

# NONROAD Overview

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The logo for MOVES (Motor Vehicle Emissions Simulator) is displayed in a stylized, metallic, 3D font with a glowing effect. The letters are white with a grey shadow, giving them a sense of depth and movement.

MOVES

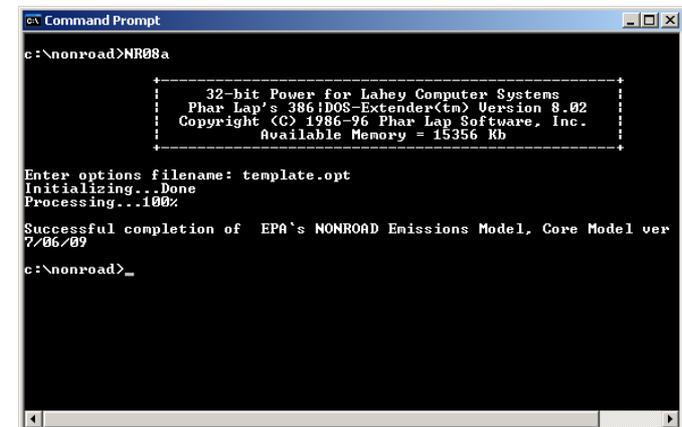
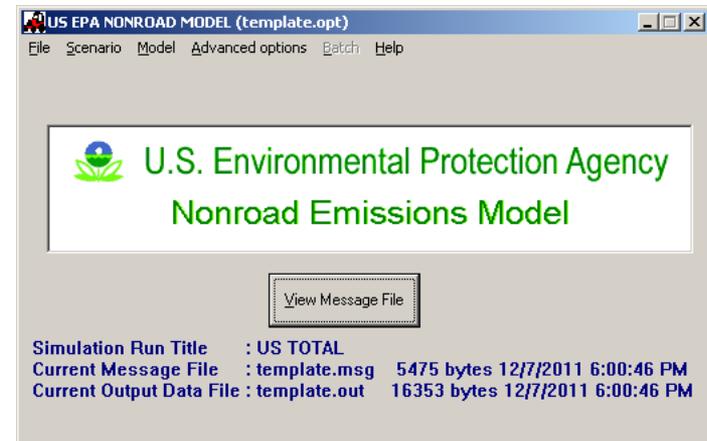


## Outline

- **Brief Description of NONROAD Model**
- **Integration into MOVES**
- **New data**

# NONROAD Model Overview

- Used to estimate NONROAD equipment emission inventories in the USA.
  - EPA Rulemaking Inventories
  - State and Local Usage
- Geographical scale from county to national
- Models equipment types except locomotive, commercial marine and aircraft
- Models criteria pollutants
- Models HAPs via NMIM
- Calendar year coverage 1970 through 2050



```
c:\nonroad>NR08a

 32-bit Power for Lahey Computer Systems
 Phar Lap's 386 iDOS-Extender(tm) Version 8.02
 Copyright (C) 1986-96 Phar Lap Software, Inc.
 Available Memory = 15356 Kb

Enter options filename: template.opt
Initializing...Done
Processing...100%

Successful completion of EPA's NONROAD Emissions Model. Core Model ver
7/06/09
c:\nonroad>_
```

# History

- Original basis is the 1991 NEVES Study
- Core code and algorithm developed in 1995
- Updated INCREMENTALLY in 1995, 2002, 2005 and 2008.
- Coded in FORTRAN95 with a reporting utility coded in Visual Basic 2003.
- Utilized in EPA NMIM model

# Exhaust Emissions Calculation

$$I = EF \cdot DF \cdot Act \cdot LF \cdot RP \cdot Pop$$

I = Exhaust Emissions Inventory (ton/year)

EF = Emission Factor (g/hp-hr)

DF = Deterioration Factor

Act = Activity (hours/year)

