

APPENDIX 6. Source code for AISPREAD

AISpread1.0.mbp

[LINK]

```
Application=d:\AISpread\AISpread1.0.mbx
Module=AI_model_dailyupdate_5September09.mb
Module=AI_model_functions_5September09.mb
Module=AI_model_main_1March10.mb
Module=AI_model_menu_31October09.mb
Module=AI_model_mitigations_8February10.mb
Module=AI_model_populate_5September09.mb
Module=AI_model_spread_31October09.mb
Module=AI_model_timing_5September09.mb
```

AI_model.def

```
Declare sub main
Declare sub menu
Declare sub AISpread
Declare sub load_data
Declare sub culled
Declare sub susceptible
Declare sub latent
Declare sub infectious
Declare sub immune
Declare sub dead
Declare sub contaminated
Declare sub removed
Declare sub disease_update
Declare sub daily_update
Declare sub local_spread
Declare sub feed_spread
Declare sub dead_spread
Declare sub san_spread
Declare sub Lrem_spread
Declare sub Ldel_spread
Declare sub vacc_spread
```

```
Declare sub pickup_spread
Declare sub slau_spread
Declare sub egg_spread
Declare sub doc_spread
Declare sub spike_spread
Declare sub updatecounters
Declare sub newcycle
Declare sub results
Declare sub dis_results
Declare sub initialdata
Declare sub load_para_data
Declare sub enddialog
Declare sub mitigations
Declare sub surveillance
Declare sub tracing
Declare sub diagnosis
Declare sub depopulation
Declare sub areas
Declare sub cmtiming
Declare sub cltiming
Declare sub dutiming
Declare sub tutiming
Declare sub cmpopulate
Declare sub clpopulate
Declare sub dupopulate
Declare sub tupopulate
Declare sub factorial
Declare sub bioexc
Declare sub biocon
Declare sub live_spread
Declare sub updatesurv
Declare sub resolved
Declare sub updatelatent
declare sub tacticalvacc
declare sub vaccimm
Declare sub progresswin
Declare sub decay_fom
declare sub repday (ByVal spp as integer,ByVal vacs as integer)
declare sub CMprodpara
```

```

declare sub CLprodpara
declare sub DUprodpara
declare sub TUprodpara
declare sub farmpara
declare sub localpara
declare sub dirpara
declare sub indirpara
declare sub biocontpara
declare sub bioexcpa
declare sub survpara
declare sub diagpara
declare sub tracpara
declare sub zoningpara
declare sub movepara
declare sub cullpara
declare sub vaccpara
declare sub ecopara1
declare sub ecopara2
declare sub pref1
declare sub seed1
declare sub view1
declare sub exit1
declare sub vaccIP (ByVal spp as integer,ByVal vacs as integer)

Declare sub seedrandom lib "d:\AISpread\PRNG\randomad.dll" alias "TRandomInit" (byval seed as integer)
Declare function random lib "d:\AISpread\PRNG\randomad.dll" alias "TRandom" () as float

Declare function triangle (ByVal l as integer,ByVal m as integer,ByVal h as integer) as integer
Declare function poisson (ByVal la as float) as integer
Declare function tsp (ByVal l,m,h as integer,n as float) as integer
Declare function normal (ByVal mean,sd as float) as integer
Declare function lognormal (ByVal mean,sd as float) as integer
Declare function weibull (ByVal alpha,beta,shift as float) as integer
Declare function beta_pert(ByVal l as float,ByVal m as float,ByVal h as float) as integer
Declare function gamma (ByVal alpha as float,ByVal scale as float) as float
Declare function uniform (ByVal l as integer,ByVal h as integer) as integer
Declare function compo (ByVal farmid as integer) as float
declare function vaccSe (ByVal spp as integer,ByVal vacs as integer) as float
declare function vaccsusc (ByVal spp as integer,ByVal vacs as integer) as float

