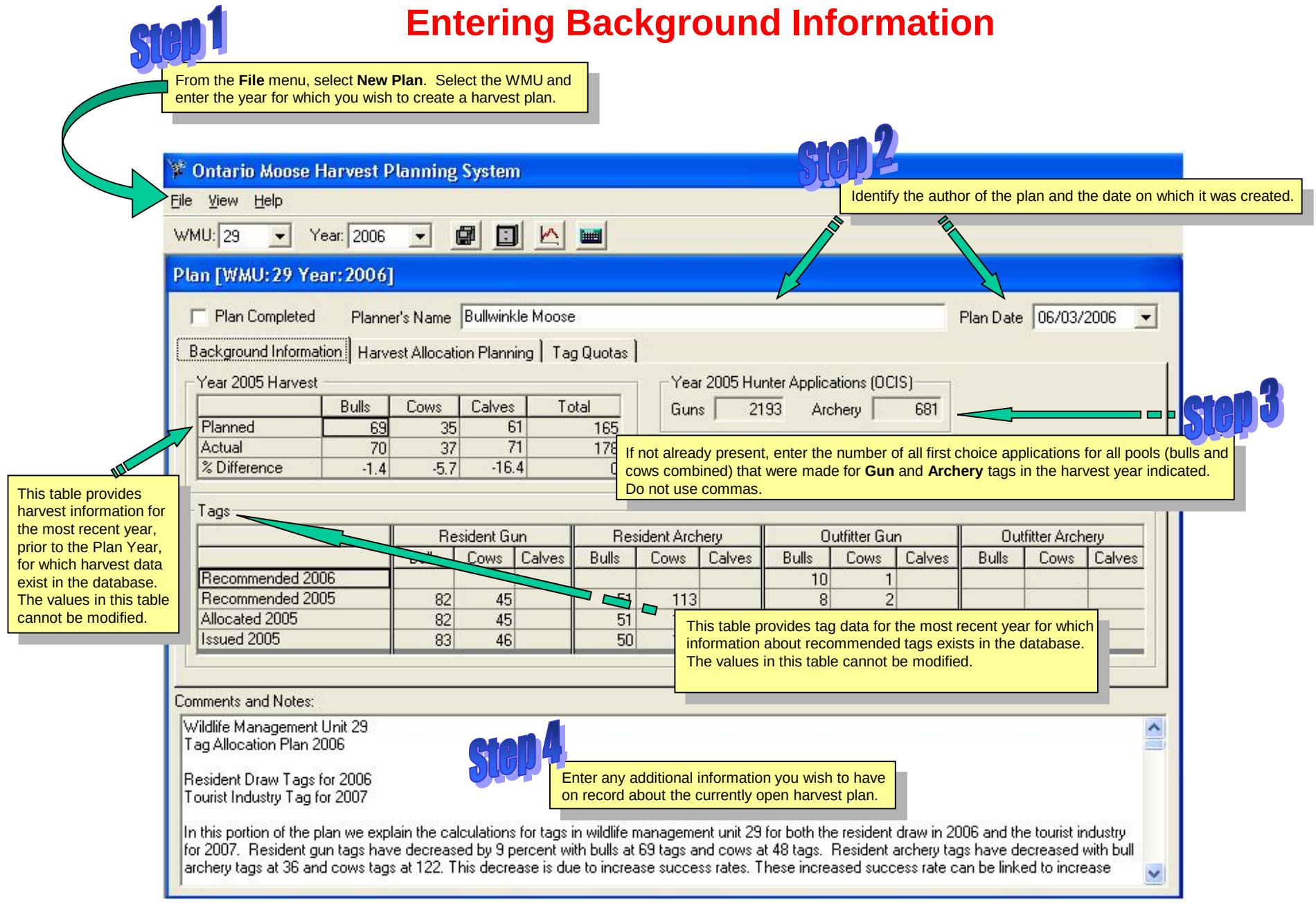
Getting Started
Entering Background Information



Entering Harvest Allocation Information

Step 5

Enter information about the moose population in the WMU for which you are developing the harvest plan. The fields that require data entry in this step are: (a) *Huntable Pop.*, (b) *Objective*, and (c) *Herd Status.*

5a. Enter the estimated huntable[1] population. Do not use commas. This value is assumed to be the same as total population unless otherwise specified.

5b. Enter the population objective (from Strategic Planning Documents). Do not use commas.