LF = Load Factor

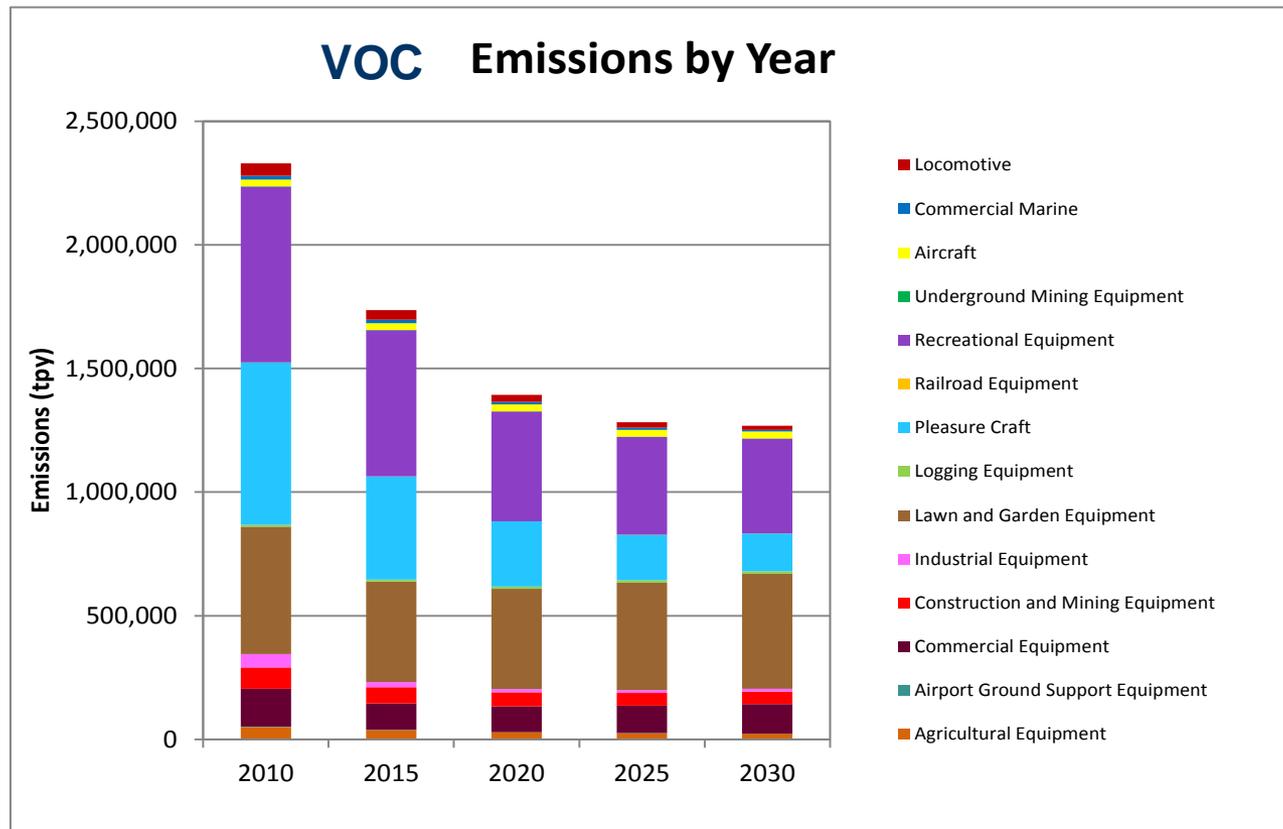
RP = average rated power (hp)

Pop = Equipment population (units)

