

# Updating surface datasets

CTSM5.1 → CTSM5.2 (→ CTSM5.3)

Presenters: Sam Levis and Peter Lawrence

Contributors in alphabetical order by first name:

Adam Herrington, B. Fang, Bill Sacks, Dave Lawrence, Erik Kluzek, Inne Vanderkellen, Jim Edwards, Johan Feddema, Keer Zhang, Keith Oleson, L. Zhao, Mariana Vertenstein, Negin Sobhani, Peter Lawrence, @renerwijn, Sam Levis, Will Wieder

# Summary of changes

## New raw datasets

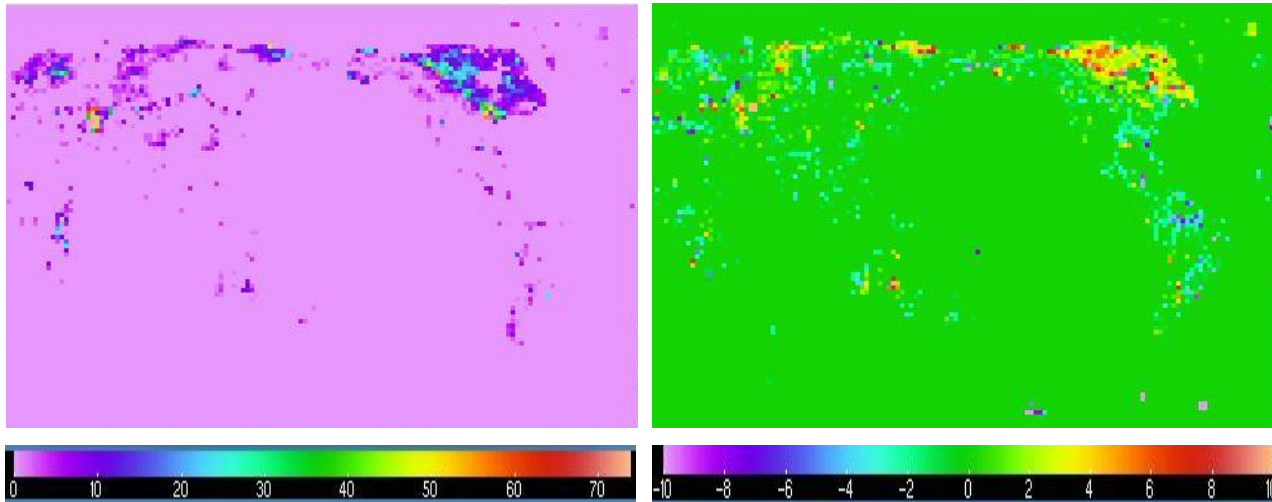
Long list of contributors

## New mksurfddata tool

Mariana V. Sam L. Erik K. Bill S. Jim E. Negin S.

# Summary of changes to the data

- New data: glacier, lake, urban, pft, lai, soil properties
- New transient data: lake, urban, pft
- Coastal landunit areas calculated more accurately



e.g. new %lake (1850 fsurdatt) and difference in %lake

# Summary of changes to the data

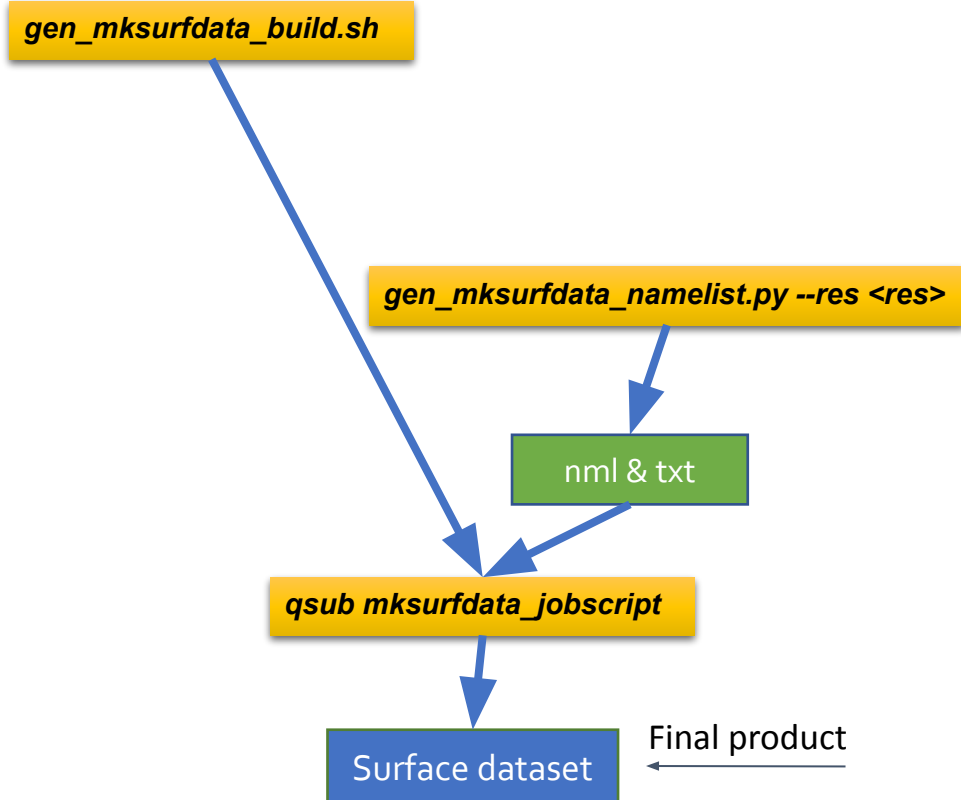
- Details, links, simulations in discussion #1868
  - <https://github.com/ESCOMP/CTSM/discussions/1868>

# New mkSURFdata tool

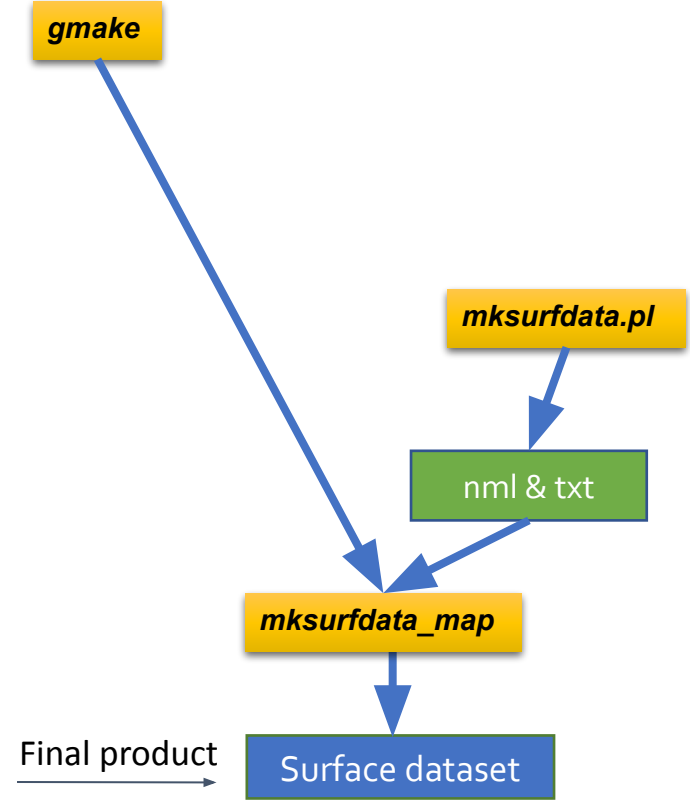
## mkSURFdata\_esmf

- is intended to build/run on any CESM/CIME supported machine
  - is a distributed memory parallel program (uses MPI & Parallel I/O)
  - uses ESMF (Earth System Modelling Framework) for regridding
- => raw data → fsurdat mapping files obsolete
- => performance and memory scale well as resolution increases
- => more likely able to run on non-NCAR systems