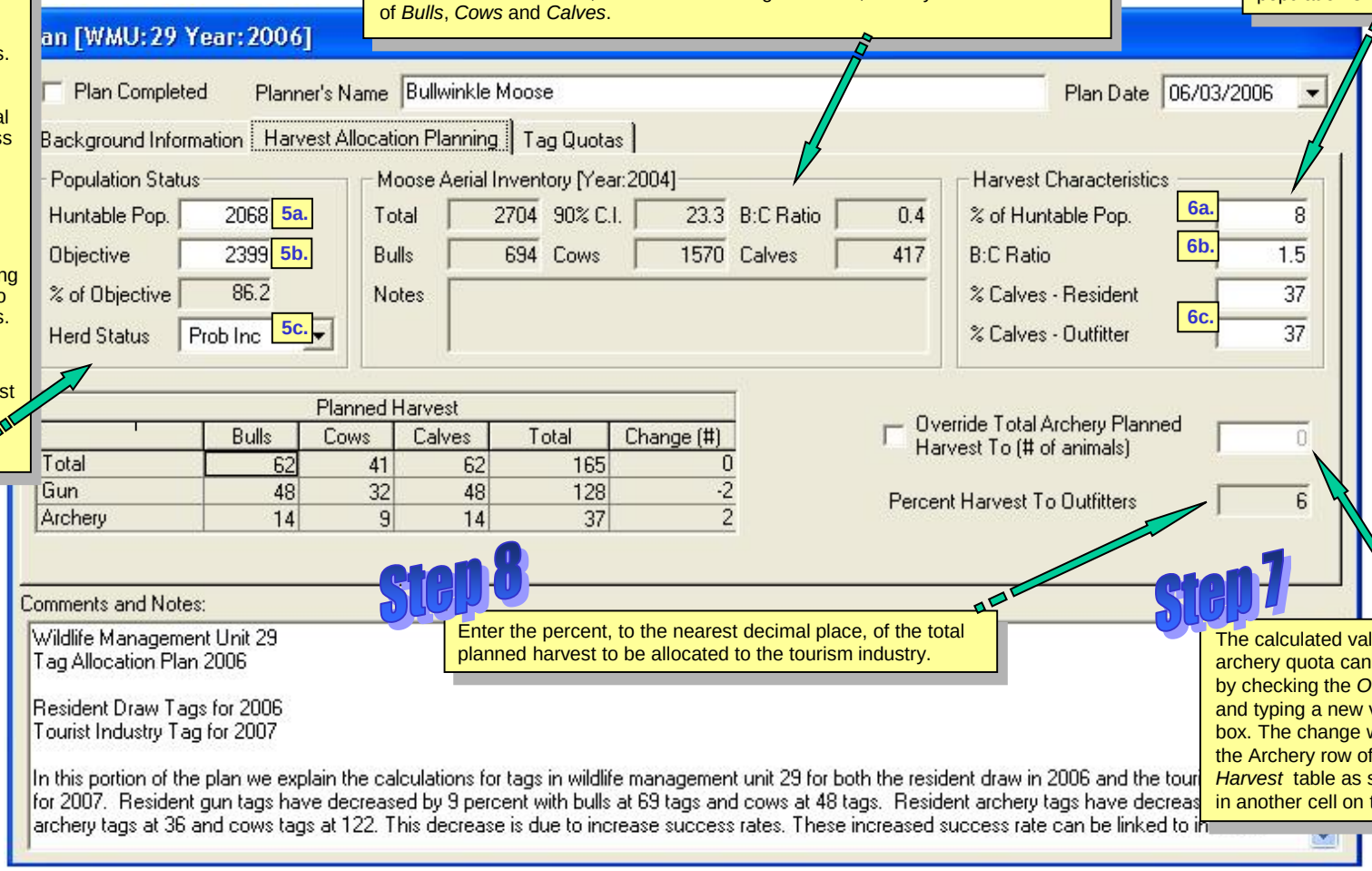
5c. From the drop-down list, select the label that best describes the status of the moose herd.

The values in this section of the screen provide population information for the WMU based on Moose Aerial Inventory (MAI) data; they cannot be modified.

Note that MAI data for *Bulls*, *Cows* and *Calves* include only observed moose; MAI *Total* includes observed, unknown and un-aged moose, so may not match the sum of *Bulls*, *Cows* and *Calves*.

Provide a description of the characteristics of the planned harvest by editing or entering values for (a) % of Huntable Population, (b) *Bull:Cow Ratio*, and (c) *% Calves* for Resident and Outfitter. Although these values are provided by the system, they can be edited to "fine-tune" the impact of the harvest on population size.

Step 6



Step 8

Enter the percent, to the nearest decimal place, of the total planned harvest to be allocated to the tourism industry.

Step 7

The calculated value for the total archery quota can be manually set by checking the *Override* checkbox and typing a new value into the text box. The change will be reflected in the Archery row of the *Estimated Harvest* table as soon as you click in another cell on the screen.