```

```
declare function vaccinfect (ByVal spp as integer,ByVal vacs as integer) as float
```

```
global
```

```
runcompleted,savedpop,includecm,includecl,includetu,includededu,local_inc,feed_inc,dbc_inc,vacc_inc,lrem_inc,ldel_inc,  
san_inc,thin_inc,  
slau_inc,egg_inc,doc_inc,live_inc,mit_inc,spk_inc,rep,truscott,jurisd,vstarted as logical
```

```
global
```

```
nfarms,ctrl,itctr,dayctr,nsus,ntobelat,nIP7d,nlat,ninf,ndead,nimm,nrem,ncont,newsus1,newsus2,newlat1,newlat2,newlat3  
,newinf,newdead,newimm,newrem1,  
newrem2,newrem3,newrem4,newcont2,newcont3,newrem5,newrem6,newcont4a,newcont4b,newcont4c,newcont4d,idno1,feedid,dbcid  
,ldelid,lremid,pickupid,slauid,  
eggid,docid,type_id,intid,vaccid,sanid,loopend,itnumber,x,dayssincediag,ctr4,NoDueSurv,NoDueDiag,NoDueDepop,NoDepop,  
noresolved,notraced,nosps,  
withinCA,withinRA,inca,inra,diag,idno2,RAmove,RAfeed,RAdbc,RApickup,RAslau,RAeggs,RAvacc,RArem,RAsan,RAldel,RAdoc,C  
Amove,CAfeed,CAdbc,CAslau,CAeggs,CAvacc,CALrem,CAsan,CALdel,CAdoc,preemptsl,acceldepop,nrepvisits,totvcrews,nvaccimm1,nvaccimm2,vacc_ty  
pe,vcrewscap,reportday,ninRA,  
ninCA,contdays,survlimit,culllimit,nculled,ndeadb,nfvacc1,nfvacc2,nbvacc1,nbvacc2,nvdoses,dbswab,svswab,svsera,nswab  
s,nsera,spp,dayend,nfvdue,vtime,  
npec, npecculled as integer
```

```
global
```

```
TOTCM1,TOTCM2,TOTCM3,TOTCM4,TOTCM5,TOTCM6,TOTCM7,TOTCM8,TOTCL1,TOTCL2,TOTCL3,TOTCL4,TOTDU1,TOTDU2,TOTDU3,TOTTU1,TOTT  
U2,TOTTU3 as integer
```

```
global
```

```
timer1,n0,f,x1,y1,z,seasonality,infectivity,bioexcl,biocont,pickupcont,feedcont,RAbuffer,CAbuffer,v_inner,v_outer,de  
cay,contactday,repearly,  
p_feed1,p_dbc1,p_lrem1,p_san1,p_ldel1,p_vacc1,p_pul,p_slau1,p_egg1,p_doc1,costcomp,costcull,costpercull,costdecont,c  
ostperdecont,costtest,costperswab,  
costpersera,costvacc,costpervacc,costop,costperop,costoverdue,cost11,cost12,cost13,cost14,cost15,cost16,cost17,cost1  
8,cost21,cost22,cost23,cost24,  
cost31,cost32,cost33,cost41,cost42,cost43,biocont1i,biocont11,biocont12,biocont13,biocont14,biocont15,biocont16,bioc  
ont17,biocont18,biocont21,biocont22,  
biocont23,biocont24,biocont3i,biocont31,biocont32,biocont33,biocont4i,biocont41,biocont42,biocont43,bioexcl1i,bioexc  
l11,bioexcl12,bioexcl13,bioexcl14,  
bioexcl15,bioexcl16,bioexcl17,bioexcl18,bioexcl21,bioexcl22,bioexcl23,bioexcl24,bioexcl3i,bioexcl31,bioexcl32,bioexc  
l33,bioexcl4i,bioexcl41,bioexcl42,
```

```
bioexcl43,v1susclx,v1susc2x,v1susc3x,v1susc4x,v2susclx,v2susc2x,v2susc3x,v2susc4x,v1Se1x,v1Se2x,v1Se3x,v1Se4x,v2Se1x
,v2Se2x,v2Se3x,v2Se4x,
v1IP1x_l,v1IP1x_m,v1IP1x_h,v1IP2x_l,v1IP2x_m,v1IP2x_h,v1IP3x_l,v1IP3x_m,v1IP3x_h,v1IP4x_l,v1IP4x_m,v1IP4x_h,
v2IP1x_l,v2IP1x_m,v2IP1x_h,v2IP2x_l,v2IP2x_m,v2IP2x_h,v2IP3x_l,v2IP3x_m,v2IP3x_h,v2IP4x_l,v2IP4x_m,v2IP4x_h,
v1RP1x_l,v1RP1x_m,v1RP1x_h,v1RP2x_l,v1RP2x_m,v1RP2x_h,v1RP3x_l,v1RP3x_m,v1RP3x_h,v1RP4x_l,v1RP4x_m,v1RP4x_h,
v2RP1x_l,v2RP1x_m,v2RP1x_h,v2RP2x_l,v2RP2x_m,v2RP2x_h,v2RP3x_l,v2RP3x_m,v2RP3x_h,v2RP4x_l,v2RP4x_m,v2RP4x_h,vaccinfe
c,vrounds,seed,l,m,h,ptrace,
Sevisit,Sedbc, Sevaccvisit as float

global stimer1,stimer2,mtimer1,mtimer2 as float

global rarea,carea,IP as object

global app_path as string

type farm_type

    id as smallint
    typeofbirds as smallint
    species as smallint
    multiaged as smallint
    integrator as smallint
    dbc_id as smallint
    feed_source1 as smallint
    feed_source2 as smallint
    pickup_id1 as smallint
    Lrem_id1 as smallint
    Lrem_id2 as smallint
    swd_id1 as smallint
    swd_id2 as smallint
    Ldel_id1 as smallint
    Ldel_id2 as smallint
    Ldel_id3 as smallint
    slauid1 as smallint
    slauid2 as smallint
    eggid1 as smallint
    eggid2 as smallint
    docid1 as smallint
    docid2 as smallint
```