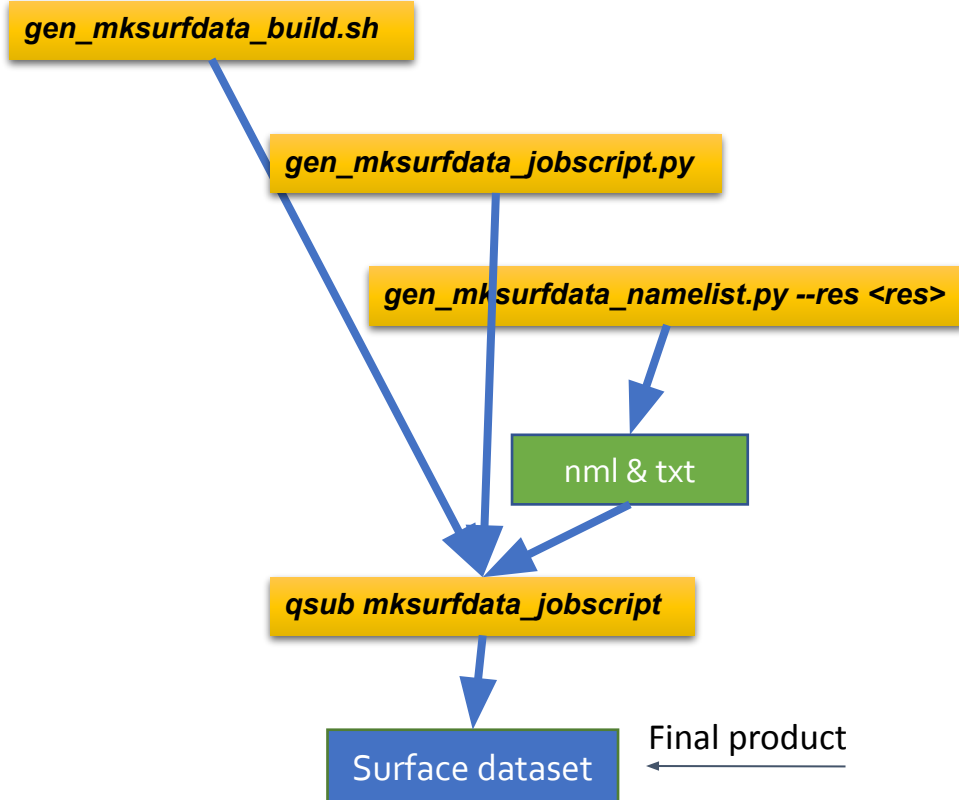
# New mk surfdata tool



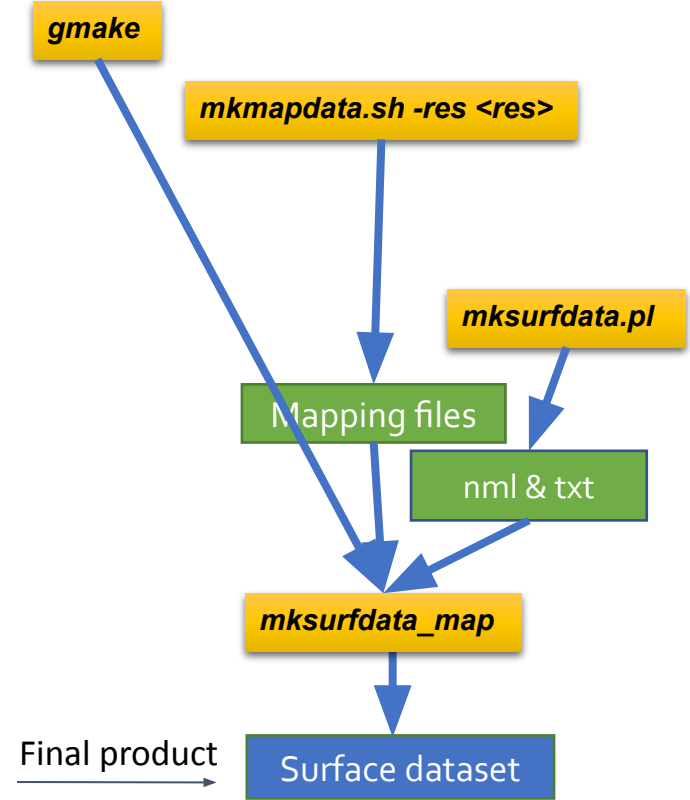
...versus the old method



# New mk surfdata tool



...versus the old method



# New mk surfdata tool

**gen\_mk surfdata\_build.sh**

**gen\_mk surfdata\_jobscript.py**

**gen\_mk surfdata\_namelist.py --res <res>**

SRC/DST grid file & raw data info collected from .xml; one SRC grid file per raw data resolution; user may modify

nml & txt

**qsub mk surfdata\_jobscript**

Surface dataset

Final product

...versus the old method

**gmake**

**mkmapdata.sh -res <res>**

SRC/DST grid file info collected from .xml; one SRC grid file per raw dataset; user may modify here first, then in nml

**mk surfdata.pl**

Mapping files

nml & txt

**mk surfdata\_map**

Surface dataset

Final product



# New mkSURFdata tool advantages

## mkSURFdata\_esmf

- is intended to build/run on any CESM/CIME supported machine
- is a distributed memory parallel program (uses MPI & Parallel I/O)
- uses ESMF (Earth System Modelling Framework) for regridding

=> raw data → fsurdat mapping files obsolete

=> performance and memory scale well as resolution increases

=> more likely able to run on non-NCAR systems

# Updating surface datasets

CTSM5.1 → CTSM5.2 (→ CTSM5.3)

New raw datasets

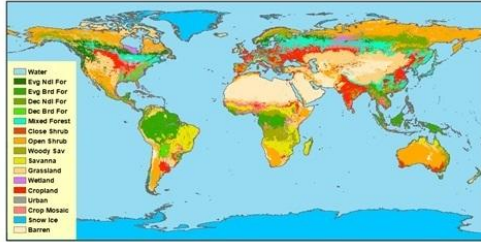
New mk surfdata tool

# New CTSM5.2 Land Use and Land Cover Data and Tools

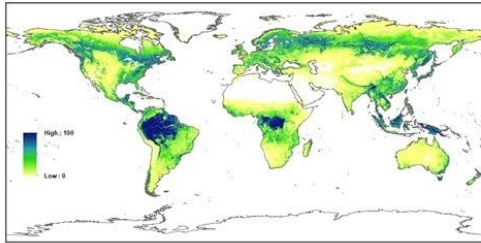
- All underlying data has been reprocessed from Satellite and Global Inventory Data at 0.25 degree resolution annually for 850 - 2300.
- All NCL component tools have been rewritten in Python with shell scripts
- All Land Use Tools are being made available on GitHub (lawrencepj1)
- LUH2 Crop => CTSM52 CFT has been updated from using MIRCA 2000 to EarthSTAT 2000 (5 minute) with FAOSTAT annual data for 1961 - 2016.
- Climate data has been included in all reconstructions of previously cleared natural vegetation rather than simple distance weighted interpolation.
- Data processing methods along with tools are written up in the CLM5 Land Data Technote (nearing completion).
- Shifting Cultivation has been added to the release data (off by default)
- High resolution 0.05 and 0.01 degree versions that are consistent with the 0.25 degree data will be made available shortly.