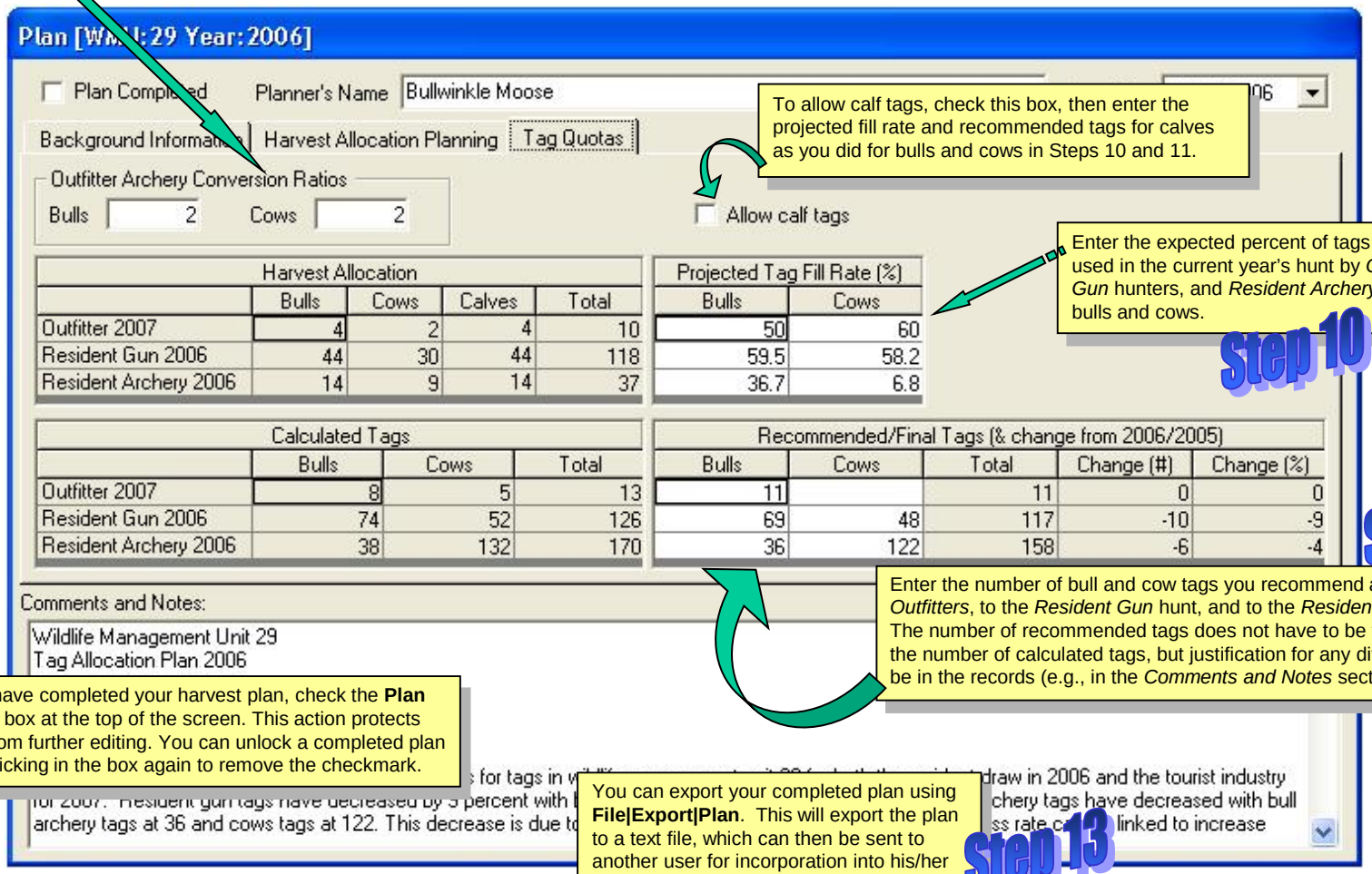
---

[1] The **huntable population** consists of moose in areas legally accessible to hunters, and excludes those in protected areas (e.g., crown game preserves, parks, etc.).

Entering Tag Quota Information

Step 9

Enter the *Outfitter Archery Conversion Ratios*. These values, although not used in the calculation of harvest quotas, are required to help OMNR main office staff determine the number of outfitter tags that can be converted from the gun hunt to the archery hunt. The conversion ratio is based on the relative success of bow hunters compared to gun hunters. For example, if bow hunters are one-fifth as successful as gun hunters, then five archery tags can be issued for each gun tag.



To allow calf tags, check this box, then enter the projected fill rate and recommended tags for calves as you did for bulls and cows in Steps 10 and 11.

Enter the expected percent of tags that will likely be used in the current year's hunt by *Outfitters*, *Resident Gun* hunters, and *Resident Archery* hunters to claim bulls and cows.

Step 10

Step 11

Enter the number of bull and cow tags you recommend allocating to *Outfitters*, to the *Resident Gun* hunt, and to the *Resident Archery* hunt. The number of recommended tags does not have to be the same as the number of calculated tags, but justification for any difference should be in the records (e.g., in the *Comments and Notes* section).

Step 12

When you have completed your harvest plan, check the **Plan Completed** box at the top of the screen. This action protects your plan from further editing. You can unlock a completed plan simply by clicking in the box again to remove the checkmark.

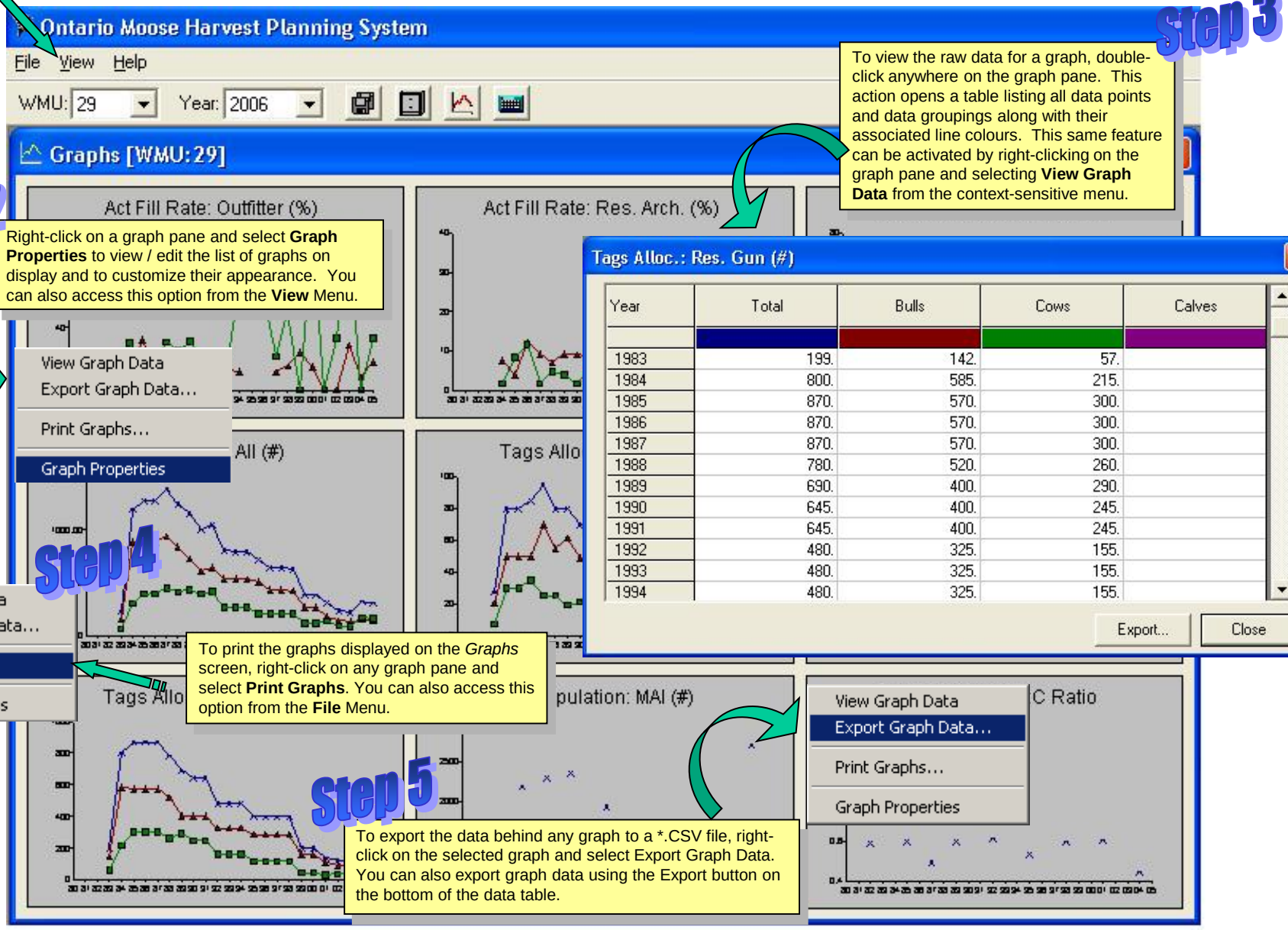
You can export your completed plan using **File|Export|Plan**. This will export the plan to a text file, which can then be sent to another user for incorporation into his/her Moose Harvest database.

