# Composite Curve Number Calculator for QGIS

A QGIS Python tool for calculating area-weighted composite curve numbers for stormwater modeling applications.

## 📁 File Organization

```

E:\CLAUDE\_Workspace\Claude\Report\_Files\Codebase\

├── composite\_cn\_calculator\_enhanced.py # LATEST VERSION (v2.1) - Enhanced UI

├── composite\_cn\_calculator\_fixed.py # Stable version (v2.0) - Core fixes

├── Enhanced\_Features\_Guide.md # Guide for v2.1 enhanced features

├── CN\_Calculator\_Debug\_Guide.md # Comprehensive debugging guide

├── CN\_Calculator\_Installation\_Guide.md # Installation and usage instructions

├── cn\_calculator\_test\_suite.py # Validation and testing tools

├── README.md # This file

└── sample\_data/ # (Create this folder for test data)

```

## 🚀 Quick Start

### \*\*Latest Version (v2.1 Enhanced)\*\* - Recommended

```python

# In QGIS Python Console - Enhanced version with project layer selection

exec(open(r'E:\CLAUDE\_Workspace\Claude\Report\_Files\Codebase\composite\_cn\_calculator\_enhanced.py').read())

main()

```

\*\*New Features in v2.1:\*\*

* 📂 \*\*Choose loaded project layers\*\* OR browse for files
* 🔄 \*\*Refresh button\*\* to update layer lists
* 🎯 \*\*Smart defaults\*\* for lookup tables and output folders
* 🚀 \*\*Auto-load results\*\* back into QGIS project

### \*\*Stable Version (v2.0)\*\* - Core fixes only

```python

# In QGIS Python Console - Fixed version with file browsing only

exec(open(r'E:\CLAUDE\_Workspace\Claude\Report\_Files\Codebase\composite\_cn\_calculator\_fixed.py').read())

main()

```

### \*\*Verify Installation\*\*

```python

# Run test suite

exec(open(r'E:\CLAUDE\_Workspace\Claude\Report\_Files\Codebase\cn\_calculator\_test\_suite.py').read())

```

## 🛠️ What Was Fixed

### \*\*Version 2.1 (Enhanced) - NEW\*\*

* \*\*✨ Project Layer Integration\*\*: Select from loaded QGIS layers OR browse files
* \*\*🎯 Smart Workflow\*\*: Radio buttons to choose selection method
* \*\*🔄 Refresh Capability\*\*: Update layer lists without restarting
* \*\*📂 Smart Defaults\*\*: Auto-detects Global References and project folders
* \*\*🚀 Auto-Load Results\*\*: Option to load results back into QGIS project

### \*\*Version 2.0 (Fixed) - Stable\*\*

1. \*\*❌ Field Validation Problems\*\* → \*\*✅ Dynamic field selection with validation\*\*
2. \*\*❌ Memory layer creation issues\*\* → \*\*✅ Proper memory layer handling\*\*
3. \*\*❌ Intersection logic failures\*\* → \*\*✅ Robust intersection with error checking\*\*

4. \*\*❌ Limited lookup table support\*\* → \*\*✅ Multiple format compatibility\*\*

5. \*\*❌ Poor error handling\*\* → \*\*✅ Comprehensive error reporting\*\*

### \*\*Choose Your Version:\*\*

* \*\*Use v2.1 Enhanced\*\* if you work with layers loaded in QGIS projects
* \*\*Use v2.0 Fixed\*\* if you prefer simple file browsing only
* \*\*Both versions\*\* have the same core calculation reliability

## 📋 Requirements

### Input Data:

* \*\*Subbasin Layer\*\*: Polygon shapefile with unique ID field
* \*\*Land Use Layer\*\*: Polygon shapefile with land use classification codes
* \*\*Soils Layer\*\*: Polygon shapefile with hydrologic soil group codes (A, B, C, D)
* \*\*CN Lookup Table\*\*: CSV/Excel with curve number values by land use and soil type

### Software:

* \*\*QGIS 3.40.4\*\* (primary target) or compatible version
* \*\*Python packages\*\*: pandas, pathlib (typically included with QGIS)

## 🎯 Expected Results

### Outputs:

1. \*\*subbasins\_cn.shp\*\*: Shapefile with composite CN values
2. \*\*cn\_results.csv\*\*: Summary table for model import

### Performance:

* \*\*Small projects\*\* (< 100 subbasins): 1-2 minutes
* \*\*Medium projects\*\* (100-1000 subbasins): 5-15 minutes
* \*\*Large projects\*\* (1000+ subbasins): 15+ minutes