## Land Cover and Cropping Data

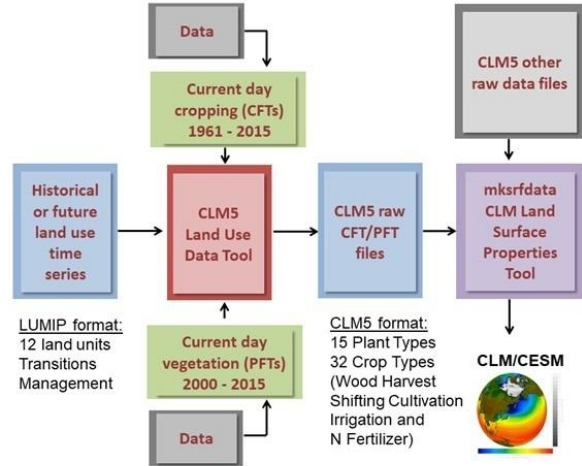
MODIS IGBP Land Cover



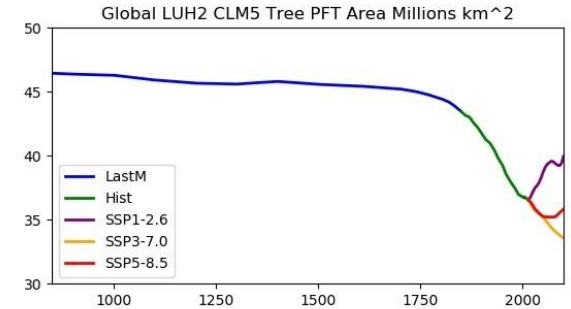
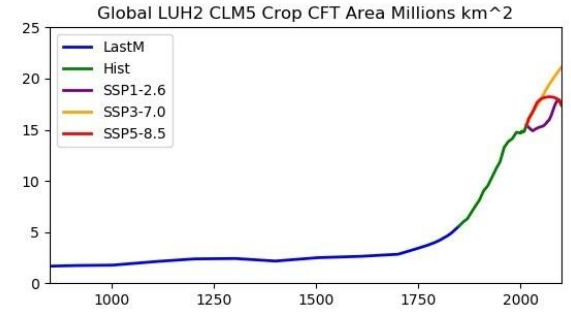
MODIS VCF Percent Tree

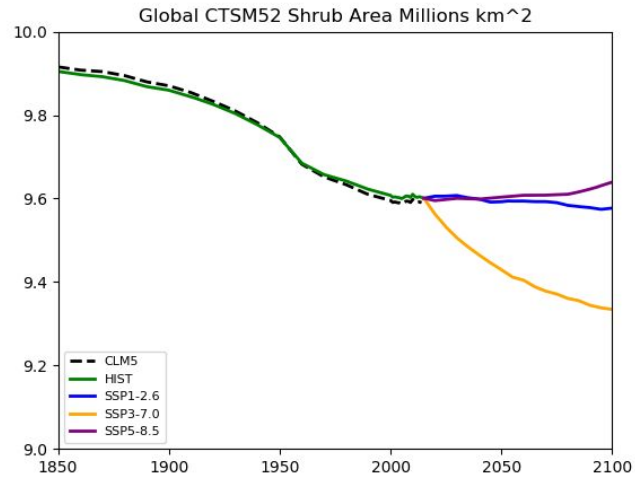
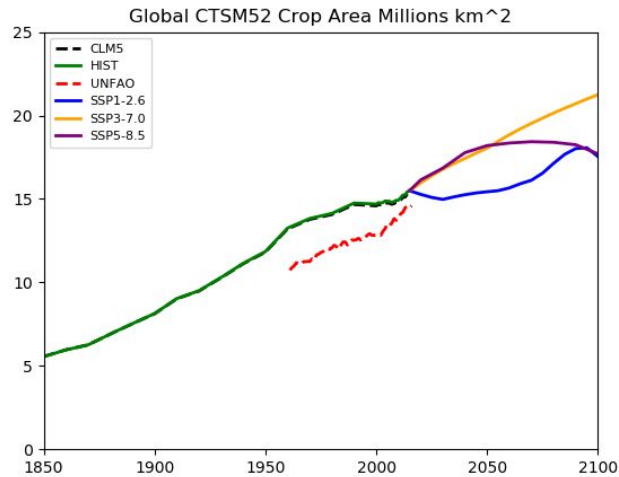
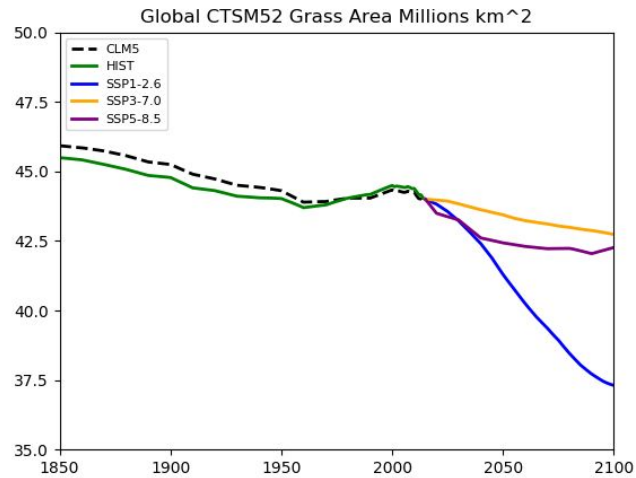
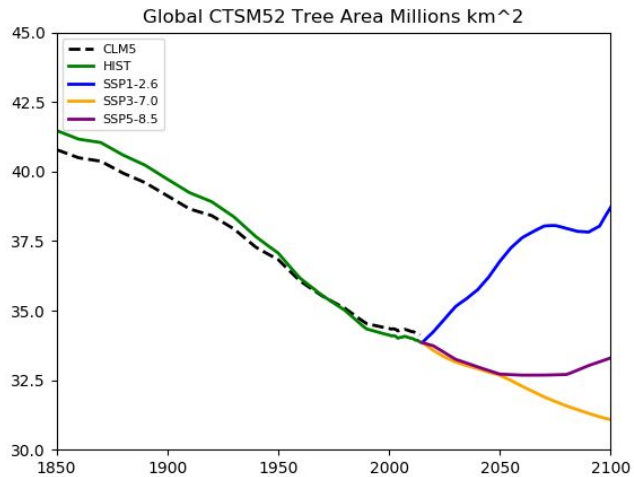