vaccid1 as smallint
dbc as smallint
cycleday as smallint
endofthisbatch as smallint
overdue as smallint
daysoverdue as smallint
daystocycle as smallint
daystofeeddelivery as smallint
daystodbc as smallint
thinning1 as smallint
thinning2 as smallint
thinning3 as smallint
litterremoval as smallint
swd as smallint
litterdelivery as smallint
turn_time as smallint
populated as smallint
batchdue as smallint
spikingday as smallint
layingcyclelength as smallint
startoflay as smallint
vacc_day1 as smallint
vacc_day2 as smallint
vacc_day3 as smallint
feed_del as smallint
dead_bird as smallint
thin as smallint
spiking as smallint
daytosetegg as smallint
litter_c as smallint
sanas smallint
litter_d as smallint
vaccinate as smallint
in_lay as smallint
fate as smallint
status as smallint
become_lat as smallint
daystillatent as smallint
become_cont as smallint

```
daystilcont as smallint
daysleftcont as smallint
daysleftlatent as smallint
daystildead as smallint
dayssincedead as smallint
daystilimmune as smallint
daysleftimmune as smallint
inf_day as smallint
when_inf as smallint
how_inf as string
exp_by as smallint
report as smallint
daystillreport as smallint
R as smallint
capacity as integer
currentcap as integer
cdays as smallint
state as string*3
gridid as smallint
xx as float
yy as float
loc as object
```

end type

```
global dyn_data(0) as farm_type
global base_data(0) as farm_type
```