## 🔧 Debugging Process

### Step 1: Environment Check

```python

# Test QGIS and Python environment

exec(open('cn\_calculator\_test\_suite.py').read())

```

### Step 2: Data Validation

* Verify all layers load correctly
* Check field names match requirements
* Confirm geographic overlap between layers
* Validate lookup table format

### Step 3: Processing Issues

* Monitor QGIS Log Messages panel
* Check for geometry validity issues
* Verify coordinate system compatibility
* Review progress and error messages

### Step 4: Result Validation

* CN values should be 30-98 (typical range)
* Total areas should match expectations
* No NULL values unless expected
* Results should make intuitive sense

## 📊 Integration with Models

### SWMM Integration:

```python

# Use cn\_results.csv to populate SWMM subcatchments

# Map Subbasin\_ID to subcatchment names

# Import CN\_Composite values to CN parameter

```

### HEC-HMS Integration:

```python

# Import subbasins\_cn.shp as basin elements

# Use CN\_Comp field for SCS Curve Number method

# Verify no missing values before model run

```

## 🚨 Common Issues & Solutions

| Issue | Symptoms | Solution |

|-------|----------|----------|

| Field not found | Error about missing fields | Use field dropdown menus |

| Empty intersection | No features result from intersection | Check layer overlap and geometry validity |

| Lookup format error | Unrecognized table format | Verify column names match expected format |

| Missing CN values | NULL results for some subbasins | Check land use codes match lookup table |

## 📚 Reference Materials

### Stormwater Modeling Standards:

* Located in: `E:\CLAUDE\_Workspace\Claude\Report\_Files\Templates\Global References\`
* \*\*SWMM User Manual\*\*: `swmm-users-manual-version-5.2.pdf`
* \*\*EPA Storm Reference\*\*: `EPA\_Storm\_Reference\_VII HYD\_ZyPDF.pdf`
* \*\*CN Lookup Tables\*\*: `CN\_Current.csv`, `LCD\_CN\_Table.csv`

### Project Examples:

* \*\*Crooked Cove Project\*\*: `E:\CLAUDE\_Workspace\Claude\Report\_Files\Projects\2025\_Project\_Crooked\`
* \*\*Template Structure\*\*: `E:\CLAUDE\_Workspace\Claude\Report\_Files\Templates\File Structure\Project\_X\`

## 🔄 Version History

### Version 2.0 (2025-05-31) - FIXED VERSION

* \*\*Fixed\*\*: All major field validation issues
* \*\*Added\*\*: Dynamic field selection interface
* \*\*Improved\*\*: Error handling and logging
* \*\*Enhanced\*\*: Lookup table format support
* \*\*Updated\*\*: Memory layer management

### Version 1.0 (Original)

* \*\*Issues\*\*: Multiple field validation problems
* \*\*Issues\*\*: Memory layer creation failures
* \*\*Issues\*\*: Limited error handling
* \*\*Status\*\*: Deprecated - use v2.0

## 💡 Best Practices

### Data Preparation:

1. \*\*Validate geometries\*\* before processing
2. \*\*Use consistent coordinate systems\*\* across all layers
3. \*\*Ensure complete coverage\*\* of land use and soils

4. \*\*Test with small datasets\*\* before full runs

### Quality Control:

1. \*\*Review log messages\*\* for warnings
2. \*\*Validate CN ranges\*\* (30-98 typical)
3. \*\*Check area calculations\*\* against expectations

4. \*\*Document data sources\*\* and processing steps

### Model Integration:

1. \*\*Save original data\*\* before modifications
2. \*\*Document field mappings\*\* used
3. \*\*Validate model input\*\* files

4. \*\*Test model runs\*\* with new CN values

## 📞 Support

### Troubleshooting Priority:

1. \*\*Check the Debug Guide\*\* first: `CN\_Calculator\_Debug\_Guide.md`
2. \*\*Run the test suite\*\* to validate setup
3. \*\*Review QGIS log messages\*\* for specific errors

4. \*\*Test with simplified data\*\* to isolate issues

### When Reporting Issues:

* QGIS version and system information
* Complete error messages from log
* Description of input data characteristics
* Steps to reproduce the problem

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\*\*Note\*\*: This tool was developed for stormwater modeling applications and follows industry standards for curve number calculations. Always validate results against engineering judgment and local standards.