Step 13

View, Print and Export WMU Time Series Data

Step 1

If it is not already displayed, go to the **View** Menu and select the **Graphs** option to open the *Graphs* screen.



Step 2

Right-click on a graph pane and select **Graph Properties** to view / edit the list of graphs on display and to customize their appearance. You can also access this option from the **View** Menu.

Step 3

To view the raw data for a graph, double-click anywhere on the graph pane. This action opens a table listing all data points and data groupings along with their associated line colours. This same feature can be activated by right-clicking on the graph pane and selecting **View Graph Data** from the context-sensitive menu.

Step 4

To print the graphs displayed on the *Graphs* screen, right-click on any graph pane and select **Print Graphs**. You can also access this option from the **File** Menu.

Step 5

To export the data behind any graph to a *.CSV file, right-click on the selected graph and select Export Graph Data. You can also export graph data using the Export button on the bottom of the data table.

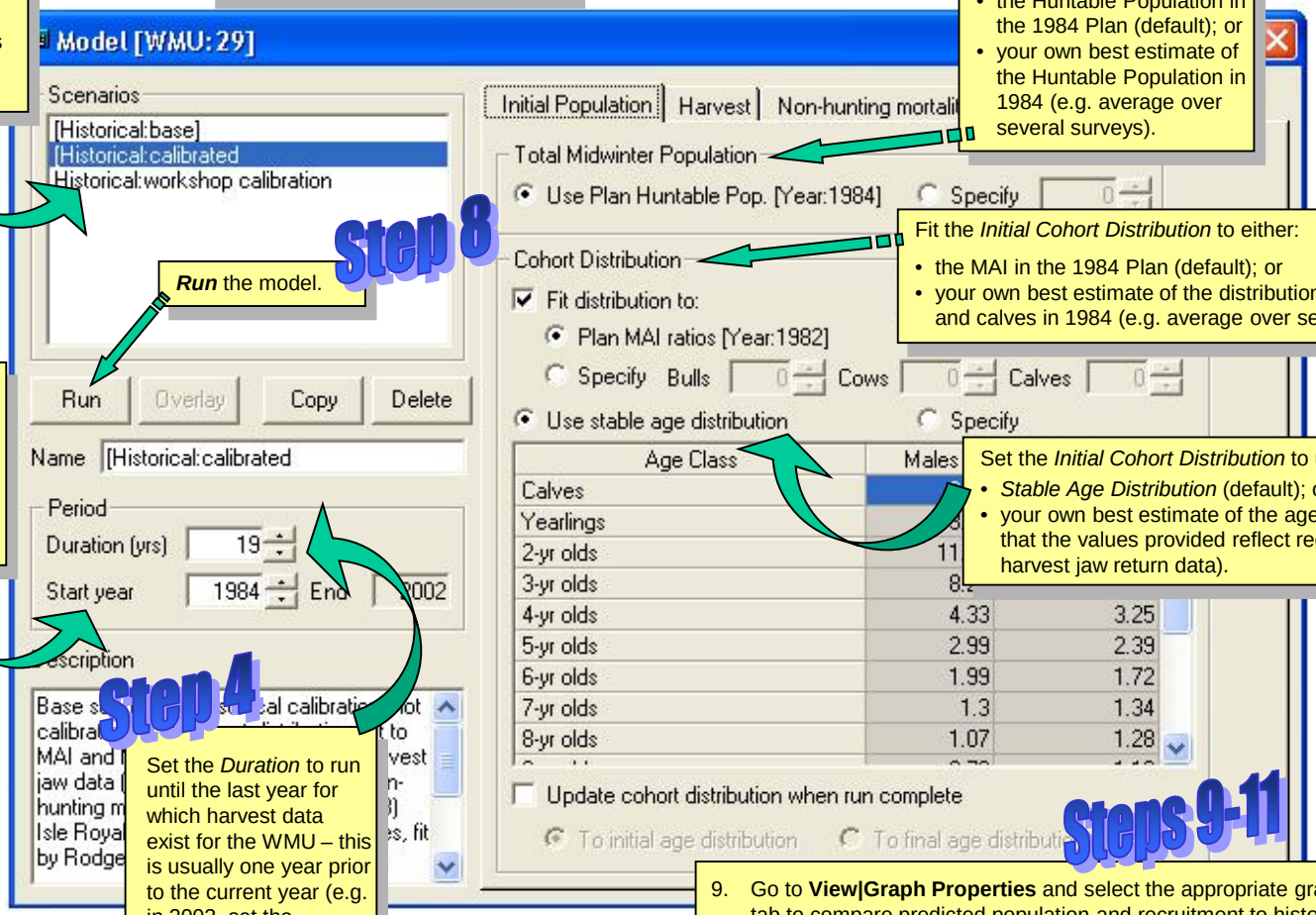
Calibrating the Model for a WMU

Step 2

Make a copy of the scenario called "Historical:base" – this contains the provincial default input parameters, configured to run over a historical period. Call this new scenario "Historical: calibrated".

