AN INTRODUCTION TO THE APLE-Lots BARNYARD RUNOFF MODEL

John Panuska PhD, PE

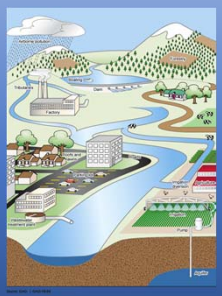
Natural Resources Extension Specialist
Biological Systems Engineering Department
UW Madison

NASECA-WI
Virtual Conference
February 10, 2021

1

Pollutant Trading Applications

The APLE-Lots Model predicts phosphorus (P) loss in runoff from animal lots and considers the impacts of lot management (animal number, size and type, scraping, sediment basins and flow diversions) on the magnitude of P loss and runoff volume.



2

The Project Team

Dr. Peter Vadas formerly with DFRC, now National Program Leader for Land and Air, USDA - ARS, Office of National Programs, Washington D.C.

Dr. Laura Ward Good, UW - Madison Department of Soil Science.

Dr. John Panuska, UW - Madison, Biological Systems Engineering Department.

Mr. Jim Beaudoin, UW Madison, Department of Soil Science.

3

So Why a New Tool ? ?

- Barnyard modeling in Wisconsin dates to the ARS **F**eedlot **R**unoff **M**odel (FRM) developed by Bob Young and published in 1982 using research data from the mid to late 1970s (~ 50 Yr. old !!).
- There has been a **significant** amount of research conducted and new data generated on animal lot runoff since the late 1970s !
- The Wisconsin DOS version of the FRM, commonly called **BARNY**, was a modification of the original released in 1987.

4

So Why a New Tool ? ?

- In 2015 Peter Vadas (DFRC) developed a new model to predict annual runoff, total solids, and total P loss from cattle lots (APLE-Lots).
- APLE-Lots considers more lot dynamics and is therefore a more realistic representation of animal lot processes.
- Also, in 2015, ARS funded the development of APLE-Lots as a cooperative project with Peter Vadas at the DFRC.

APLE-Lots Equations Peer Reviewed Reference:
Vadas, P. A., L. W. Good, J. C. Panuska, D. L. Busch and R. A. Larson. (2015). A new model for phosphorus loss in runoff from outdoor cattle lots. Trans. ASABE, 58(4); 1035-1045.

5

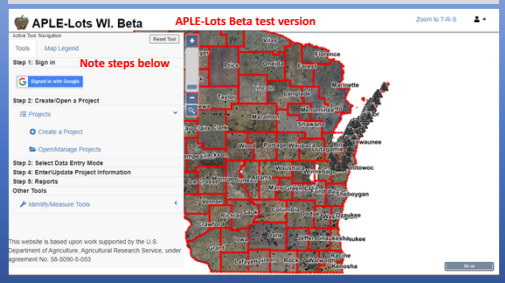
The APLE-Lots Model

The APLE-Lots Model currently under development can use either an interactive air photo **map - based** or **mapless** interface.

Earthen Lot DFRC 2

6

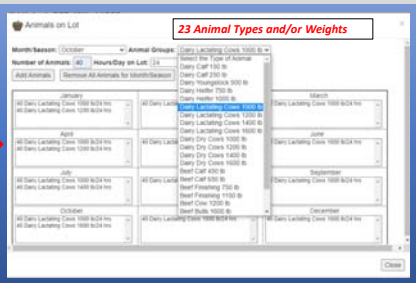
Model Setup & Operation



Initial screen

7

Model Setup & Operation



Note different animal types on lot at the same time.

Add animals to your lot

10

Model Setup & Operation

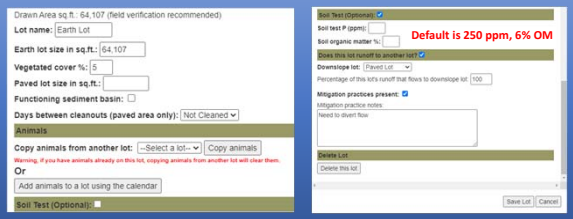
Use slide bar tool to zoom into barnyard.

Enter an address.

