

Animal Disease Spread Model

Output Settings and Running Simulation



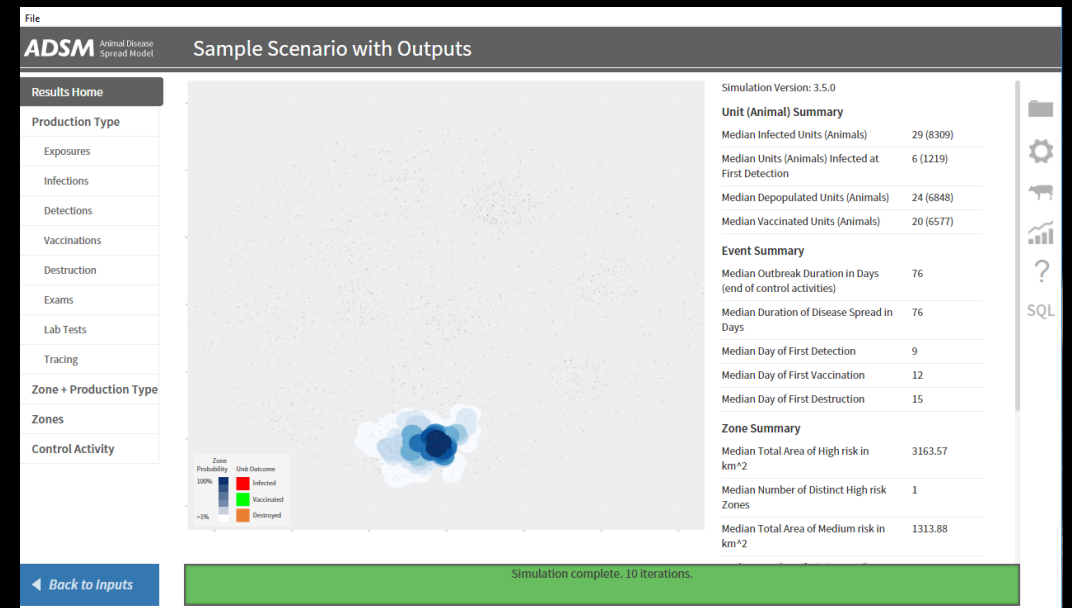
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Document Conventions

The following conventions are used throughout the training modules:

Other **TRAINING MODULES** in this series will be referred to using all capital letters, bold face, italics and underline.

Rhetorical questions and *extra notes* will be in orange italics.

Conventions applying to the ADSM application are:

Navigation tabs on right and Admin panels on left are designated with an underline. Examples are Project Panel or Population tab.

Items with an action on click, such as [Apply] Button or [Save As] icon are enclosed in square brackets.

Parameter fields (inputs) are in blue italics and *Variables* (outputs) are in green italics.

Navigation Tabs > *Parameter field* indicates to go to the given navigation tab to find the given field.

Hyperlinks appear in bright green type with underline <http://navadmc.github.io/ADSM/>

Specifying Outputs



The Output Settings parameters customize the details of how the simulation will execute. We will cover each of these parameters.

The screenshot shows a software interface for simulation settings. The background is a photograph of a farm with a tall metal windmill and several black cows in a green field under a blue sky with white clouds. The interface is overlaid on the right side of the image.

Population

Disease

Disease Progression

Assign Progression

Disease Spread

Review Disease Spread

Controls on

Control Protocol

Vaccination Triggers

Vaccination Rings

Vaccination Global

Destruction Global

Assign Protocols

Zones

Zone Effects

Assign Effects

Output Settings

Iterations*

10

The number of iterations of this scenario that should be run

Stop criteria*

Stop when there are no more latent or infectious units and all control activities are finished ▾

The criterion used to end each iteration.

Cost Tracking

Cost track destruction
Disable this to ignore entered destruction costs.

Cost track vaccination
Disable this to ignore entered vaccination costs.

Cost track zone surveillance
Disable this to ignore entered Zone surveillance costs.