Step 1

Select the WMU of interest from the **File** Menu, and open the **Model** Window from the **View** Menu.



Step 5

Estimate the *Initial Total Midwinter Population* for the WMU in 1984 using either:

- the Huntable Population in the 1984 Plan (default); or
- your own best estimate of the Huntable Population in 1984 (e.g. average over several surveys).

Step 6

Fit the *Initial Cohort Distribution* to either:

- the MAI in the 1984 Plan (default); or
- your own best estimate of the distribution of bulls, cows and calves in 1984 (e.g. average over several surveys).

Step 7

Set the *Initial Cohort Distribution* to use either:

- *Stable Age Distribution* (default); or
- your own best estimate of the age distribution (note that the values provided reflect regional pre-selective harvest jaw return data).

Step 8

Run the model.

Step 3

Set the model *Start year* as either:

- 1984 (default); or
- earliest year for which you have reasonable data for the WMU.

Step 4

Set the *Duration* to run until the last year for which harvest data exist for the WMU – this is usually one year prior to the current year (e.g. in 2003, set the *Duration* such that the *End* year is 2002).

Steps 9-11

9. Go to **View|Graph Properties** and select the appropriate graphs from the *Modelling* tab to compare predicted population and recruitment to historical values.
10. If fit is unsatisfactory, adjust the *Scaling* Factor for the *Non-Hunting Mortality* rates and/or the *Birth Rates* (last two tabs of the **Model** Window. ***Run*** (or ***Overlay***) the model again.
11. If you are satisfied with the fit of the model to the historical data, then save the scenario; otherwise try changing additional model inputs. Often the first thing to question is the survey data for 1984 – this can be changed by modifying the assumptions for the *Initial Total Midwinter Population*, and the *Initial Cohort Distribution* for Bulls, Cows and Calves.

Using the Model to Predict into the Future for a WMU

Step 1 Follow the steps outlined in the previous slide to create a historical calibrated scenario for the WMU of interest (e.g. called "Historical:calibrated"). This will contain parameter values calibrated to match the historical record for the WMU.

Step 2 Make a copy of the historical calibrated scenario. Call this new scenario "Future Predictions".

Step 3 Set the model *Start year* to the current year (e.g. 2004).

Step 4 Set the *Duration* to run as far forward as you would like (e.g., 10 years).

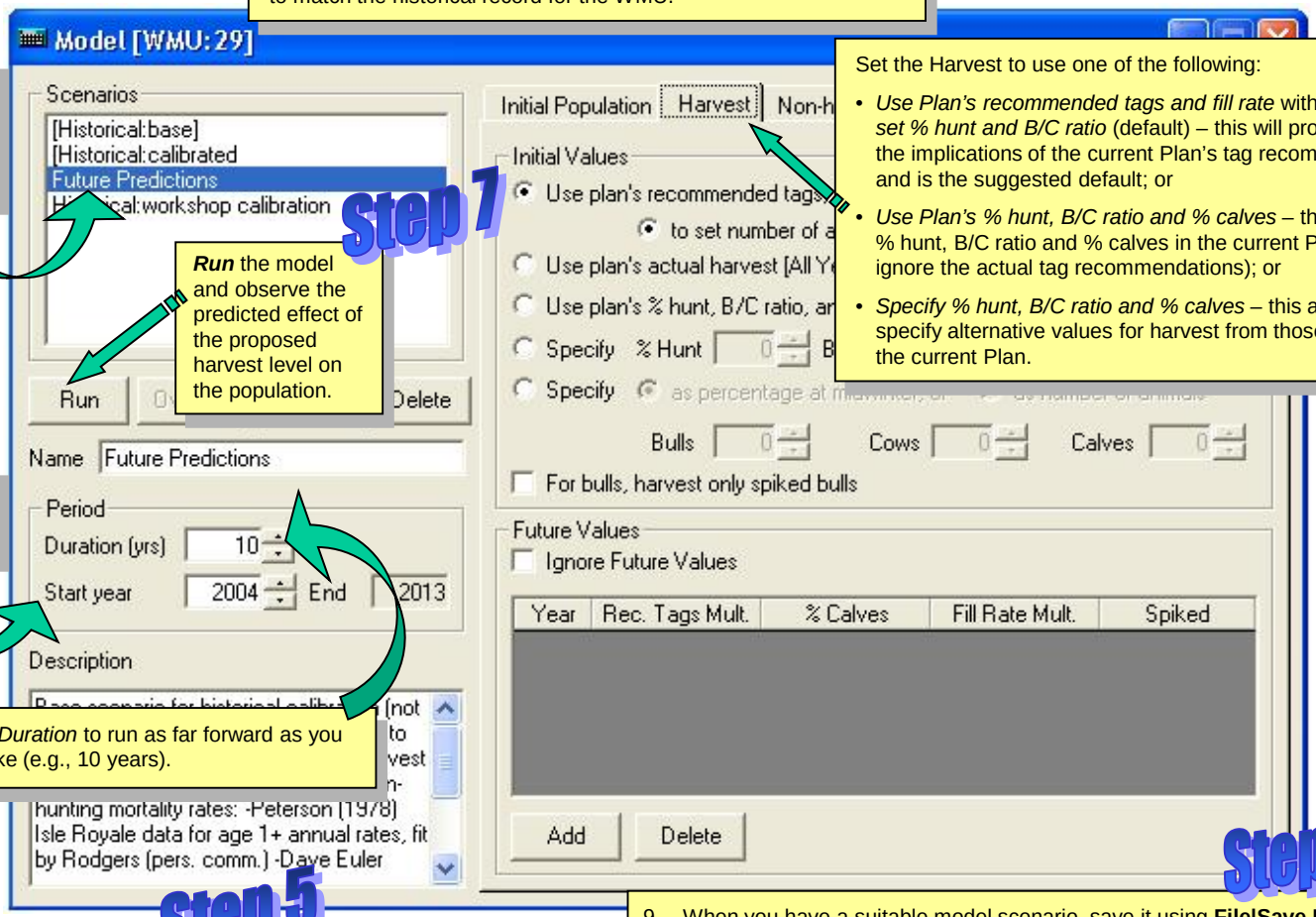
Step 5 Go back to the Initial Population tab and ensure that:

- the *Initial Cohort Distribution* is fit to the *Plan MAI ratios* for the current year; and
- the *Initial Cohort Distribution* is set to use *Stable Age Distribution*.

Step 6 Set the Harvest to use one of the following:

- *Use Plan's recommended tags and fill rate* with the option *to set % hunt and B/C ratio* (default) – this will project forward the implications of the current Plan's tag recommendations and is the suggested default; or
- *Use Plan's % hunt, B/C ratio and % calves* – this will use the % hunt, B/C ratio and % calves in the current Plan (but will ignore the actual tag recommendations); or
- *Specify % hunt, B/C ratio and % calves* – this allows you to specify alternative values for harvest from those provided in the current Plan.

Step 7 ***Run*** the model and observe the predicted effect of the proposed harvest level on the population.



Steps 8-9

9. When you have a suitable model scenario, save it using **File|Save Model** for future use on your computer.
10. Use the **File|Export|Scenario** option to save the currently selected scenario to a file. This will allow you to send it to another user.

Model Structure

The steps described in this presentation are those that occur in one annual time step of the model.

The first step in the annual cycle is to specify the initial midwinter moose population for the start year of the run, and to apportion those animals to all defined age/sex classes. The default number of age classes is 15, i.e., from calves to 14-year olds (and older).

Age	M	F
0	308	295
1	241	331
2	143	194
...	...	...
14+	8	21

Midwinter population

Age	M	F
0	308	295
1	241	331
2	143	194
...	...	...
14+	8	21

Midwinter population

Non-hunting mortality #1

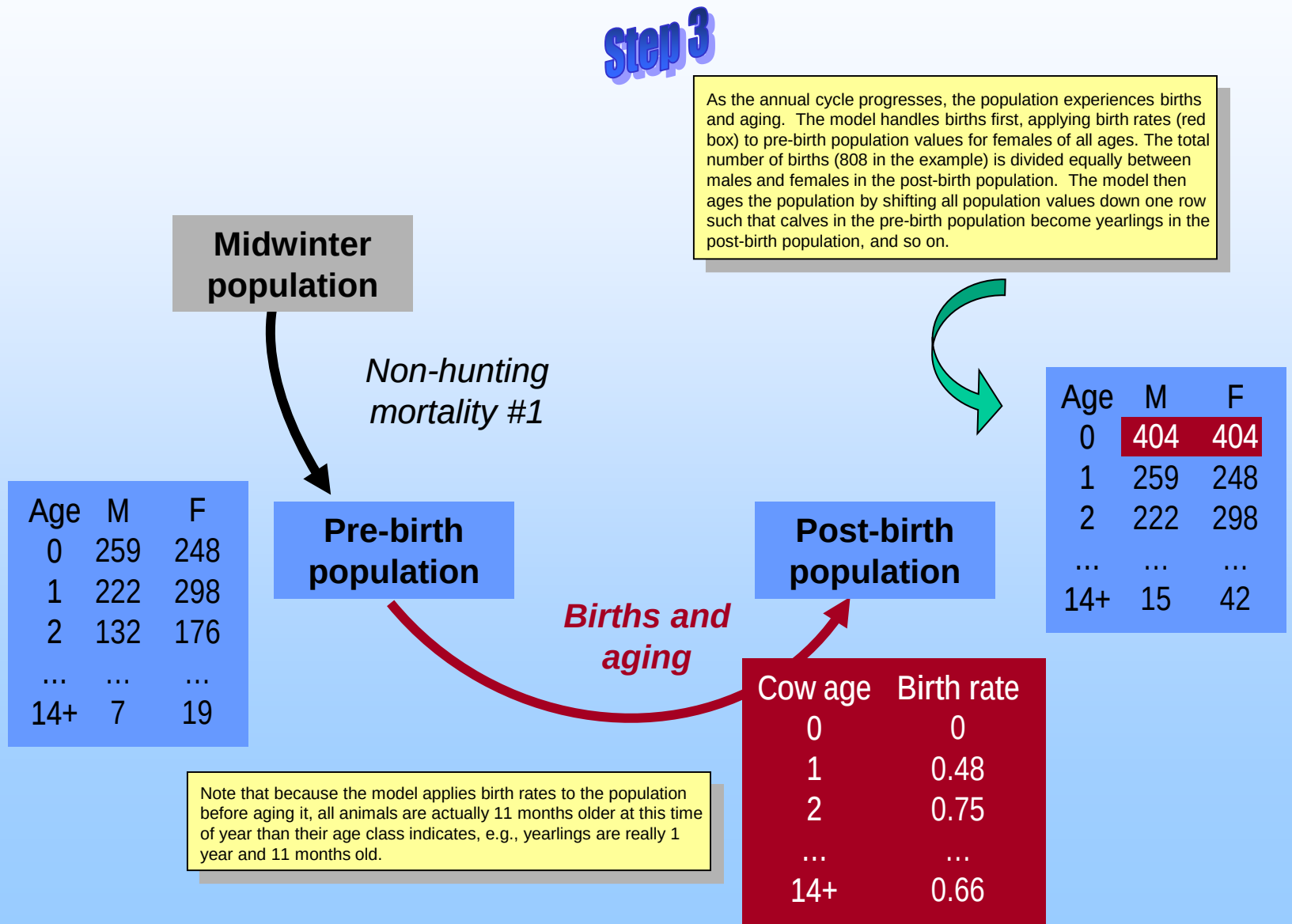
Age	M	F
0	0.16	0.16
1	0.08	0.10
2	0.08	0.09
...	...	...
14+	0.08	0.09