type surv_type

```
id as Smallint
surv_status as Smallint
self_report as Smallint
daystilldiag as Smallint
diagoutcome as Smallint
days_sched_surv as Smallint
SurvNo as Smallint
days_since_surv as Smallint
```

```
days_sched_depop as Smallint
days_since_depop as Smallint
daysleftdepop as Smallint
traced as Smallint
RA as Smallint
CA as Smallint
VA as smallint
diagnosed as Smallint
DCP as Smallint
SP as Smallint
cdays as smallint
partcullled as smallint
toremoved as smallint
vacc_status as Smallint
vdue_day as Smallint
why_vacc as Smallint
vdays as Smallint
daystovaccimm as smallint
duepec as smallint
```

```
end type
```

```
global surv_data(0) as surv_type
```

```
type disease_outputs
```

```
id as smallint
daylat as smallint
howinf as string
dayinf as smallint
```

```
endinf as smallint
endstat as smallint
howend as string
```

```
end type
```

```
global disoutputs(0) as disease_outputs
```



```
type poppara
    description as string
    lowv as float
    modev as float
    highv as float
    other as float

end type

global popp(0) as poppara
global disp(0) as poppara

type locpar
    Ho as float
    Rd as float
    alpha as float
    maxrad as float

end type

global loc_par as locpar

type exp
    day as smallint
    id as smallint
    from as smallint
    how as string
    effective as smallint

end type

global exposures(0) as exp

type dis_res
```

```
it as smallint
day as Smallint
nsus as Smallint
nlat as Smallint
ninf as Smallint
ndead as Smallint
nimm as Smallint
nrem as Smallint
ncont as Smallint
newsus as Smallint
newlat as Smallint
newinf as Smallint
newimm as Smallint
newdead as Smallint
newrem as Smallint
newcont as Smallint
nduesurv as Smallint
nduediag as Smallint
nduedepop as Smallint
ndepop as Smallint
nresolved as Smallint
ntraced as smallint
nsps as smallint
withinCA as Smallint
withinRA as Smallint
```

end type

```
global disease_results(0) as dis_res
```

```
type it_res
  scenario as string
  itno as smallint
  endday as Smallint
  nIP7d as smallint
  ninf as Smallint
  ncul as smallint
  ndeadbirds as integer
  RA_area as float
```

n_inRA as Smallint
CA_area as float
n_inCA as Smallint
MCHarea as float
n_inMCH as Smallint
nfarmvacc1 as smallint
nfarmvacc2 as smallint
nbirdsvacc1 as integer
nbirdsvacc2 as integer
nvaccdoses as integer
nfarmvaccimm1 as smallint
nfarmvaccimm2 as smallint
vacctime as smallint
npec_due as smallint
npec_culled as smallint
swabs as integer
sera as integer
costcomp as float
costcull as float
costdecont as float
costtest as float
costvacc as float
costop as float
costoverdue as float
cost as float
Rmin as float
R25 as float
Rmed as float
R75 as float
Rmax as float
Ravg as float
ngrid as smallint
it as smallint
OD_CM1 as smallint
OD_CM2 as smallint
OD_CM3 as smallint
OD_CM4 as smallint
OD_CM5 as smallint
OD_CM6 as smallint

OD_CM7 as smallint
OD_CM8 as smallint
OD_CL1 as smallint
OD_CL2 as smallint
OD_CL3 as smallint
OD_CL4 as smallint
OD_DU1 as smallint
OD_DU2 as smallint
OD_DU3 as smallint
OD_TU1 as smallint
OD_TU2 as smallint
OD_TU3 as smallint
IN_CM1 as smallint
IN_CM2 as smallint
IN_CM3 as smallint
IN_CM4 as smallint
IN_CM5 as smallint
IN_CM6 as smallint
IN_CM7 as smallint
IN_CM8 as smallint
IN_CL1 as smallint
IN_CL2 as smallint
IN_CL3 as smallint
IN_CL4 as smallint
IN_DU1 as smallint
IN_DU2 as smallint
IN_DU3 as smallint
IN_TU1 as smallint
IN_TU2 as smallint
IN_TU3 as smallint
TOT_CM1 as integer
TOT_CM2 as integer
TOT_CM3 as integer
TOT_CM4 as integer
TOT_CM5 as integer
TOT_CM6 as integer
TOT_CM7 as integer
TOT_CM8 as integer
TOT_CL1 as integer

```

TOT_CL2 as integer
TOT_CL3 as integer
TOT_CL4 as integer
TOT_DU1 as integer
TOT_DU2 as integer
TOT_DU3 as integer
TOT_TU1 as integer
TOT_TU2 as integer
TOT_TU3 as integer
end type

global it_results(0) as it_res

type inf_list

    id as smallint

end type
global inflist(0) as inf_list