Supplemental Outputs

Save daily unit states
Save all daily non-susceptible states for each unit in a supplemental file.

Save daily events
Save all daily events in a supplemental file.

Save daily exposures
Save all exposures in a supplemental file.

Save map output
Create map outputs for units in supplemental directory.

The first parameter in the Output Settings allows you to enter the number of **iterations** you want to run.

Why run multiple iterations?

Recall the stochastic nature of ADSM. For every iteration and every probability density function (pdf) parameter in the application, there is a Monte Carlo-style selection of the exact value that is entered into the simulation engine. In the example pdf **Latent period – cattle**, the value for the latent period is a number between 0 and 9, with the most likely value to be 3 and least likely values to be 0 or 9.

As a result, every iteration spreads disease in a variable fashion and has a unique outcome, which allows a range of possible outcomes when reviewing multiple iterations.

Running a small number of iterations allows a review of the outcome to see if your parameters are acting as expected. The training modules [RESULTS](#) and [VERIFICATION & VALIDATION](#) give examples of how to review parameters and results.

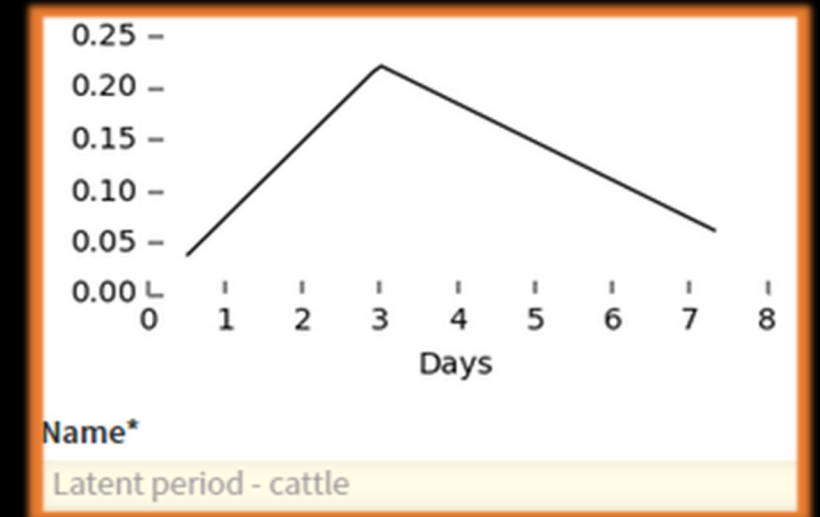
A complex project could include more iterations. More iterations allow a broader range of possibilities to be exercised in the simulation.

Edit the Output Settings

Iterations*

10

The number of iterations of this scenario that should be run



The next step is to bring the simulation to a logical end.

To select the *stop criteria* parameter, use the pull-down list. Enter number of days if you have selected the specific days option.

Edit the Output Settings

Iterations*

100

The number of iterations of this scenario that should be run

Stop criteria*

Stop after a specified number of days

Stop when there are no more latent or infectious units.

Stop when the first detection occurs.

Stop when there are no more latent or infectious units and all control activities are finished

Stop after a specified number of days

The maximum number of days that iterations of this scenario should run.

Options to stop the simulation:

- ⚙️ Stop when there are no more latent or infectious units and all control activities are finished – all destruction activities and vaccination activities are complete
- ⚙️ Stop when there are no more latent or infectious units – end of disease spread
- ⚙️ Stop when the first detection occurs – to observe silent spread only
- ⚙️ Stop after a specified number of days – parameter specifying days is required



Cost Tracking can be activated on Output Settings:

- ⚙️ *Destruction Costs*
- ⚙️ *Vaccination Costs*
- ⚙️ *Zone Surveillance Costs*

Cost Tracking

- Cost track destruction**
Disable this to ignore entered destruction costs.
- Cost track vaccination**
Disable this to ignore entered vaccination costs.
- Cost track zone surveillance**
Disable this to ignore entered **Zone** surveillance costs.