## CTSM52 Land Use Data Tool - Mksurfddata

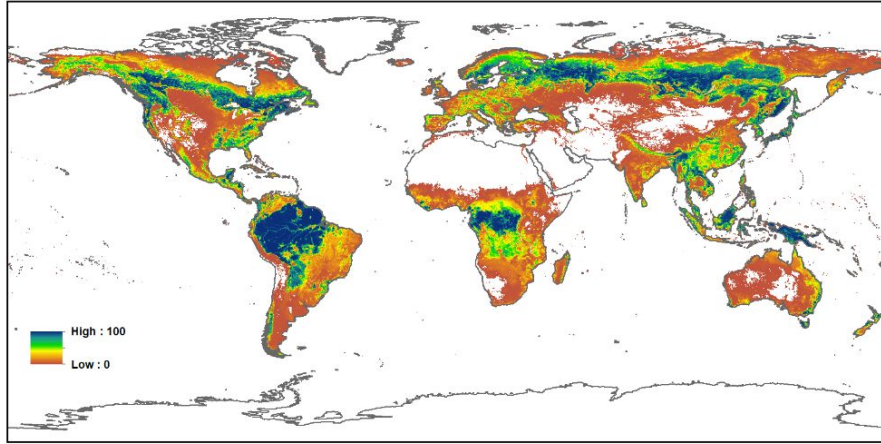


## Time Series Data

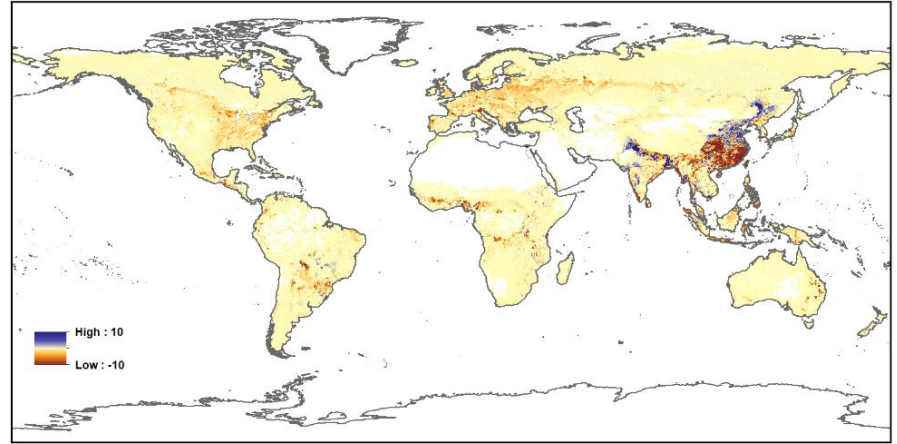




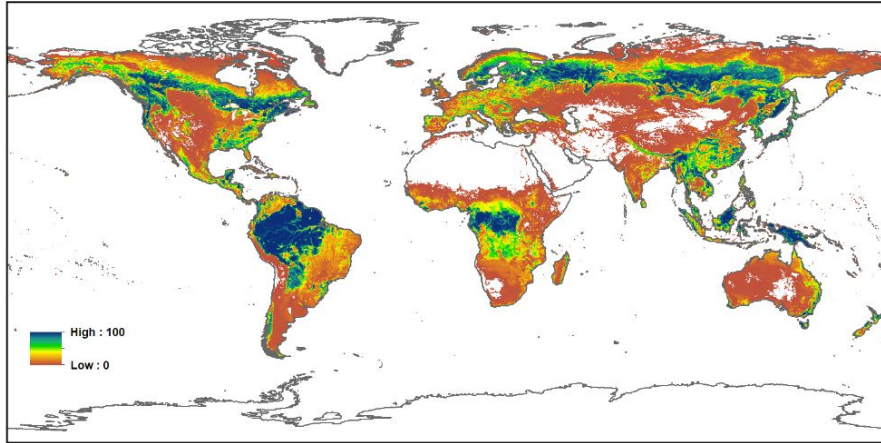
CTSM52 All Trees 2015



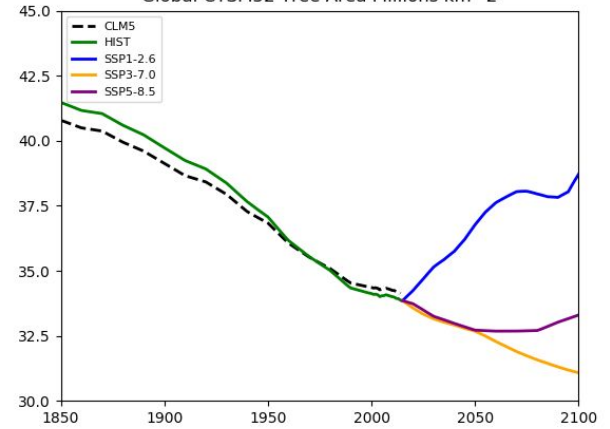
CTSM52 - CLM5 All Trees 2015



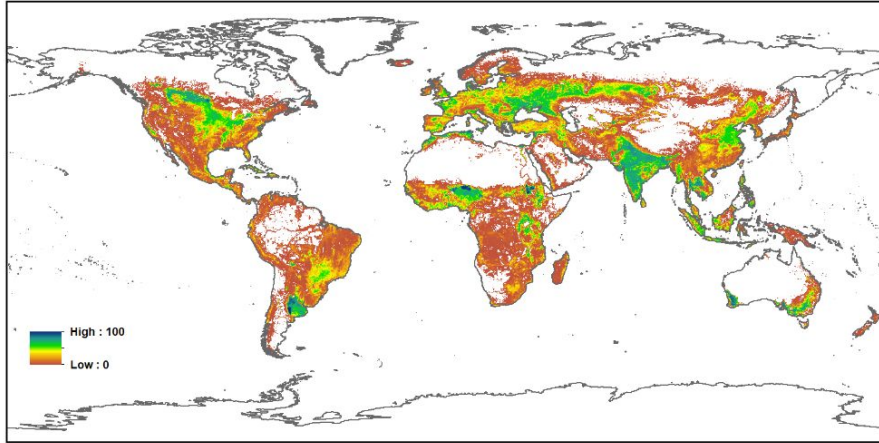
CLM5 All Trees 2015



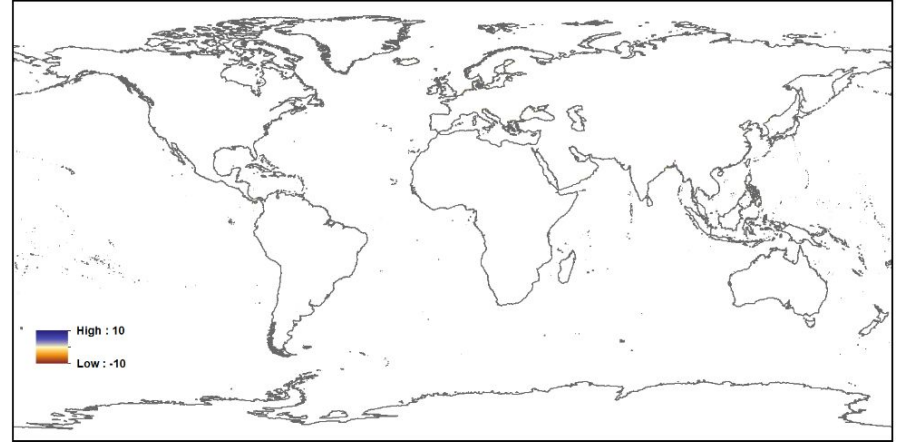
Global CTSM52 Tree Area Millions km<sup>2</sup>