Pre-birth population

Age	M	F
0	259	248
1	222	298
2	132	176
...	...	...
14+	7	19

Step 2

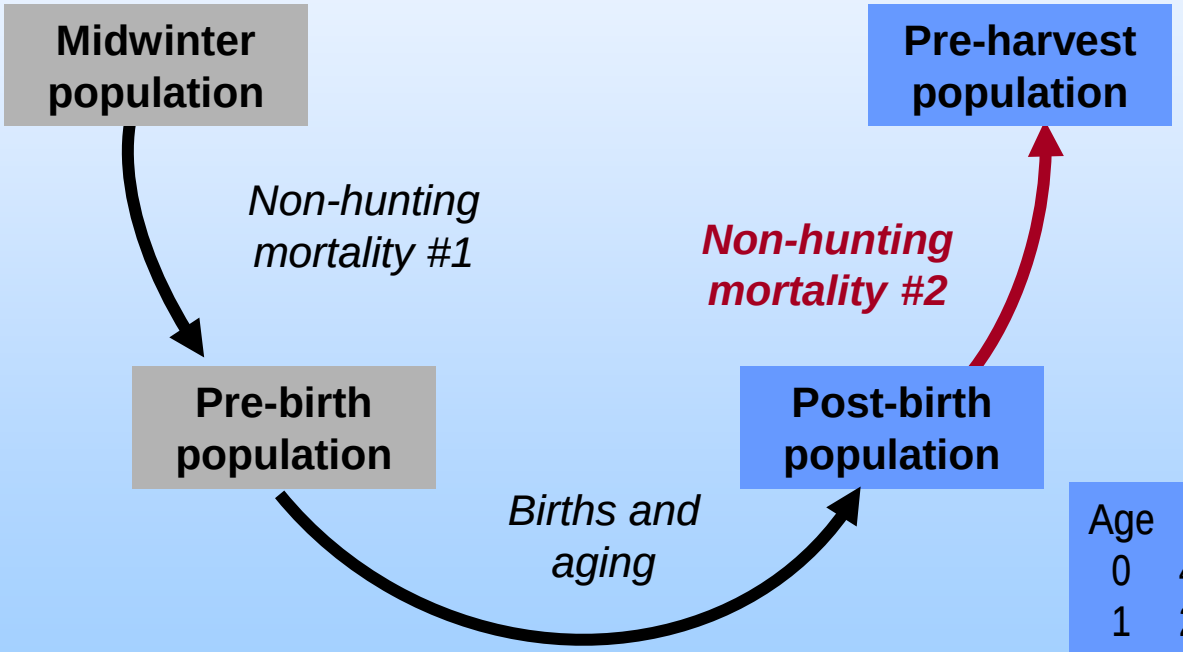
The model then applies non-hunting mortality rates (red box), corresponding to the midwinter to birth period, to the initial midwinter population values. The result is a reduced pre-birth population.


Step 3
As the annual cycle progresses, the population experiences births and aging. The model handles births first, applying birth rates (red box) to pre-birth population values for females of all ages. The total number of births (808 in the example) is divided equally between males and females in the post-birth population. The model then ages the population by shifting all population values down one row such that calves in the pre-birth population become yearlings in the post-birth population, and so on.
Midwinter population
Non-hunting mortality #1
Age M F
0 259 248
1 222 298
2 132 176
… … …
14+ 7 19
Pre-birth population
Births and aging
Post-birth population
Age M F
0 404 404
1 259 248
2 222 298
… … …
14+ 15 42
Cow age Birth rate
0 0
1 0.48
2 0.75
… …
14+ 0.66
Note that because the model applies birth rates to the population before aging it, all animals are actually 11 months older at this time of year than their age class indicates, e.g., yearlings are really 1 year and 11 months old.