The parameters supporting *Destruction and Vaccination Costs* are set in the Control Protocol

Cost Tracking

- Cost track destruction**
Disable this to ignore entered destruction costs.
- Cost track vaccination**
Disable this to ignore entered vaccination costs.
- Cost track zone surveillance**
Disable this to ignore entered **Zone** surveillance costs.

Cost of destruction cleaning per unit*
10.0000
The cost associated with cleaning and disinfection for each destroyed unit of this type.

Cost of euthanasia per animal*
75.0000
The cost associated with euthanizing each destroyed animal of this type.

Cost of indemnification per animal*
125.0000
The cost of indemnification for each destroyed animal of this type.

Cost of carcass disposal per animal*
20.0000
The cost of carcass disposal for each destroyed animal of this type.

Cost of vaccination setup per unit*
12.0000
The cost of site setup for each vaccinated unit of this type.

Cost of vaccination baseline per animal*
2.0000
The baseline cost of vaccination for each vaccinated animal of this type. This cost applies to all vaccinations before the threshold is met.

Vaccination demand threshold
50000
The number of animals of this type that can be vaccinated before the cost of vaccination increases.

Cost of vaccination additional per animal*
2.0000
The additional cost of vaccination for each vaccinated animal of this type after the threshold is exceeded.

The parameters supporting *Zone Surveillance Costs* are set in the Zone Effects

Name
Surveillance

Zone direct movement
Unrestricted movement
Function that describes direct movement rate.

Zone indirect movement
Unrestricted movement
Function that describes indirect movement rate.

Zone detection multiplier*
4.0
Multiplier for the probability of observing **clinical signs** in units of this **production type** in this Zone.

Cost of surveillance per animal day*
0.0200
Cost of surveillance per animal per day in this Zone.

Clarification on Costs



There are 3 steps to getting cost results in the final outputs:

- 1) Check *Cost Accounting* in Control Protocol
- 2) Enter *Cost values* in *Cost Accounting*
- 3) Check *Cost tracking* on Output Settings

The cost outputs are in the dataset *Results_dailycontrols*. There is code for queries in Example Database Queries folder installed in the ADSM Workspace that will make a subset of costs.

Create Control Protocols

[+ New Control Protocol](#)

▼ **Cattle Control**  

- Detection
- Tracing
- Testing
- Exams
- Destruction
- Vaccination
- Cost Accounting

Cost of destruction cleaning per unit*

The cost associated with cleaning and disinfection for each destroyed unit of this type.

Cost of euthanasia per animal*

The cost associated with euthanizing each destroyed animal of this type.

Cost of indemnification per animal*

The cost of indemnification for each destroyed animal of this type.

Cost of carcass disposal per animal*

The cost of carcass disposal for each destroyed animal of this type.

Cost Tracking

- Cost track destruction**
Disable this to ignore entered destruction costs.
- Cost track vaccination**
Disable this to ignore entered vaccination costs.
- Cost track zone surveillance**
Disable this to ignore entered **Zone** surveillance costs.

Supplemental Output



Supplemental Output Files are activated on Output Settings

Why are the Supplemental Files not created automatically?

The daily supplemental files create an output file for each iteration. If you run 10 iterations, you get 10 files of each set. If you run 100 iterations, you get 100 files of each set.

The map files create a set of files per week of each iteration, one file for units, and one file for zones.

Producing all these files takes time and space, especially while you are experimenting with parameters in your scenario. You can turn on the outputs once you are comfortable that your parameters are in place.

The RESULTS training covers the contents of supplemental files in detail.

Supplemental Outputs

- Save daily unit states**
Save all daily non-susceptible states for each unit in a supplemental file.
- Save daily events**
Save all daily events in a supplemental file.
- Save daily exposures**
Save all exposures in a supplemental file.
- Save map output**
Create map outputs for units in supplemental directory.

Running and Monitoring



Starting the simulation

In the bottom left corner of the application, you will see a contextual action button. This means that the button takes different actions depending on the form you are on and the state the model is in.

