crop consumptive use - effective precipitation

- Begining and ending mean air temp of moisture use
- Begining and ending day of growing season
- Length of growing season
- Monthly % of daylight hours
- Climate data from weather stations
  - Mean monthly temperature (degrees F)
  - Precipitation (inches/month)
- Latitude: weighted average of weather stations used
- Percentage of project area for crop
- Irrigated acres (see separate flowchart)
- Shortage acres (see separate flowchart)
- Shortage cutoff dates (see shortage acres)

NIR(in) x irrigated acres = NIR(acre-feet)

NIR x incidental losses = Total CU

Consumptive Uses and Losses Report needs:
- spatial: Aggregate HUC to major tributary and state
- temporal: Sum to annual

What is final form needed?

All set for RiverWare
- spatial: HUC
- temporal: Monthly

Does HUC need to be split?

Yes
- Split made based on GIS irrigated acres
  - End

No
  - End

Note:
Applies to Colorado, Utah, and Wyoming.
Arizona is similar but some steps differ.
New Mexico calculates data with their own methods.
Cutoff Dates and Shortage Acres (only applicable for crops 1 and 2) 1986-2000

**Note:**
Applies to Colorado, Utah, and Wyoming.
Arizona provides shortage as a percentage of that irrigated.
New Mexico calculates data with their own methods.
GIS acreage coverage (1995, 2000 coverage CO and UT; 1995 coverage WY)  
County Agricultural Statistics CAS (Published every year)  
Census of Agriculture COA (Published every 5 years)

Is the County partially outside the Upper Colorado Basin?  
Yes  
Use GIS acreage for county  

No  

Is this crop number 1 or 2? (alfalfa or pasture)  
Yes  
CAS for alfalfa, CAS and COA for pasture  

No  

Is this crop number 3-19?  
Yes  
Select greater of CAS, COA or GIS total  
Is this crop number 9 or 15? (corn)  
Yes  
Distribute silage and grain corn 50/50  

No  

Is this crop number 9 or 15? (corn)  
No  

End
Average adjusted county irrigated crop acreage

GIS or COA county acreage = X CAS current year CAS 5 year average

Average adjusted county irrigated crop acreage

HUC/county crop acreage = average adjusted county irrigated crop acreage X HUC/county GIS acres by crop county GIS acres by crop

End

Note:
Applies to Colorado, Utah, and Wyoming.
Arizona provides their own estimates.
New Mexico calculates data with their own methods.
Municipal and Industrial Uses reported by HUC and state. USGS Circular 1004&1081

Straight line interpolation for unreported years

Consumptive Uses and Losses
Report needs:
spatial: Aggregate HUC to major tributary and state
temporal: annual

What is final form needed?

RiverWare needs:
spatial: HUC
temporal: Monthly

Annual to monthly disaggregation provide by Ray Alvarado of CWCB

End

Monthly values found with disaggregation

Does the HUC need to be split?

No

End

Yes

County population

Population center eyed for split.
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End

Note:
Applies to Colorado, Utah, and Wyoming.
Arizona M&I use reported from intrastate entities.
New Mexico calculates data with their own methods.
Mineral use reported by HUC and state. USGS Circular 1004&1081

Straight line interpolation for unreported years

What is the final form needed?

Brenda needs: spatial: major tributary and state
temporal: annual

Jim needs: spatial: HUC
temporal: month

Annual to monthly disaggregate evenly across year except for slight hump in summer months.
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Does HUC need to be split?

Split evenly across all parts

Note:
Applies to Colorado, Utah, and Wyoming.
Arizona does not report mineral consumptive use.
New Mexico calculates data with their own methods.
Average use rate in gallons/head/day

Cattle  10 gal/head/day
Sheep  2 gal/head/day
Hogs   3 gal/head/day
Horses 10 gal/head/day

GIS portion of county irrigated crop acreage in Upper Colorado Basin

GIS total county irrigated crop acreage

GIS portion = \frac{GIS \text{ portion}}{GIS \text{ total}} = \text{portion of county in upper basin}

GIS portion \times \text{number of animals} \times \text{average use rate}

Consumptive use for animal/county/year

Is entire county in upper basin?

If no:

No

If yes:

Yes

Number of animals/county/year

GIS portion

GIS total

GIS portion \times \text{number of animals} \times \text{average use rate}

Consumptive use for animal/county/year

What is the final form needed?