Locate the air photo with the barnyard you want to model

8

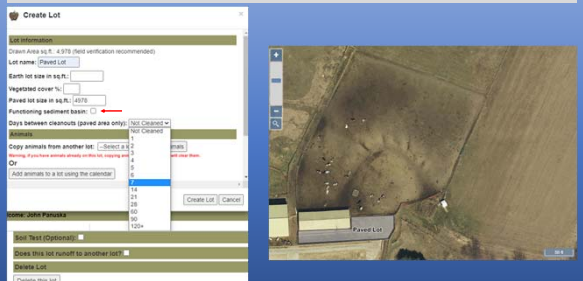
Model Setup & Operation



Add an Earth Lot draining to the Paved Lot

11

Model Setup & Operation



Add a Paved Lot

9

Model Setup & Operation

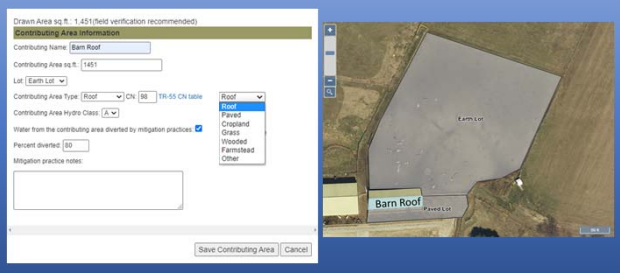
Earth Lot draining to a Paved Lot

12

Poll Question No. 1

13

Model Setup & Operation



Add a contributing area draining to paved lot

14

Poll Question No. 2

18

Model Output

- Precipitation data are used for the county where the lot is located.
- The output file is placed in the **Downloads** subdirectory.
- Model output is in a tabular format in an Excel spreadsheet.

15

Model Output - Parameters and units -

- Model results for a Paved or Earth Lot annual output:
  Runoff (in), Sediment loss (ton) and Total P loss (Lb.)
- Model results for contributing lot annual output (Paved or Earth):
  Sediment loss (ton), Total P loss (Lb.)
- Model results for a lot system (downstream outflow point) annual output:
  Paved Lot and Earth Lot: Sediment loss (ton), Total P loss (Lb.)

16

Model Output - Modeled versus Measured -

Measured and Modeled rainfall runoff, P, and solids for a concrete lot (DFRC 1) in 2014.

	Measured	APLE-Lots WI*	Difference (Pred.- Meas.)	BARNY***
Annual runoff (in)	27.1	26.7	-0.04	
Total P (Lb.)	45.4	56.	+10.6	69

Measured and Modeled rainfall runoff, P, and solids for an earthen lot (DFRC 2) in 2014.

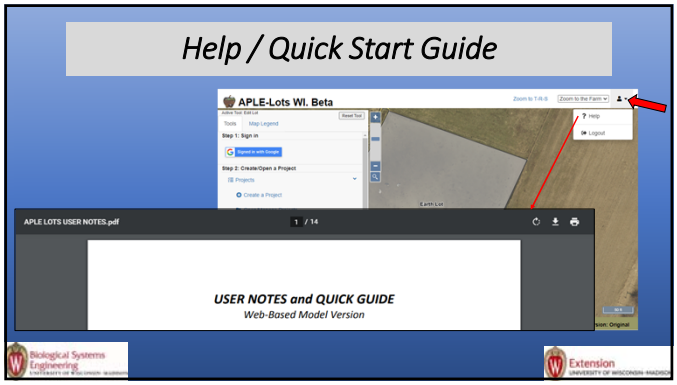
	Measured	APLE-Lots WI*	Difference (Pred.- Meas.)	BARNY***
Annual runoff (in)	17.6	16.7	-0.09	
Total P (Lb.)	99	92	-7	10.7

* Calculated with precipitation measured at the Sauk Wastewater Treatment Plant. Event precipitation was used for calculating event runoff and the annual rainfall total was used for calculating the curve number.

** Using a constant TP concentration of 85 and 10.1 mg/l for paved and earthen lots, respectively.

Due to monitoring equipment that had never been used before on lots under frozen conditions it is not possible to quantify data uncertainties.

17


Help / Quick Start Guide
APLE-Lots WI. Beta
APLE LOTS USER NOTES.pdf
USER NOTES and QUICK GUIDE
Web-Based Model Version
Biological Systems Engineering
Extension

19


Questions ????
Where to find APLE-Lots:
https://aplelots.wisc.edu/
Biological Systems Engineering
Extension

20