Before initial run: When one or more forms appear to be incomplete, the text is [Validate Scenario] and the button color is yellow

You may be able to run the simulation with some yellow parameters

When entering parameters, the text is [Validate Scenario] and the button color is green

When the simulation has validated, the text is [Run Simulation] and the button color is green

After run when results are present:

When the simulation has completed and is on Results Home, the text is [Back to Inputs] and the button color is blue

When the simulation has completed and is on Parameter View, the text is [View Results] and the button color is green



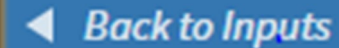
Validate Scenario ▶



Validate Scenario ▶



Run Simulation ▶



◀ *Back to Inputs*



View Results ▶

- Results Home
- Production Type
 - Exposures
 - Infections
 - Detections
 - Vaccinations
 - Destruction
 - Exams
 - Lab Tests
 - Tracing
- Zone + Production Type
 - Zones
 - Control Activity

Running Simulation... 

[Recalculate Summary Statistics](#)

The moving bars indicate the simulation engine is engaged.

Supplemental Output Files

[Calculate Summary CSV](#)

[Combine Output Files](#)

Warning: These operations may take very long for large scenarios.

There are visual cues to check the status of a running simulation.

The [Abort] option becomes available after a few seconds when iterations start. [Abort] allows any running iterations to complete, then returns to Results Home showing partial results.



The Status bar across the bottom gives a count and visual of completed iterations. The bar progressively changes to green as iterations finish.



The Status bar also shows iterations as they process with the time each one took to complete. It takes a few seconds after starting before iterations start appearing.



[Back to Inputs](#)

Running Simulation

Abort



5 of 100 iterations completed.

Iteration 1: 2s
Iteration 2: 1s
Iteration 3: 1s

The command window also reports a status and indicates when iterations complete. The command window can be found in the second application window, usually shown in the Desktop toolbar.

