

# Land Ice Working Group Software Engineering Updates and Future Plans

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With contributions from many others  
in the CESM Software Engineering Group

# CESM Release Process

- After this May, aiming for annual May releases

## Functional vs. Scientific Support

- Functional support: passes software tests
- Scientific support: multi-decadal run with scientific review of model output

# CESM 1.1.0 Release Highlights

- TG compset: standalone CISM forced by previous model output
- Improved out-of-the-box CISM parameter settings
- Ensemble capabilities
- Improved glacier cover in CLM, from Randolph Glacier Inventory
  - ▶ Option to ensure consistency with CISM over Greenland
- Bug fix in handling of glacier virtual columns
- Standardized namelist generation

# Porting Process

- **Verify functionality**
  - ▶ Run hundreds of tests (e.g., restart) across supported model configurations and resolutions
- **Validate climate**
  - ▶ Target several popular model configurations
- **Load balance and performance tune**

# Three Releases on Feb 1

All of these include Yellowstone support

- **CESM 1.1.1: support for new model features**
  - ▶ Base for development of CAM5 and CAM-SE
  - ▶ Scientific support for CAM5
    - FV 1°, FV 2°
    - 1850, 20th century and RCP CMIP5 scenarios
- **CESM 1.0.5: support for CMIP5 science**
  - ▶ Scientific support for all CAM4 FV CMIP5 simulations
- **CCSM3 port**

# CESM 1.2 Release

Target release date: May 30

- CLM4.5
  - ▶ Big focus on biogeochemistry, but also updates some snow parameterizations
- Further tweaks and validation of CAM5-SE
- Updates to ocean biogeochemistry
- Bug fix in surface temperature sent from CLM to CISM
  - ▶ Note that this bug affects the current out-of-the-box TG forcing data
- CISM2???

# CISM2 Integration in CESM

## What's done?

- CISM2 builds and **sort of** runs within CESM
- Latest version of glimmer-cism pulled in as an svn external
  - ▶ no more need for copying code
- CESM build now supports:
  - ▶ C++ code
  - ▶ Trilinos
  - ▶ cmake
- Port to major CESM-supported machines and compilers
- Added parallel capabilities to CESM's GLC component and to glint
- Out-of-the-box support for configuration settings and processor layouts for running SEACISM dycore, standalone or coupled
- Improved testing support

# CISM2 Integration in CESM

What still needs to be done?

- Bring glint interface up-to-date with changes that have been made for CISM2
- Create input datasets for Greenland at multiple resolutions
- A few other bug fixes
- Additional testing



# CISM2 Integration in CESM

## Out-of-the-box support

```
create_newcase -case $CASE -mach yellowstone  
-compset TGIS2 -res f09_g16_g110
```

### CISM1 Compsets

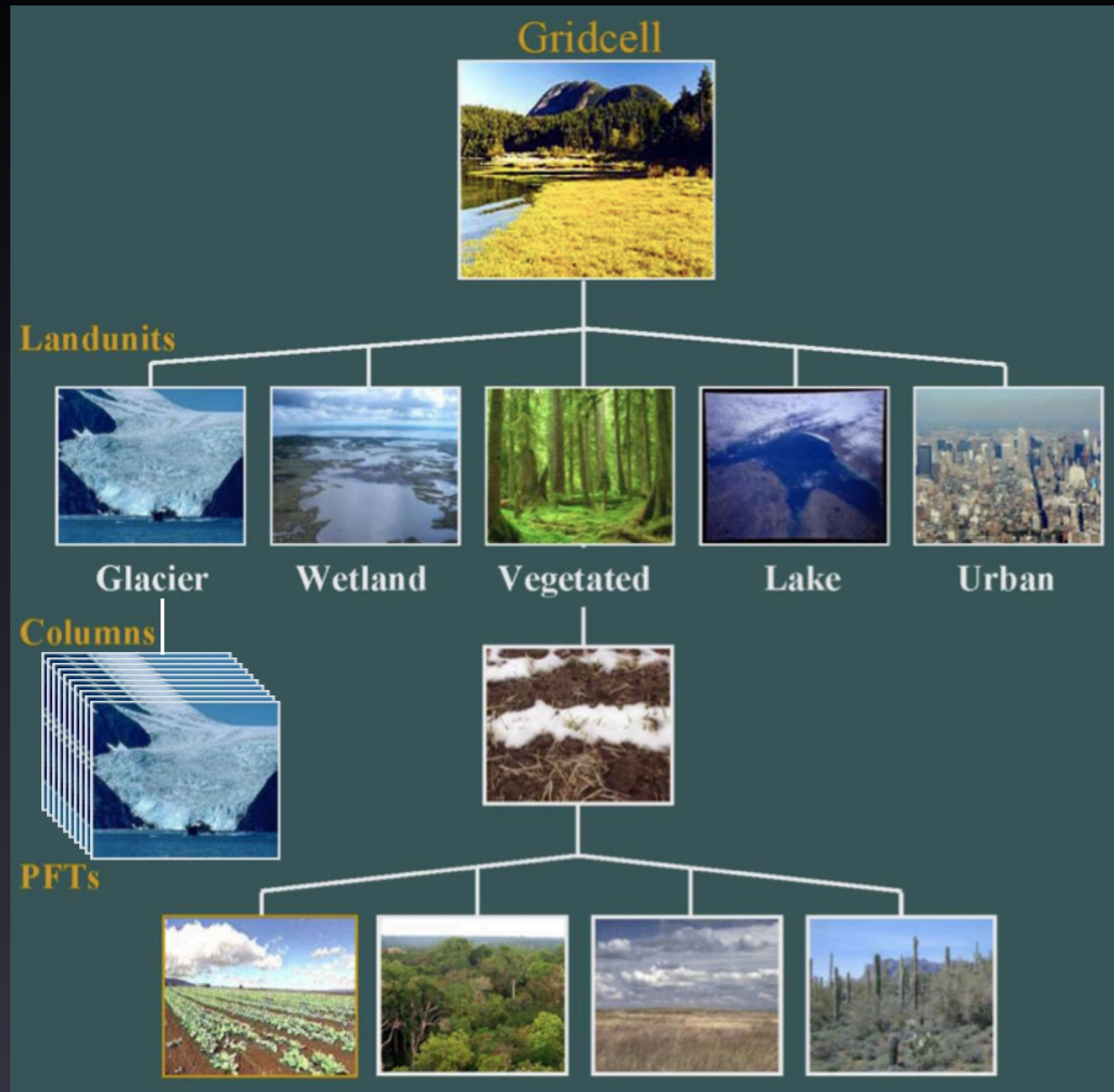
- One CISM task
- Trilinos not included in build
- Configuration file set up for SIA dycore