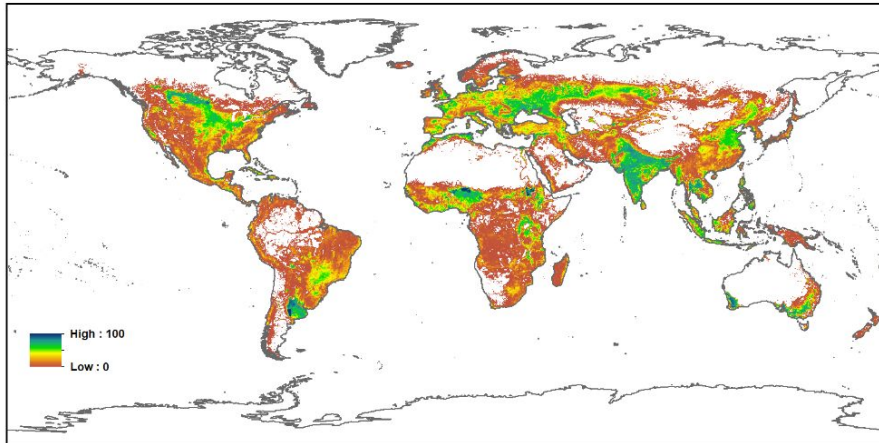
CTSM52 All Crops 2015



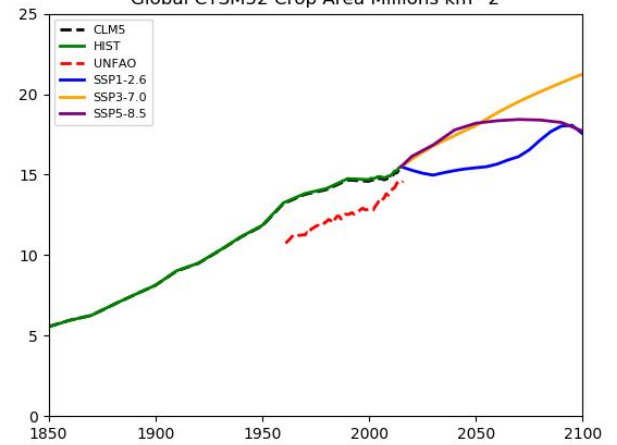
CTSM52 - CLM5 All Crops 2015



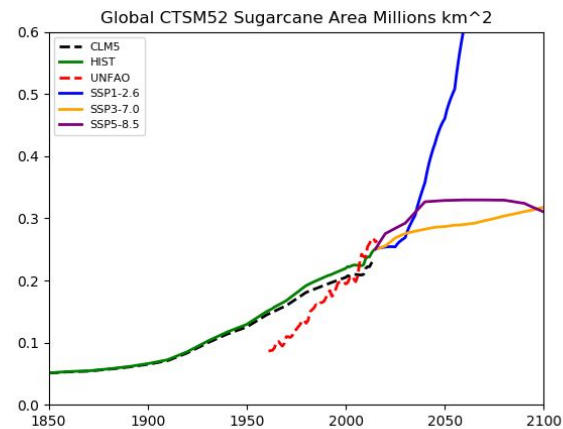
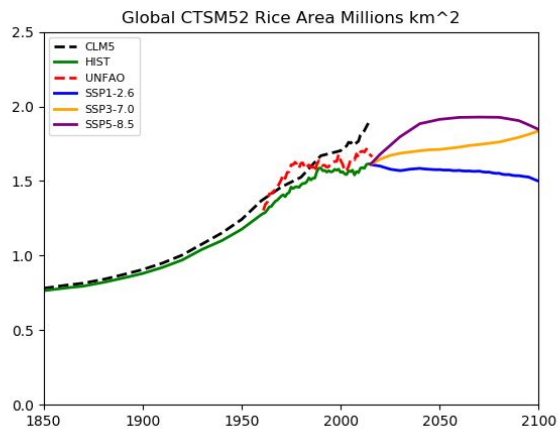
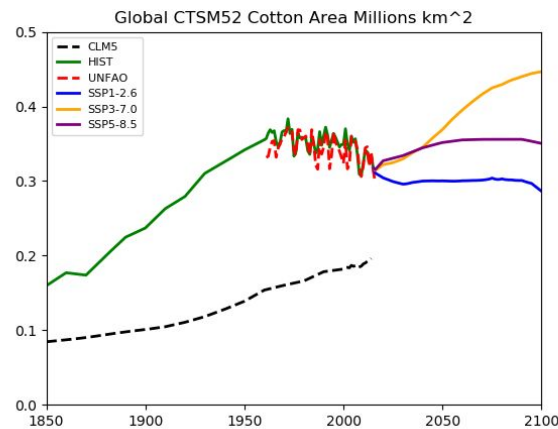
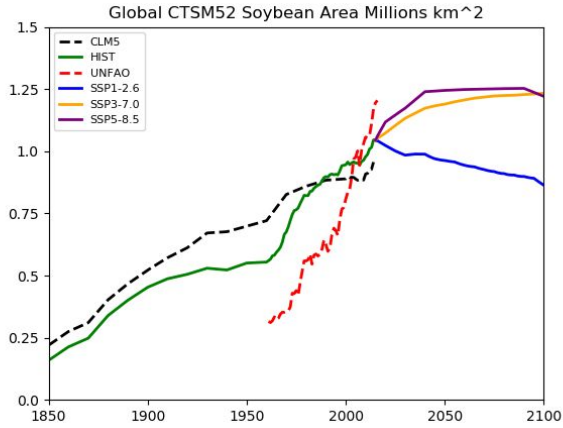
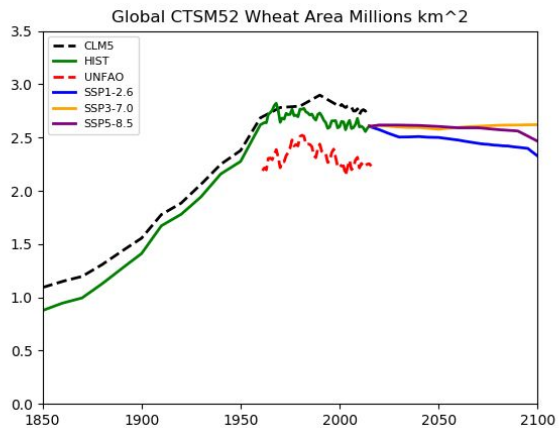
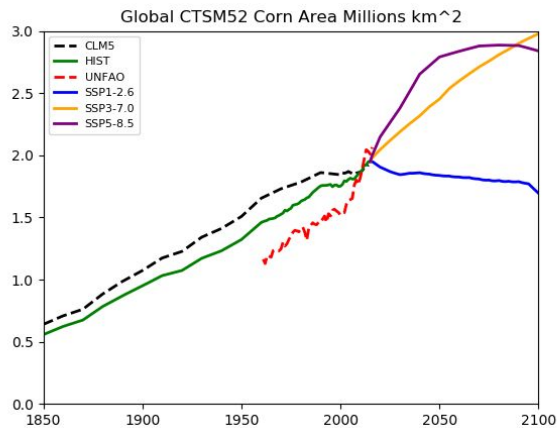
CLM5 All Crops 2015



Global CTSM52 Crop Area Millions km<sup>2</sup>



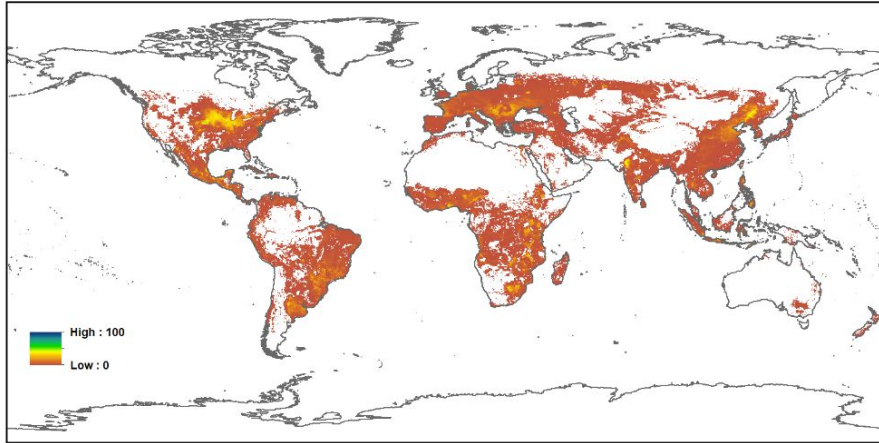




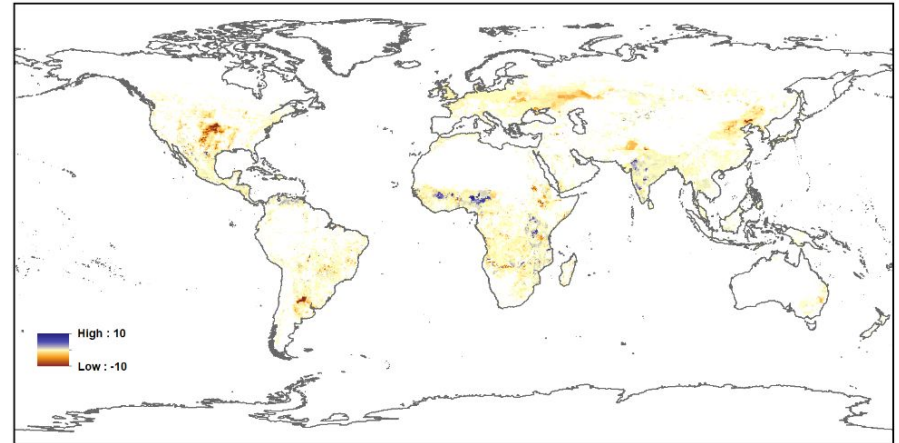
Special Thanks to Sam Rabin for helping get these right