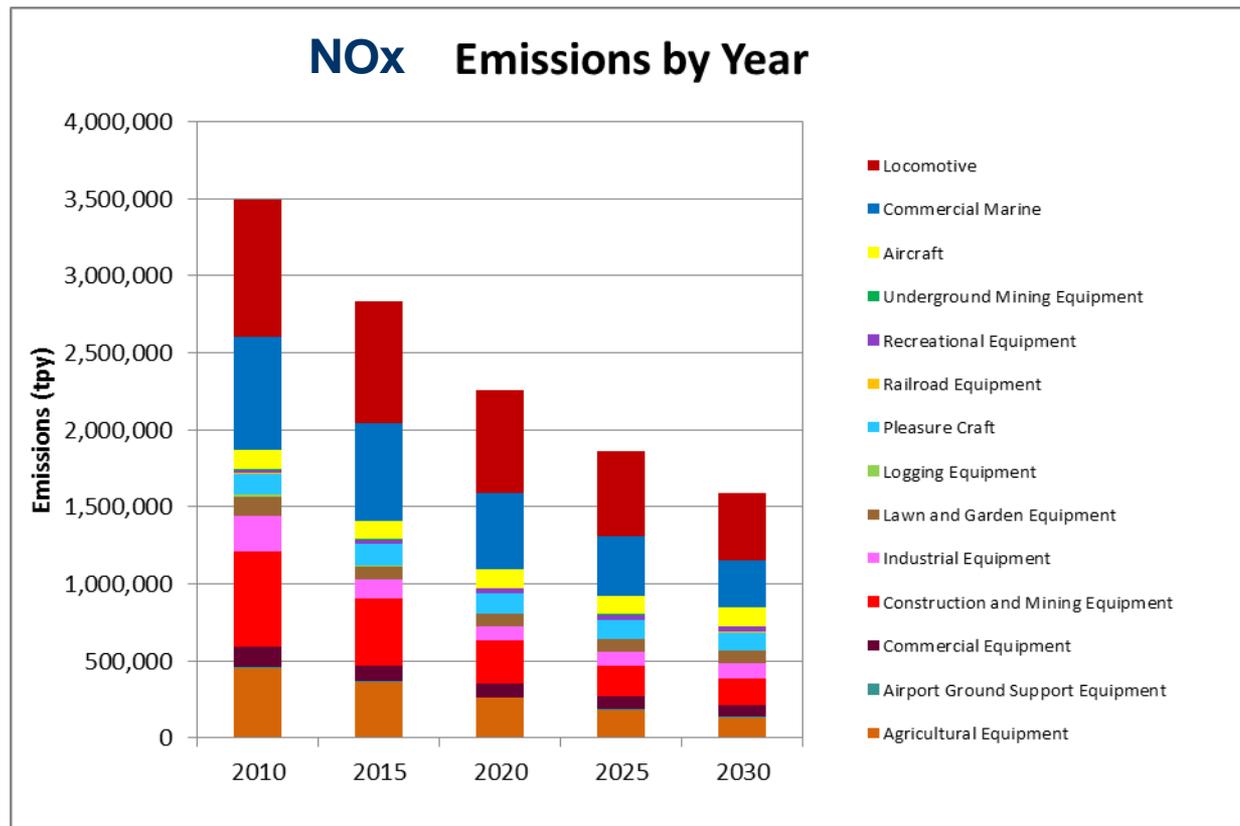
## Planned Improvements

- **New data is available and being sought**
  - Equipment populations
  - Activity estimates
  - Growth / Scrappage estimates
  - Emission factors and Load factors
  - New data may suggest changes in underlying algorithm
- **Software needs updating**
  - Fortran 95
  - Data structures should be in a database application
  - MOVES-style GUI

