

# Core Model Proposal #365: Add Land Use History Output

**Product:** Global Change Analysis Model (GCAM)

**Institution:** Joint Global Change Research Institute (JGCRI)

**Authors:** Dawn Woodard, Matthew Binsted

**Reviewers:** Marshall Wise, Ellie Lochner

**Date committed:** December 16, 2022

**IR document number:** PNNL-34046

**Related sector:** land

**Type of development:** C++ code

**Purpose:** This Core Model Proposal adds the ability to output land use history data going back to the year 1700 to the GCAM database. Note that before 1975, all cropland is allocated to OtherArableLand; data on historical land allocation by cropland category is not available pre-1975.

# Description of Changes

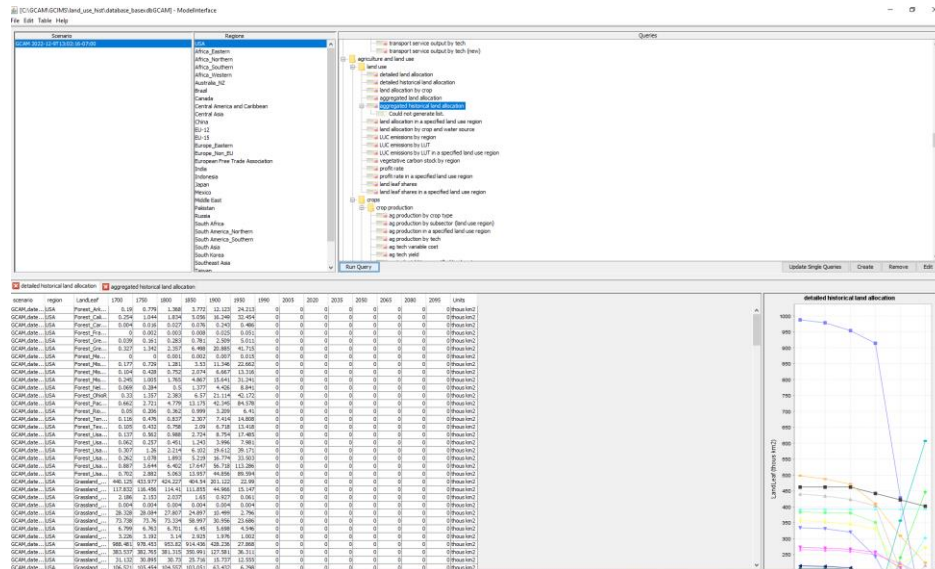
We added a `getHistoricalLandUse()` function in the `LandLeaf` class that returns a `LandUseHistory` pointer to the `mLandUseHistory` member variable.

In `xml_db_outputter`, we added a loop over land use history output to write historical land allocation ("hist-land-allocation") in thousand km<sup>2</sup> for each year of land use history. Additionally, for this to work we needed to include "land\_allocator/include/land\_use\_history.h" and define a map `LandMapType` in `xml_db_outputter.cpp`.

Finally, we added a "detailed historical land allocation" query to `Main_queries.xml` to retrieve historical land allocation output in each `LandLeaf` and an "aggregated historical land allocation" query that aggregates this data to the same aggregate groups as the "aggregated land allocation" query.

# Validation

Information on "detailed historical land allocation" and "aggregated historical land allocation" is written to the database and retrieved via the new queries (below). Note that before 1975, all cropland is allocated to `OtherArableLand`; data on historical land allocation by cropland category is not available pre-1975. For this reason, cropland data is filtered out of the new historical land allocation queries.



10:07 AM 10/10/2015 10:10:10 AM

File Edit View Help

Database: [Database Name] Model: [Model Name]

Table: [Table Name]

Columns: [List of columns]

Queries: [List of queries]

Created historical land allocation

Year	Region	Land Use	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
1970	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
1975	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
1980	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
1985	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
1990	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
1995	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
2000	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
2005	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
2010	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
2015	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
2020	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
2025	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
2030	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
2035	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
2040	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
2045	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
2050	USA	Total	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000

aggregated historical land allocation

Legend:

- Total (blue line)
- Forest (green line)
- Grassland (red line)
- Urban (purple line)
- Water (orange line)
- Barren (yellow line)
- Other (grey line)