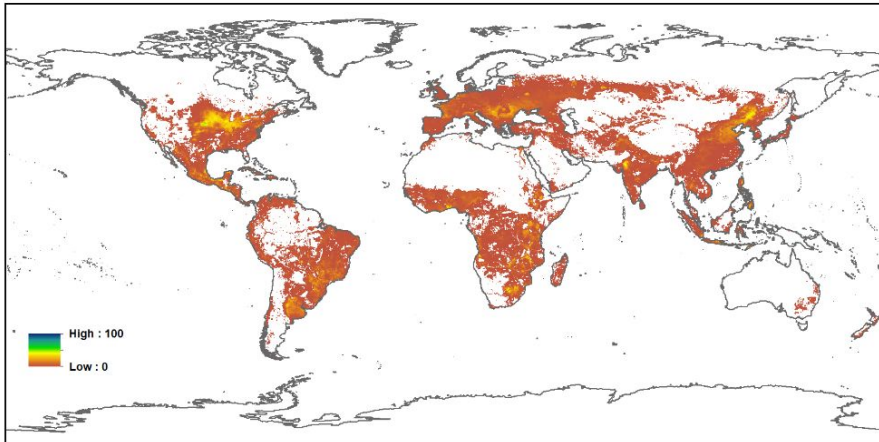
CTSM52 Corn 2015



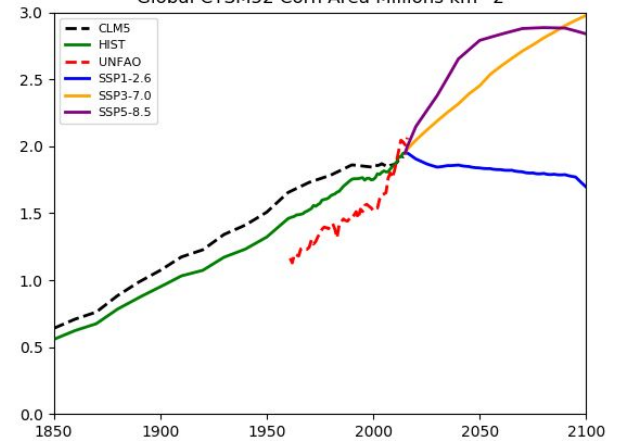
CTSM52 - CLM5 Corn 2015



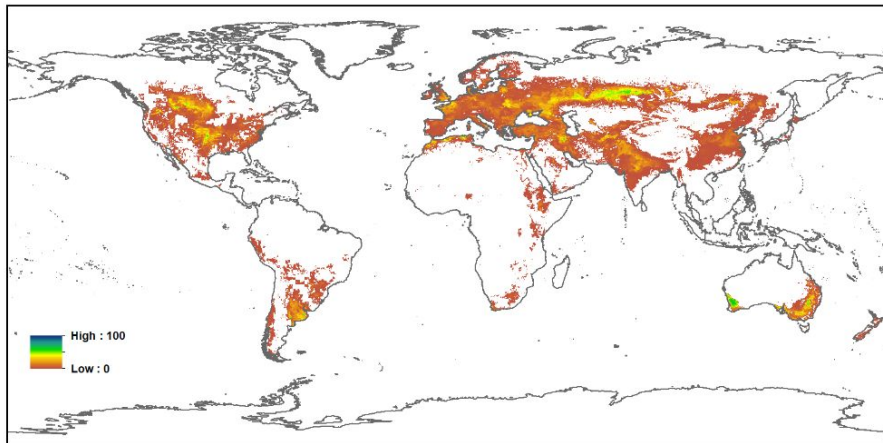
CLM5 Corn 2015



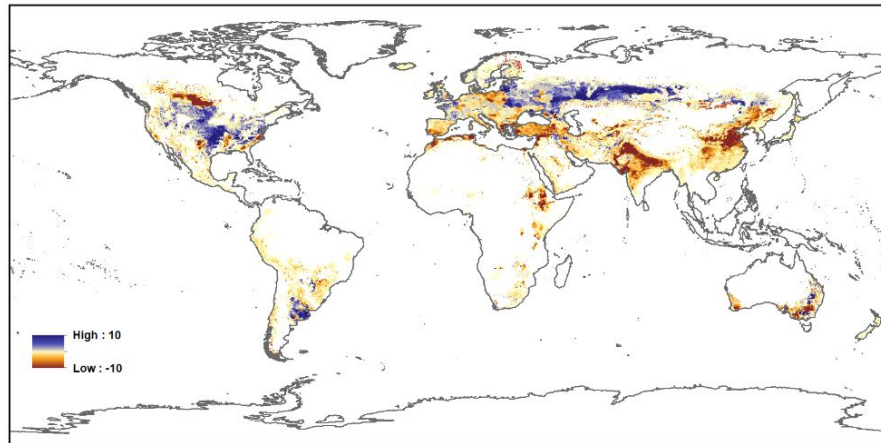
Global CTSM52 Corn Area Millions km<sup>2</sup>