### CISM2 Compsets

- Multiple CISM tasks
- Trilinos included in build
- Configuration file set up for SEACISM dycore

# Dynamic Landunits in CLM

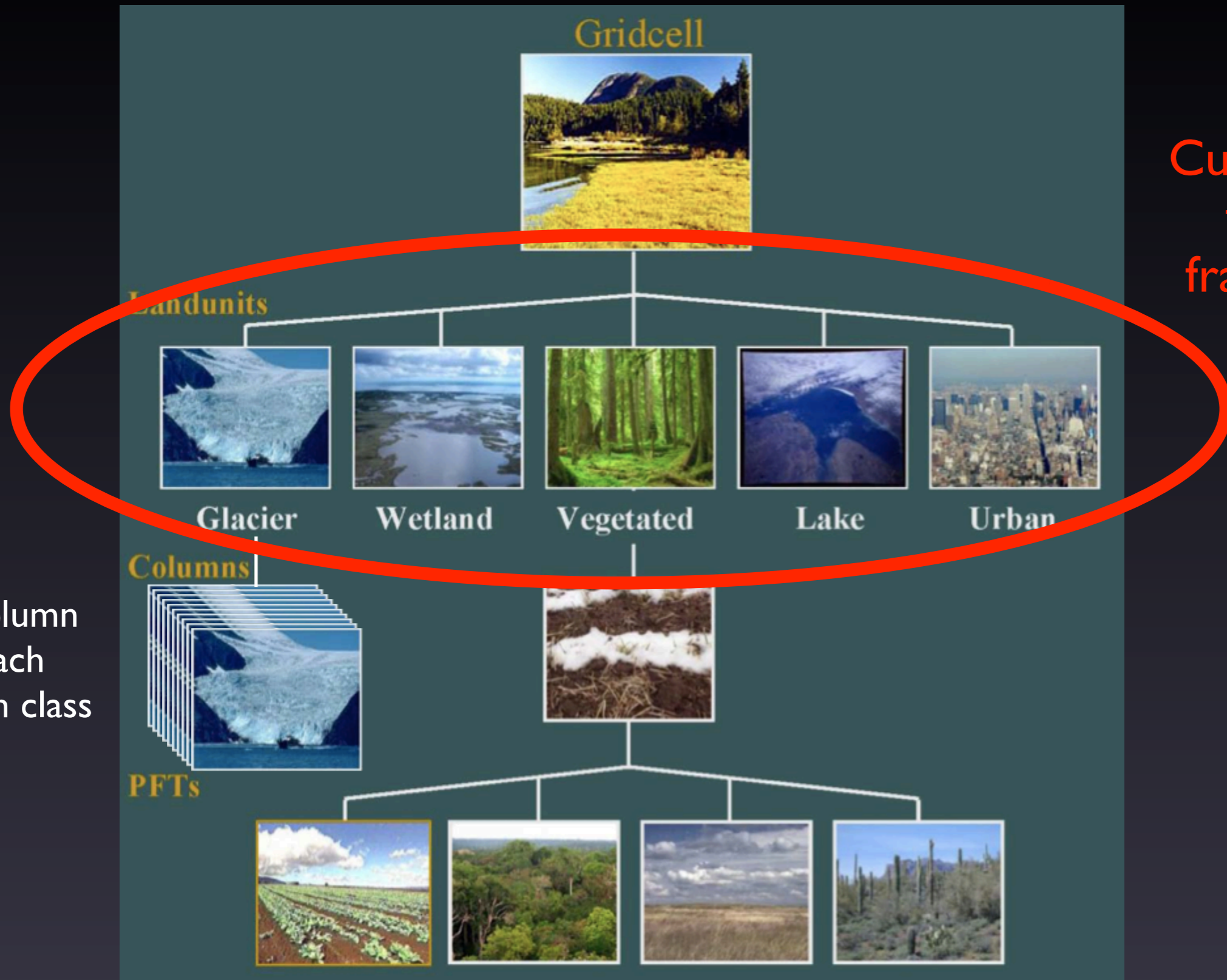
Work in progress



One column  
for each  
elevation class

# Dynamic Landunits in CLM

Work in progress



Currently:  
fixed  
fractions

One column  
for each  
elevation class





# Improved Mapping Functionality

Work in progress (Jon Wolfe)

## Goals:

- Allow mapping to/from irregular land grids – e.g., Spectral Element grid
- Allow mapping to/from multiple ice sheets, plus a global grid of smaller glaciers & ice caps
- Use new conservative mapping functions from Bill Lipscomb (also, Bob Fischer)
- Parallelize mapping routines