```

AI_model_dailyupdate_5September09.mb

```

Include "Mapbasic.def"
Include "AI_Model.def"

sub daily_update
dim ctr2, idno as smallint
for ctr2=1 to nfarms
    idno1=dyn_data(ctr2).id
    if dyn_data(ctr2).feed_del=1 and dyn_data(ctr2).daystofeeddelivery=0 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0)
        or (surv_data(ctr2).ra=1 and RAfeed=1) or (surv_data(ctr2).ca=1 and CAfeed=1)) then
            if dyn_data(ctr2).multiaged=0 then
                if dyn_data(ctr2).endofthisbatch>popp(29).other then
                    dyn_data(ctr2).daystofeeddelivery=popp(29).other
                else
                    dyn_data(ctr2).feed_del=0
                    dyn_data(ctr2).daystofeeddelivery=0
                end if
            else

```

```

        dyn_data(ctr2).daystofeeddelivery=popp(29).other
    end if
    if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"feed" then
        end if
    end if
end if
if dyn_data(ctr2).dead_bird=1 and dyn_data(ctr2).dbc<>0 and dyn_data(ctr2).daystodbc=0 then
    if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAdbc=1) or (surv_data(ctr2).ca=1 and CAdbc=1)) then
        if dyn_data(ctr2).multiaged=0 then
            if dyn_data(ctr2).dbc_id=4 then
                if dyn_data(ctr2).endofthisbatch>popp(78).other then
                    dyn_data(ctr2).daystodbc=popp(78).other
                else
                    dyn_data(ctr2).dead_bird=0
                    dyn_data(ctr2).daystodbc=0
                end if
            else
                if dyn_data(ctr2).endofthisbatch>popp(30).other then
                    dyn_data(ctr2).daystodbc=popp(30).other
                else
                    dyn_data(ctr2).dead_bird=0
                    dyn_data(ctr2).daystodbc=0
                end if
            end if
        end if
    end if

    end if
    if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"dbc" then
        end if
    end if
end if
if dyn_data(ctr2).litter_c=1 and dyn_data(ctr2).litterremoval=0 then
    if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAlrem=1) or (surv_data(ctr2).ca=1 and CALrem=1)) then
        dyn_data(ctr2).litter_c=0
        if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"lc" then

```

```

        end if
    end if
end if
if dyn_data(ctr2).san=1 and dyn_data(ctr2).swd=0 then
    if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAsan=1) or (surv_data(ctr2).ca=1 and CAsan=1)) then
        dyn_data(ctr2).san=0
        if dyn_data(ctr2).status=6 and dyn_data(ctr2).multiaged=0 then
            if random()<=1 then
                newrem3=newrem3+1
                dyn_data(ctr2).status=5
                dyn_data(ctr2).daysleftcont=0
            end if
        end if
        if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"san" then
            end if
        end if
    end if
if dyn_data(ctr2).litter_d=1 and dyn_data(ctr2).litterdelivery=0 then

    if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAldel=1) or (surv_data(ctr2).ca=1 and CAldel=1)) then
        dyn_data(ctr2).litter_d=0
        if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"ld" then
            end if
        end if
    end if
if dyn_data(ctr2).spiking=1 and dyn_data(ctr2).spikingday=0 then
    if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAmove=1) or (surv_data(ctr2).ca=1 and CAmove=1)) then
        dyn_data(ctr2).spiking=0
        if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn data(ctr2).how_inf<>"sp" then
            end if
        end if
    end if
if dyn_data(ctr2).multiaged=0 then

```

```

do case dyn_data(ctr2).species
case 1
  do case dyn_data(ctr2).typeofbirds
  case 1
    if dyn_data(ctr2).thin=1 then
      if dyn_data(ctr2).thinning1=0 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RApickup=1) or (surv_data(ctr2).ca=1 and CApickup=1)) then
          dyn_data(ctr2).thin=2
          dyn_data(ctr2).thinning1=0
          dyn_data(ctr2).overdue=0
          dyn_data(ctr2).daysoverdue=0
          dyn_data(ctr2).currentcap=int(dyn_data(ctr2).capacity*2/3)
          if mit_inc=1 and dyn_data(ctr2).currentcap>vcrewscap then
            if dyn_data(ctr2).currentcap mod vcrewscap=0 then
              surv_data(ctr2).vdays=dyn_data(ctr2).currentcap/vcrewscap
            else
              surv_data(ctr2).vdays=dyn_data(ctr2).currentcap\vcrewscap+1
            end if
          else
            surv_data(ctr2).vdays=1
          end if
          if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr
or dyn_data(ctr2).how_inf<>"thin" then
            end if
          else
            dyn_data(ctr2).overdue=1
          end if
        end if
      elseif dyn_data(ctr2).thin=2 then
        if dyn_data(ctr2).thinning2=0 then
          if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RApickup=1) or (surv_data(ctr2).ca=1 and CApickup=1)) then
            dyn_data(ctr2).thin=3
            dyn_data(ctr2).thinning2=0
            dyn_data(ctr2).overdue=0
            dyn_data(ctr2).daysoverdue=0
            dyn_data(ctr2).currentcap=int(dyn_data(ctr2).capacity*1/3)
            if mit_inc=1 and dyn_data(ctr2).currentcap>vcrewscap then