Validation confirmation



Starting simulation on all available processors, 4 processors in this example

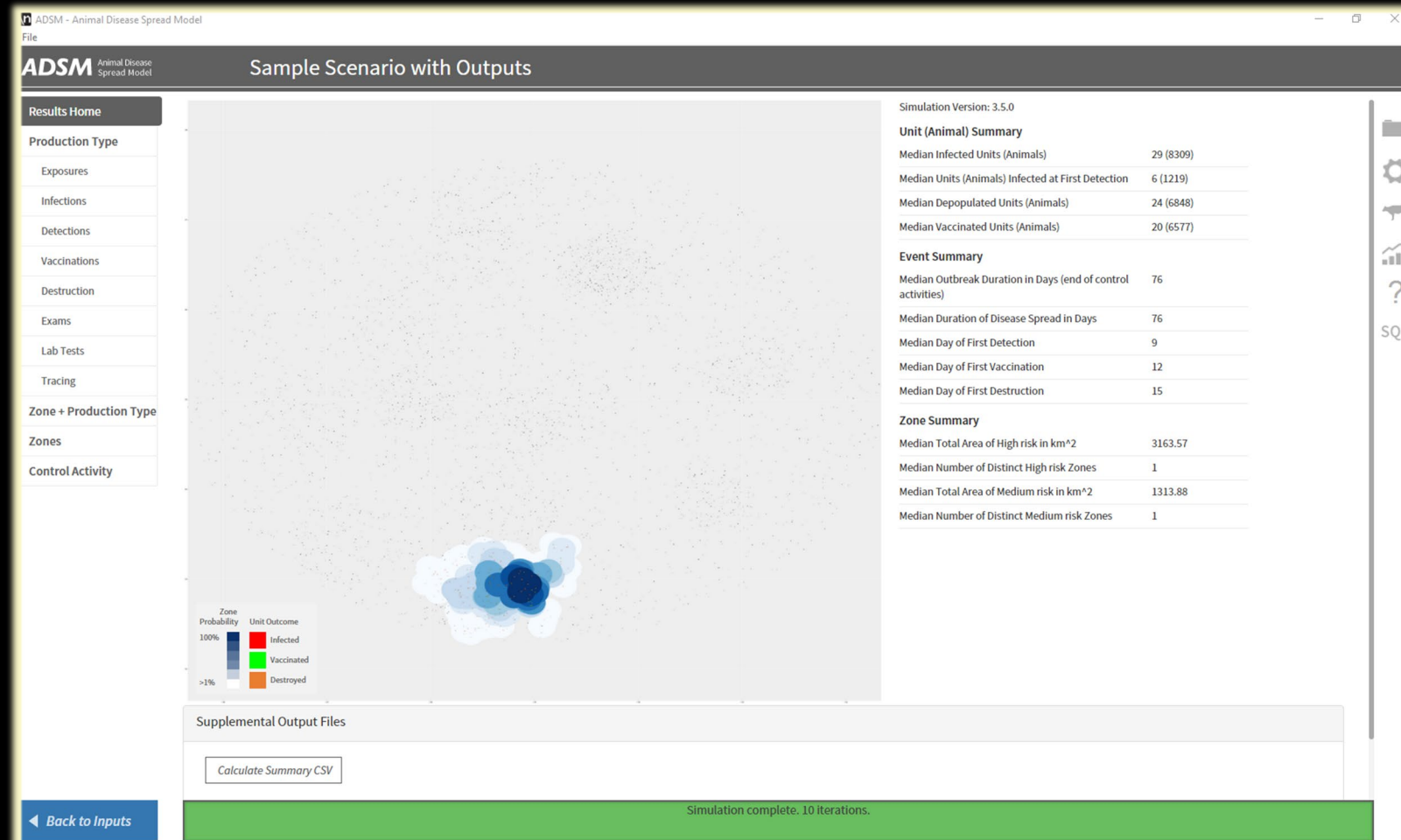


Iterations completed



```
F:\Prod_Final\ADSM\ADSM.exe
Done migrating databases.
Converting any existing user_notes to unit_id as needed...
C Engine Exit Code: 0
Starting Simulation run at 2020-10-06 17:16:35.054331+00:00
Starting Unit Stat creation
Finished Unit Stat creation
Setting up Python...
Running in: F:\Prod_Final\ADSM
Starting run
Setting up Python...
Running in: F:\Prod_Final\ADSM
Setting up Python...
Running in: F:\Prod_Final\ADSM
Setting up Python...
Running in: F:\Prod_Final\ADSM
Sample Scenario - Finished Iteration 2: 77 Days
Sample Scenario - Finished Iteration 3: 73 Days
Sample Scenario - Finished Iteration 1: 66 Days
Sample Scenario - Finished Iteration 5: 42 Days
Sample Scenario - Finished Iteration 4: 124 Days
Sample Scenario - Finished Iteration 6: 106 Days
Sample Scenario - Finished Iteration 8: 25 Days
Sample Scenario - Finished Iteration 7: 115 Days
Sample Scenario - Finished Iteration 9: 15 Days
Sample Scenario - Finished Iteration 11: 25 Days
Sample Scenario - Finished Iteration 12: 15 Days
Sample Scenario - Finished Iteration 13: 79 Days
Sample Scenario - Finished Iteration 14: 79 Days
Sample Scenario - Finished Iteration 10: 194 Days
Sample Scenario - Finished Iteration 15: 50 Days
Sample Scenario - Finished Iteration 16: 44 Days
Sample Scenario - Finished Iteration 18: 43 Days
Sample Scenario - Finished Iteration 19: 39 Days
```

Results Home is the initial screen shown when ADSM iterations have completed. A complete review of all the simulation outputs is covered in the RESULTS training.



What's Next?





Join the flock!