Step 4

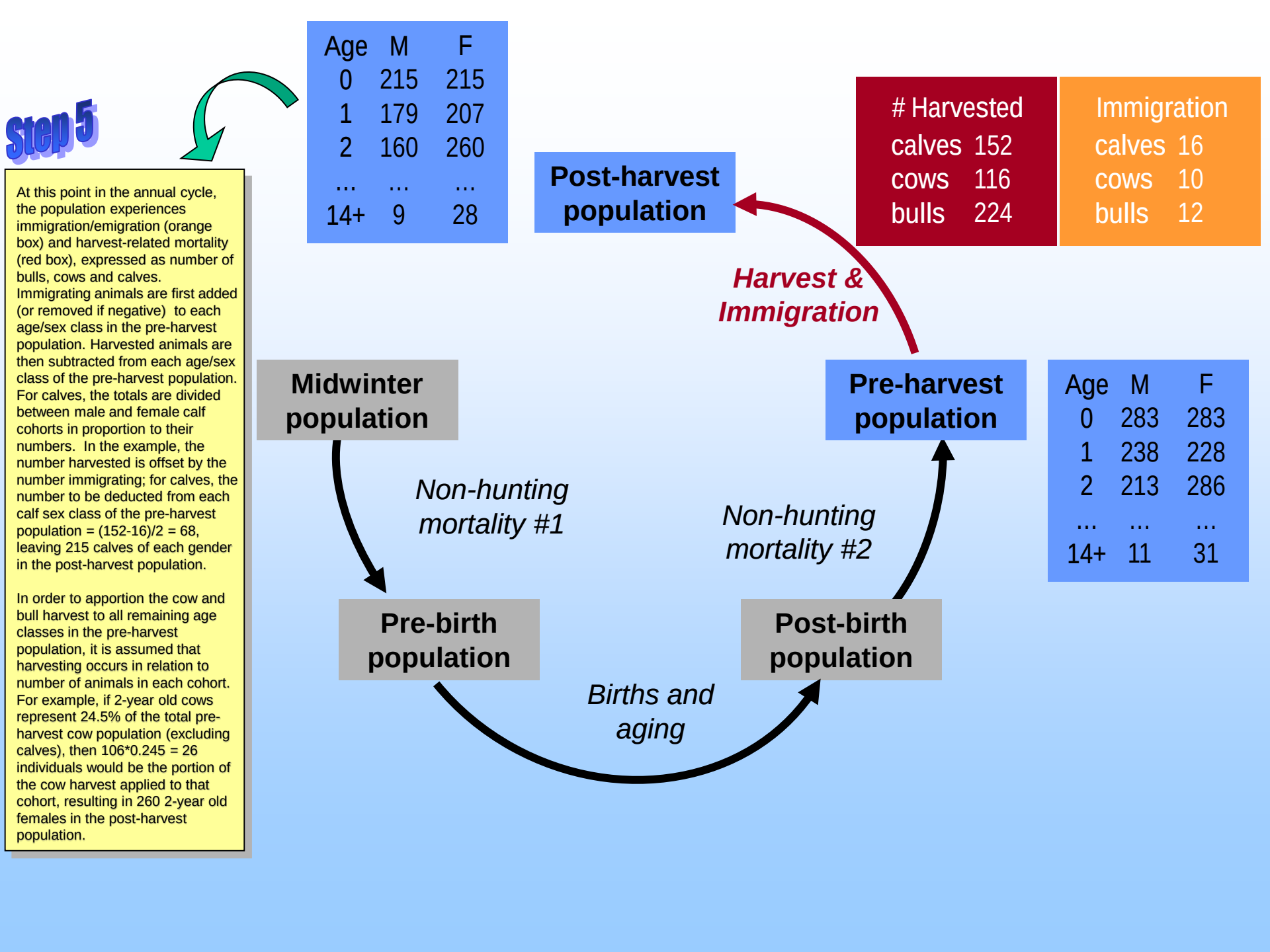
Next, the population experiences a second episode of non-hunting mortality during the birth to harvest period. The model applies these mortality rates (red box) to the post-birth population to produce a new set of values to represent the pre-harvest population.

Age	M	F
0	283	283
1	238	228
2	213	286
…	…	…
14+	11	31



Age	M	F
0	0.30	0.30
1	0.08	0.08
2	0.04	0.04
…	…	…
14+	0.04	0.04

Age	M	F
0	404	404
1	259	248
2	222	298
…	…	…
14+	15	42


Step 5
At this point in the annual cycle, the population experiences immigration/emigration (orange box) and harvest-related mortality (red box), expressed as number of bulls, cows and calves. Immigrating animals are first added (or removed if negative) to each age/sex class in the pre-harvest population. Harvested animals are then subtracted from each age/sex class of the pre-harvest population. For calves, the totals are divided between male and female calf cohorts in proportion to their numbers. In the example, the number harvested is offset by the number immigrating; for calves, the number to be deducted from each calf sex class of the pre-harvest population = (152-16)/2 = 68, leaving 215 calves of each gender in the post-harvest population.
In order to apportion the cow and bull harvest to all remaining age classes in the pre-harvest population, it is assumed that harvesting occurs in relation to number of animals in each cohort. For example, if 2-year old cows represent 24.5% of the total pre-harvest cow population (excluding calves), then 106*0.245 = 26 individuals would be the portion of the cow harvest applied to that cohort, resulting in 260 2-year old females in the post-harvest population.
Age M F
0 215 215
1 179 207
2 160 260
... ...
14+ 9 28
Post-harvest population
Harvested
calves 152
cows 116
bulls 224
Immigration
calves 16
cows 10
bulls 12
Harvest & Immigration
Pre-harvest population
Age M F
0 283 283
1 238 228
2 213 286
... ...
14+ 11 31
Midwinter population
Non-hunting mortality #1
Pre-birth population
Births and aging
Post-birth population
Non-hunting mortality #2

Step 6

Finally, the population experiences a third episode of non-hunting mortality during the harvest to midwinter period. The model applies these mortality rates (red box) to the post-harvest population to produce a new set of values that represents the new midwinter population in the following year. This calculation ends the first complete annual time step of the model; the process is then repeated for each subsequent model time step.

Age	M	F
0	0.05	0.05
1	0.05	0.05
2	0.05	0.05
...	...	...
14+	0.05	0.05

Age	M	F
0	215	215
1	179	207
2	160	260
...	...	...
14+	9	28

Age	M	F
0	204	204
1	170	197
2	152	247
...	...	...
14+	8	27