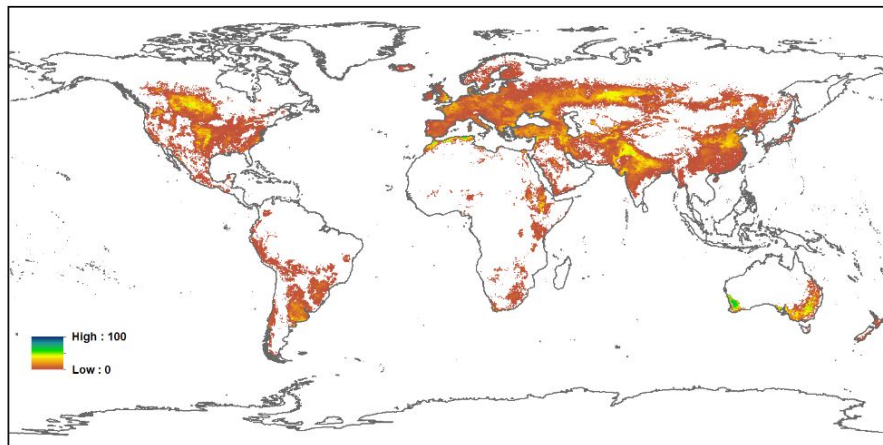
CTSM52 Wheat 2015



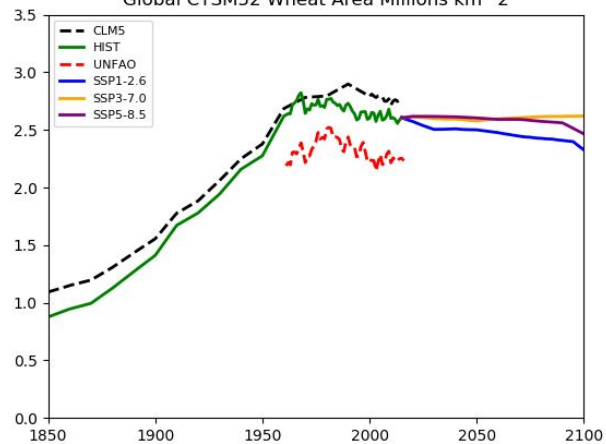
CTSM52 - CLM5 Wheat 2015

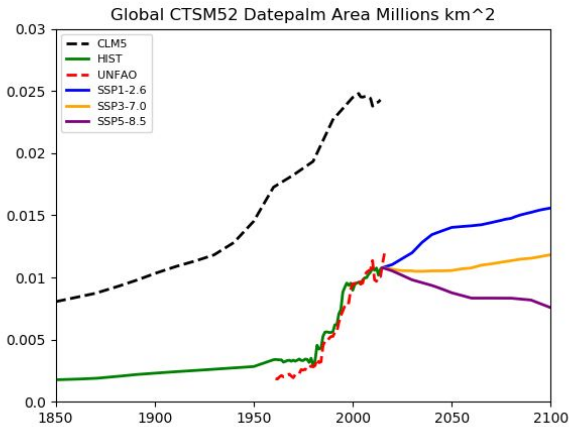
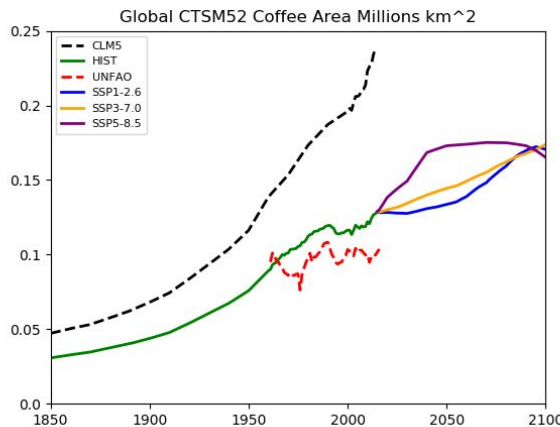
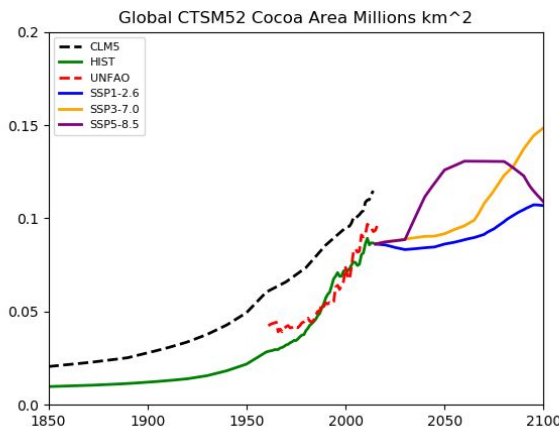
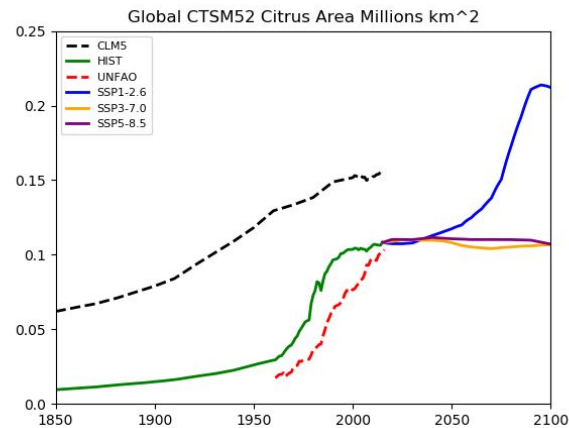
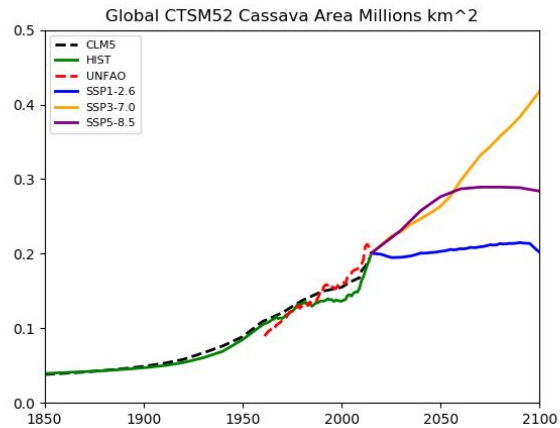
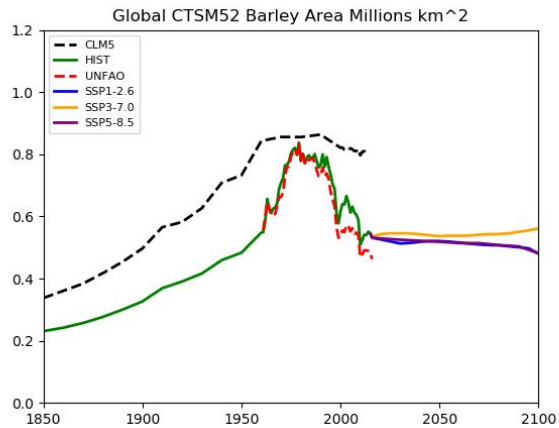


CLM5 Wheat 2015

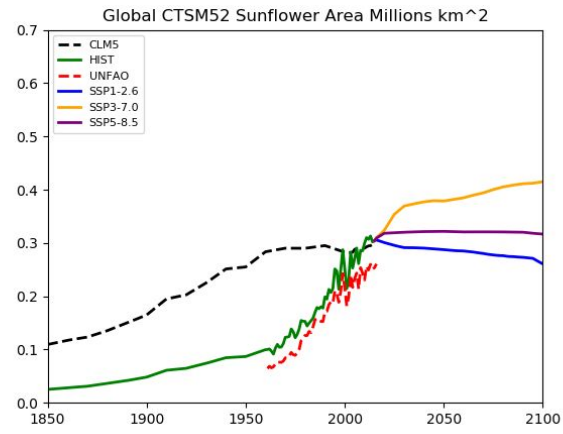
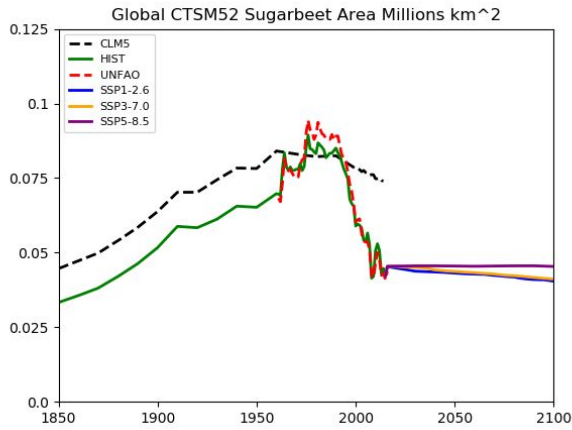
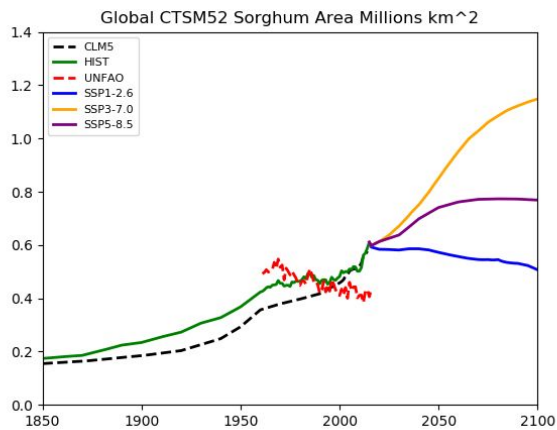
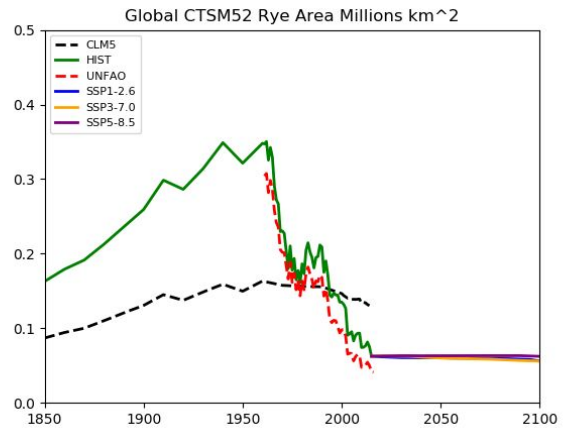
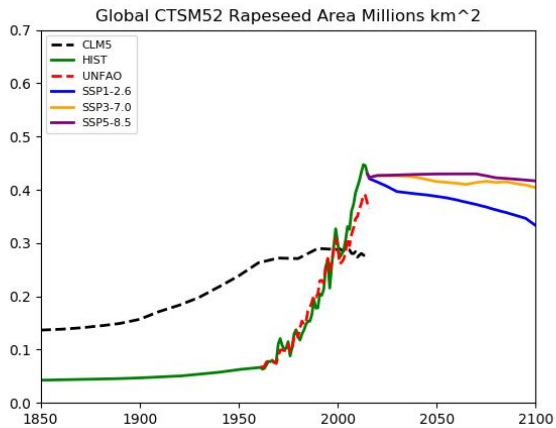
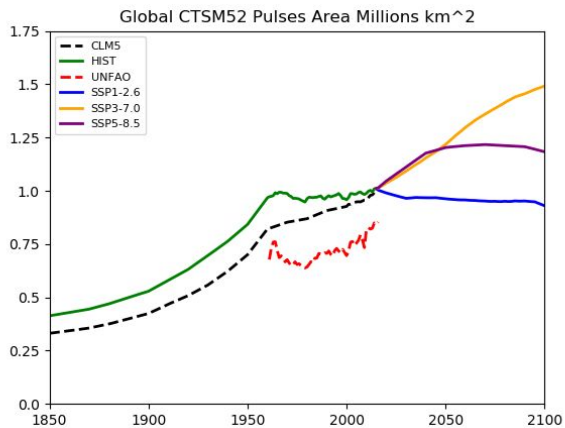