```



```

        if dyn_data(ctr2).currentcap mod vcrewscap=0 then
            surv_data(ctr2).vdays=dyn_data(ctr2).currentcap/vcrewscap
        else
            surv_data(ctr2).vdays=dyn_data(ctr2).currentcap\vcrewscap+1
        end if
    else
        surv_data(ctr2).vdays=1
    end if

        if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr
or dyn_data(ctr2).how_inf<>"thin" then
            end if
        else
            dyn_data(ctr2).overdue=1
        end if
    end if
elseif dyn_data(ctr2).thin=3 then
    if dyn_data(ctr2).thinning3=0 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAPickup=1) or (surv_data(ctr2).ca=1 and CAPickup=1)) then
            dyn_data(ctr2).thin=0
            dyn_data(ctr2).thinning3=0
            dyn_data(ctr2).overdue=0
            dyn_data(ctr2).daysoverdue=0
            dyn_data(ctr2).currentcap=0
            surv_data(ctr2).vdays=0
            if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr
or dyn_data(ctr2).how_inf<>"thin" then
                end if
            else
                dyn_data(ctr2).overdue=1
            end if
        end if
    end if
    if mit inc=1 and surv data(ctr2).ra=1 and RAPickup=1 and dyn data(ctr2).populated=1 then
        if dyn_data(ctr2).thinning1=1 or dyn_data(ctr2).thinning2=1 or dyn_data(ctr2).thinning3=1 then
            if surv_data(ctr2).surv_status<=1 then
                surv_data(ctr2).surv_status=3
                surv_data(ctr2).survno=1
            end if
        end if
    end if
end if

```

```

surv_data(ctr2).daystilldiag=1
nsera=nsera+svsera
nswabs=nswabs+dbswab
costttest=costttest+(svswab*costperswab)+(svsera+costpersera)
if dyn_data(ctr2).status>1 and dyn_data(ctr2).status<5 and random()<=Sevisit then
  surv_data(ctr2).diagoutcome=1
else
  surv_data(ctr2).diagoutcome=2
  if acceldepop=1 then
    dyn_data(ctr2).endofthisbatch=1
    dyn_data(ctr2).thinning1=0
    dyn_data(ctr2).thinning2=0
    dyn_data(ctr2).thinning3=1
    dyn_data(ctr2).thin=3
  end if
end if
end if
end if
case 2

case 3

  if dyn_data(ctr2).vaccinate=1 and dyn_data(ctr2).vacc_day1=0 then
    if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
      dyn_data(ctr2).vacc_day2=beta_pert(popp(13).lowv,popp(13).modev,popp(13).highv)-
dyn_data(ctr2).cycleday
      dyn_data(ctr2).vaccinate=2
      if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
        end if
      end if
    end if
    if dyn_data(ctr2).vaccinate=2 and dyn_data(ctr2).vacc_day2=0 then
      if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
        dyn_data(ctr2).vacc_day3=beta_pert(popp(14).lowv,popp(14).modev,popp(14).highv)-
dyn_data(ctr2).cycleday

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```

        dyn_data(ctr2).vaccinate=3
        if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
            end if
        end if
    end if
    if dyn_data(ctr2).vaccinate=3 and dyn_data(ctr2).vacc_day3=0 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
            dyn_data(ctr2).vaccinate=0
            dyn_data(ctr2).vacc_day3=0
            if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                end if
            end if
        end if
    case 4
        if dyn_data(ctr2).vaccinate=1 and dyn_data(ctr2).vacc_day1=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vacc_day2=beta_pert(popp(10).lowv, popp(10).modev, popp(10).highv) -
dyn_data(ctr2).cycleday
                dyn_data(ctr2).vaccinate=2
                if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                    end if
                end if
            end if
            if dyn_data(ctr2).vaccinate=2 and dyn_data(ctr2).vacc_day2=0 then
                if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                    dyn_data(ctr2).vacc_day3=beta_pert(popp(11).lowv, popp(11).modev, popp(11).highv) -
dyn_data(ctr2).cycleday
                    dyn_data(ctr2).vaccinate=3
                    if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                        end if
                    end if
                end if
            end if
        end if
    end if