Learn more about ADSM or try an example

ADSM is currently available at <https://github.com/NAVADMC/ADSM/releases/latest>

Try the sample scenario

<https://github.com/NAVADMC/ADSM/wiki/A-Quick-Start-Guide:-Running-the-sample-scenario>

Read the wiki pages link

<https://github.com/NAVADMC/ADSM/wiki>

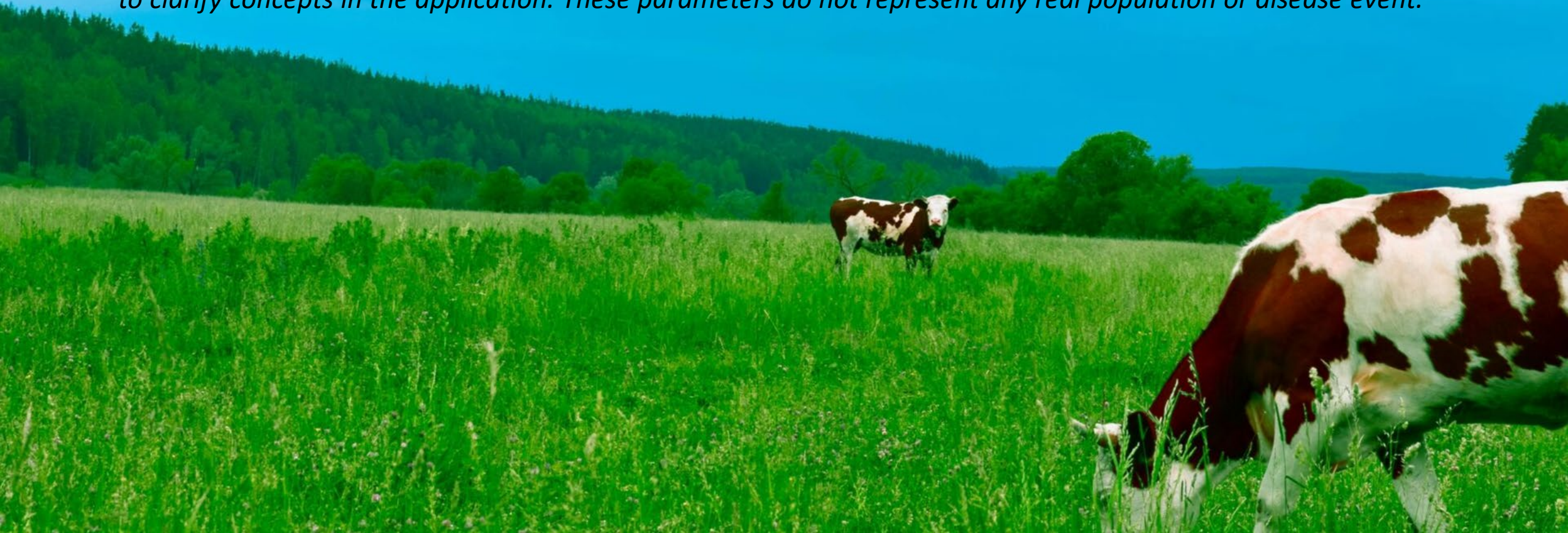
Additional training materials are posted at
<http://navadmc.github.io/ADSM/>

Trainings include:

- Overview
- Populations and Production Types
- Getting Started
- Disease Parameters
- Control Parameters
- Output Settings and Run
- Results
- Detailed Evaluation of Results - Verification and Validation
- Vaccination Strategy
- Administration



The outcome of an ADSM simulation (as with any computer simulation model) depends heavily on the quality of the scenario input parameters; the assumptions of the modeler who created the scenario; and the capabilities and limitations of the model framework itself. The utility of disease models like those created with ADSM critically depends on input and interpretation of experts familiar with the behavior of disease within populations, and with the limitations, assumptions, and output of the model. While ADSM is available as a service to animal health communities, the ADSM team does not necessarily endorse results obtained with the ADSM application or any conclusions drawn from such results. Note that the parameters provided in the Sample Scenario are simple examples to clarify concepts in the application. These parameters do not represent any real population or disease event.



This work was funded in whole through Cooperative Agreement AP18VSCEAH00C005 with the University of Tennessee Department of Animal Science by the Animal and Plant Health Inspection Service, an agency of the United States Department of Agriculture.

Photo credits

Canva.com

Pinecroft Farms, Woodstock CT, Mariah Chapman

NAHMS Archives – Judy Rodriguez



Animal Science