Global CTSM52 Wheat Area Millions km<sup>2</sup>



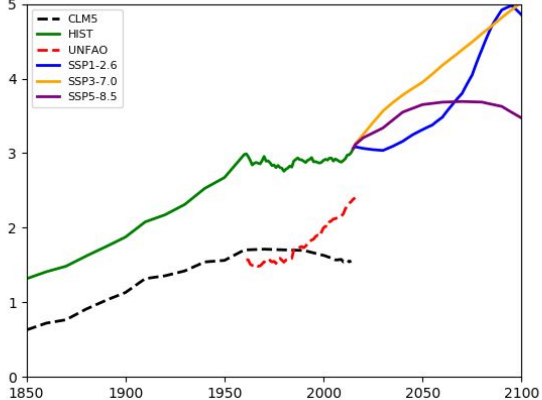


Special Thanks to Sam Rabin for helping get these right

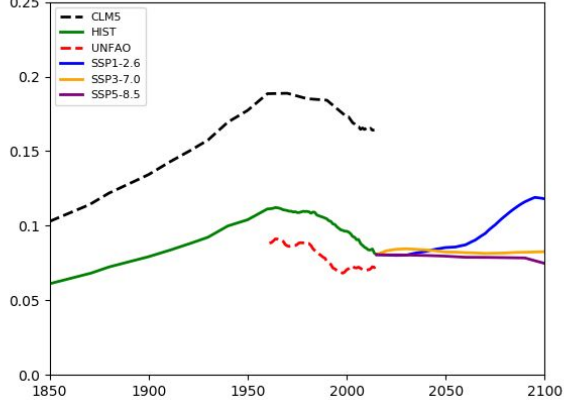


Special Thanks to Sam Rabin for helping get these right

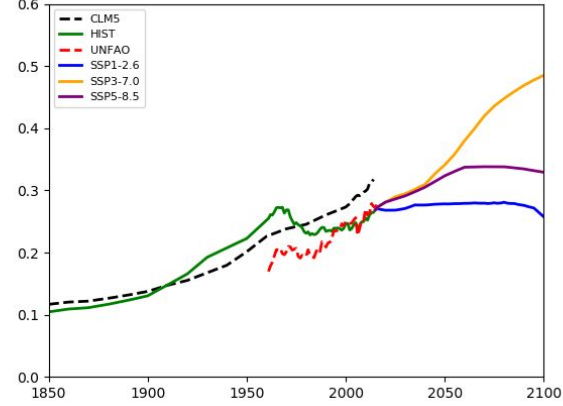
Global CTSM52 Foddergrass (Other Crops) Area Millions km<sup>2</sup>



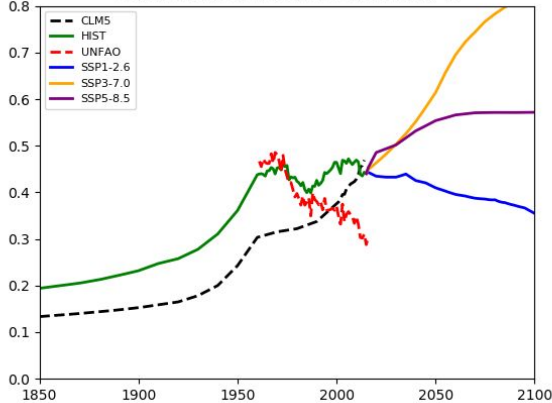
Global CTSM52 Grapes Area Millions km<sup>2</sup>



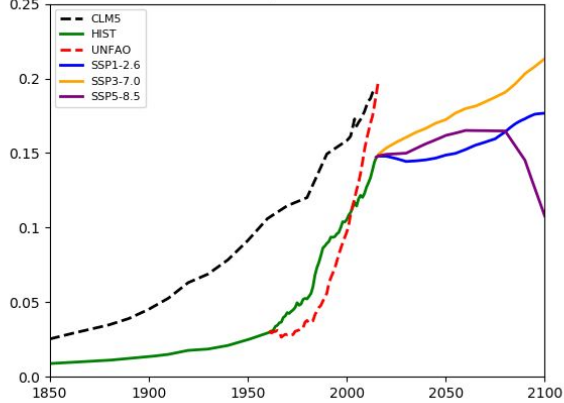
Global CTSM52 Groundnuts Area Millions km<sup>2</sup>



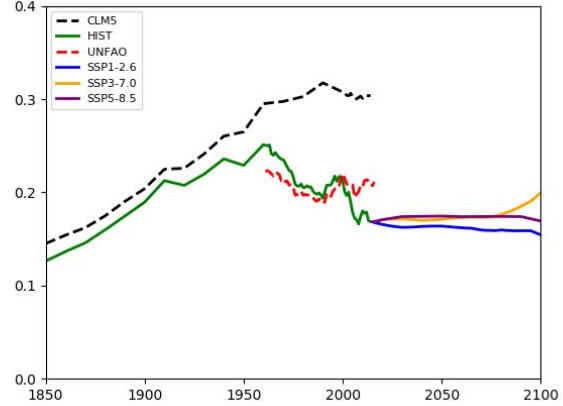
Global CTSM52 Millet Area Millions km<sup>2</sup>



Global CTSM52 Oilpalm Area Millions km<sup>2</sup>



Global CTSM52 Potatoes Area Millions km<sup>2</sup>



Special Thanks to Sam Rabin for helping get these right

# New CTSM5.2 Land Use and Land Cover Data and Tools

- All underlying data has been reprocessed from Satellite and Global Inventory Data at 0.25 degree resolution.
- All NCL component tools have been rewritten in Python with shell scripts
- All Land Use Tools are being made available on GitHub (lawrencepj1)
- LUH2 Crop => CTSM52 CFT has been updated from using MIRCA 2000 to EarthSTAT 2000 (5 minute) with FAOSTAT annual data for 1961 - 2016.
- Climate data has been included in all reconstructions of previously cleared natural vegetation rather than simple distance weighted interpolation.
- Data processing methods along with tools are written up in the CLM5 Land Data Technote (nearing completion).
- Shifting Cultivation has been added to the release data (off by default)
- High resolution 0.05 and 0.01 degree versions that are consistent with the 0.25 degree data will be made available shortly.

Thanks - Questions - Discussion