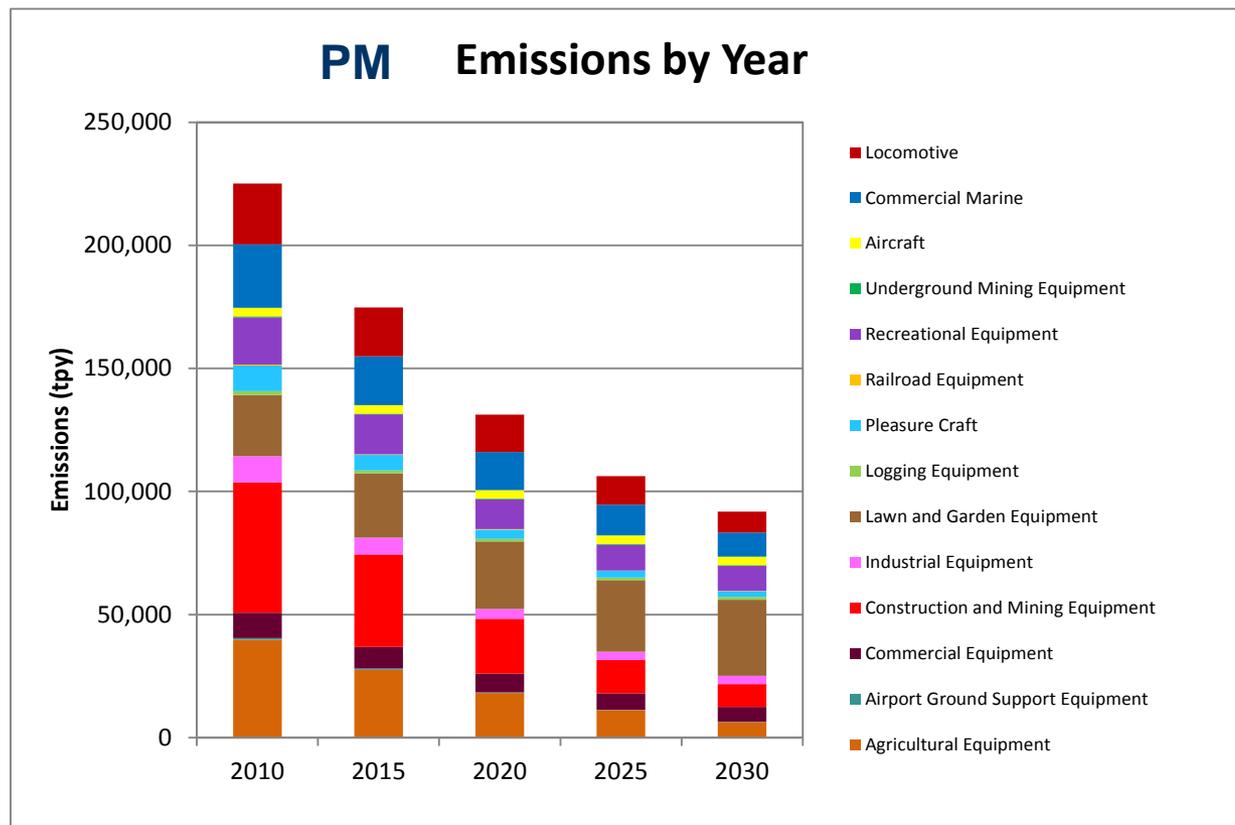
## National NONROAD Sector VOC Emissions by Category



## National NONROAD Sector NOx Emissions by Category



## National NONROAD Sector PM<sub>2.5</sub> Emissions by Category



## Planned Updates – Activity Data

- **NONROAD Growth and Activity Work by Environ**
  - Currently in Progress
  - Gathering available state data for available categories
    - California
    - Texas
    - LADCO
    - Maricopa County, AZ
    - Baltimore, MD
  - Analyzing US Census of Agriculture (Dept of Ag)
    - Comparing to NONROAD
    - Comparing to Texas 2007 survey

## Planned Purchase of Commercial Sales Data

- **National historical and projected equipment sales database**
  - Commercial sales data by application, fuel type and power range
  - Revise scrappage algorithm to translate sales into equipment populations
  - Update populations
- **Additional equipment activity**
- **State and county allocation**
- **Develop forecasts for next decade**

## Integration into MOVES

- **Phase 1: Insertion of existing NONROAD executable into the MOVES model, conversion of data into MySQL.**
  - Currently underway - UNC and Environ work assignment
  - Planned for MOVES2013
  - MOVES model will “Call” current NONROAD Fortran program
  - MOVES GUI expanded to include non-road sectors
  - Combined MOVES – NONROAD model will run similar to NMIM
- **Phase 2: Integrate NONROAD algorithms fully into MOVES**
  - Reprogram in Java / MySQL
  - Make software object oriented and totally database driven
  - Phase 2 not currently scheduled for MOVES2013

## Planned Updates: Emission Factors

- **Phase 1: Develop new emission factors and load factors from EPA NONROAD Pilot study and other available data**
  - Focused primarily on the construction sector
  - New average emission and load factors from newer data
  - Work currently being done by ERG contractor
- **Phase 2: Develop operating mode based emission rates and load factors for NONROAD**
  - PEMS and PAMS data basis
  - New emission factors to use in MOVES
  - New duty cycles
  - Phase two not currently scheduled for MOVES2013

## Planned Updates: Population, Activity, and Growth

- **Challenges of developing nationwide estimates and allocations to county level**
  - Large range of equipment types and applications
  - Limited resources
- **EPA is seeking other sources of data**
  - Panel later this morning