```

```

        if dyn_data(ctr2).vaccinate=3 and dyn_data(ctr2).vacc_day3=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vaccinate=0
                dyn_data(ctr2).vacc_day3=0
                if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                    end if
                end if
            end if
        end if
    case 5

    case 6

        if dyn_data(ctr2).vaccinate=1 and dyn_data(ctr2).vacc_day1=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vacc_day2=beta_pert(popp(19).lowv,popp(19).modev,popp(19).highv)-
dyn_data(ctr2).cycleday
                dyn_data(ctr2).vaccinate=2
                if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                    if mit_inc=1 then
                        end if
                    end if
                end if
            end if
        end if
        if dyn_data(ctr2).vaccinate=2 and dyn_data(ctr2).vacc_day2=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vacc_day3=beta_pert(popp(20).lowv,popp(20).modev,popp(20).highv)-
dyn_data(ctr2).cycleday
                dyn_data(ctr2).vaccinate=3
                if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                    end if
                end if
            end if
        end if
        if dyn_data(ctr2).vaccinate=3 and dyn_data(ctr2).vacc_day3=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then

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```

        dyn_data(ctr2).vaccinate=0
        dyn_data(ctr2).vacc_day3=0
        if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
            end if
        end if
    end if
case 7
    if dyn_data(ctr2).vaccinate=1 and dyn_data(ctr2).vacc_day1=0 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
            dyn_data(ctr2).vacc_day2=beta_pert(popp(16).lowv, popp(16).modev, popp(16).highv) -
dyn_data(ctr2).cycleday
            dyn_data(ctr2).vaccinate=2
            if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                end if
            end if
        end if
        if dyn_data(ctr2).vaccinate=2 and dyn_data(ctr2).vacc_day2=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vacc_day3=beta_pert(popp(17).lowv, popp(17).modev, popp(17).highv) -
dyn_data(ctr2).cycleday
                dyn_data(ctr2).vaccinate=3
                if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                    end if
                end if
            end if
            if dyn_data(ctr2).vaccinate=3 and dyn_data(ctr2).vacc_day3=0 then
                if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                    dyn_data(ctr2).vaccinate=0
                    dyn_data(ctr2).vacc_day3=0
                    if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                        end if
                    end if
                end if
            end if
        end if
    end if

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```

        end if
    case 8

    end case
case 2
do case dyn_data(ctr2).typeofbirds
case 1
    if dyn_data(ctr2).in_lay=0 and dyn_data(ctr2).daytosetegg=0 and dyn_data(ctr2).populated=1 and
dyn_data(ctr2).status<>3 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAeggs=1) or (surv_data(ctr2).ca=1 and CAeggs=1)) then
            dyn_data(ctr2).in_lay=1
        end if
    end if
case 2
    if dyn_data(ctr2).in_lay=0 and dyn_data(ctr2).daytosetegg=0 and dyn_data(ctr2).populated=1 and
dyn_data(ctr2).status<>3 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAeggs=1) or (surv_data(ctr2).ca=1 and CAeggs=1)) then
            dyn_data(ctr2).in_lay=1
        end if
    end if
    if dyn_data(ctr2).vaccinate=1 and dyn_data(ctr2).vacc_day1=0 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
            dyn_data(ctr2).vaccinate=0
            if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                end if
            end if
        end if
    case 3
        if dyn_data(ctr2).vaccinate=1 and dyn_data(ctr2).vacc_day1=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vacc_day2=beta_pert(popp(54).lowv,popp(54).modev,popp(54).highv)-
dyn_data(ctr2).cycleday
                dyn_data(ctr2).vaccinate=2
            end if
        end if
    end case
end case
end do