Brenda needs:
spatial: major tributary and state
temporal: annual

Aggregate to major tributaries

End
Jim needs:
spatial: HUC
temporal: monthly

Livestock by HUC

Disaggregate annual to monthly using monthly distribution of minerals

Disaggregate to HUC/month

Does the HUC need to be split?

Split based on GIS irrigated acres

Annual to monthly disaggregate evenly across year except for slight hump in summer months. THIS IS A GUESS

Note:
Applies to Colorado, Utah, and Wyoming. Arizona is similar but some steps differ. New Mexico calculates data with their own methods.
Estimated from records provided by various power companies in the Colorado River basin

Is the data monthly?

Yes

No

Develop distribution from available historic records

Locate HUC for export/import

End

Note:
Applies to Colorado, Utah, and Wyoming. Arizona is similar but some steps differ. New Mexico calculates data with their own methods.
Start

Export data from individual states and USGS Water Resources Data Reports

Is the data monthly?

Yes

Locate HUC for export/import

No

Develop distribution from available historic records

End

Note:
Applies to Colorado, Utah, and Wyoming.
Arizona does not report export or import consumptive use.
New Mexico calculates data with their own methods.
Average free water surface (FWS) evaporation rate

Net evaporation (in) = FWS - greater of (precipitation or salvage)

Net evaporation (acre-feet) = net evaporation (in) * major tributary and state surface area (acre-feet) * (1 foot/12 inches)

What is the final form needed?

Brenda needs:
- spatial: major tributary and state
- temporal: annual

Jim needs:
- spatial: HUC
- temporal: month
Stockponds by HUC
Split evenly across parts
Disaggregate to HUC/month
Disaggregate annual to monthly using monthly distribution of evaporation
Does the HUC need to be split?
Split evenly across parts
End

Note:
Applies to Colorado, Utah, and Wyoming.
Arizona is similar but some steps differ.
New Mexico calculates data with their own methods.

HUC GIS irrigated acres
Major tributary and state GIS irrigated acres
Overlay of two GIS coverages provides distribution of major tributary to HUC
Stockponds by major tributary
Portion of HUC in major tributary distribution
Stockpond by HUC
Average monthly distribution of evaporation

1986-2000
Major tributary and state GIS irrigated arces
HUC GIS irrigated acres
Stockponds by major tributary
Portion of HUC in major tributary distribution
Overlay of two GIS coverages provides distribution of major tributary to HUC
Stockpond by HUC
Average monthly distribution of evaporation
Does the HUC need to be split?
Split evenly across parts
End

Note:
Applies to Colorado, Utah, and Wyoming.
Arizona is similar but some steps differ.
New Mexico calculates data with their own methods.
Reservoir Evaporation (minor or unmeasured 1986-2000)

Start

Reservoir location
Latitude, Longitude, Elevation

Upper Basin FWS evaporation rate TIN GIS coverage

FWS evaporation rate

Maximum Reservoir Surface Area

Fullness factor

Precipitation historic data at local weather station

Salvage values

Net evaporation (in) = FWS evap - greater of (precipitation or salvage)

Net evaporation (acre-feet) = net evaporation (in) * reservoir surface area (acre-feet) * (1 foot/12 inches)

Average monthly distribution of evaporation

Disaggregate annual to monthly using monthly distribution of evaporation

End

Note:
Applies to Colorado, Utah, and Wyoming. Arizona is similar but some steps differ. New Mexico calculates data with their own methods.
Reservoir Evaporation (major or measured) 1986-2000

Start

Reservoir location
Latitude, Longitude, Elevation

Upper Basin FWS evaporation rate TIN GIS coverage

FWS evaporation rate

Monthly reservoir elevation data

Monthly reservoir surface area from elevation to surface area table

Directly collected monthly reservoir surface area

Precipitation historic data at local weather station

Salvage values

Disaggregate annual to monthly using monthly distribution of evaporation

Disaggregate annual to monthly
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Net evaporation (in) = FWS evap - greater of (precipitation or salvage)

Net evaporation (acre-feet) = net evaporation (in) * reservoir surface area (acre-feet) * (1 foot/12 inches)

End

Note:
Applies to Colorado, Utah, and Wyoming.
Arizona is similar but some steps differ.
New Mexico calculates data with their own methods.
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