```

```

        if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
            end if
        end if
    end if
    if dyn_data(ctr2).vaccinate=2 and dyn_data(ctr2).vacc_day2=0 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
            dyn_data(ctr2).vacc_day3=beta_pert(popp(55).lowv,popp(55).modev,popp(55).highv) -
dyn_data(ctr2).cycleday
            dyn_data(ctr2).vaccinate=3
            if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                end if
            end if
        end if
    if dyn_data(ctr2).vaccinate=3 and dyn_data(ctr2).vacc_day3=0 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
            dyn_data(ctr2).vaccinate=0
            dyn_data(ctr2).vacc_day3=0
            if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                end if
            end if
        end if
    end if
case 4
    if dyn_data(ctr2).vaccinate=1 and dyn_data(ctr2).vacc_day1=0 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
            dyn_data(ctr2).vacc_day2=beta_pert(popp(54).lowv,popp(54).modev,popp(54).highv) -
dyn_data(ctr2).cycleday
            dyn_data(ctr2).vaccinate=2
            if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                end if
            end if
        end if
    if dyn_data(ctr2).vaccinate=2 and dyn_data(ctr2).vacc_day2=0 then

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        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
            dyn_data(ctr2).vacc_day3=beta_pert(popp(55).lowv,popp(55).modev,popp(55).highv)-
dyn_data(ctr2).cycleday
            dyn_data(ctr2).vaccinate=3
            if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                end if
            end if
        end if
        if dyn_data(ctr2).vaccinate=3 and dyn_data(ctr2).vacc_day3=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vaccinate=0
                dyn_data(ctr2).vacc_day3=0
                if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                    end if
                end if
            end if
        end case
    case 3
        do case dyn_data(ctr2).typeofbirds
            case 1
                if mit_inc=1 and surv_data(ctr2).ra=1 and RApickup=1 and dyn_data(ctr2).populated=1 then
                    if dyn_data(ctr2).endofthisbatch=1 then
                        if surv_data(ctr2).surv_status<=1 then
                            surv_data(ctr2).surv_status=3
                            surv_data(ctr2).survno=1
                            surv_data(ctr2).daystilldiag=1
                            nsera=nsera+svsera
                            nswabs=nswabs+dbswab
                            costttest=costttest+(svswab*costperswab)+(svsera+costpersera)
                            if dyn_data(ctr2).status>1 and dyn_data(ctr2).status<5 and random()<=Sevisit then
                                surv_data(ctr2).diagoutcome=1
                            else
                                surv_data(ctr2).diagoutcome=2
                            end if
                        end if
                    end if
                end if
            end case
        end do
    end case
end if

```



```

        end if
    end if
end case
case 4
do case dyn_data(ctr2).typeofbirds
case 1
if dyn_data(ctr2).populated=1 and dyn_data(ctr2).status<>3 then
if dyn_data(ctr2).thin=1 then
if dyn_data(ctr2).thinning1=0 then
if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RApickup=1) or (surv_data(ctr2).ca=1 and CAPickup=1)) then
dyn_data(ctr2).thin=2
dyn_data(ctr2).thinning1=0
dyn_data(ctr2).overdue=0
dyn_data(ctr2).daysoverdue=0
dyn_data(ctr2).currentcap=int(dyn_data(ctr2).capacity/2)
if mit_inc=1 and dyn_data(ctr2).currentcap>vcrewscap then
if dyn_data(ctr2).currentcap mod vcrewscap=0 then
surv_data(ctr2).vdays=dyn_data(ctr2).currentcap/vcrewscap
else
surv_data(ctr2).vdays=dyn_data(ctr2).currentcap\vcrewscap+1
end if
else
surv_data(ctr2).vdays=1
end if
if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or
dyn_data(ctr2).inf_day<>dayctr or dyn_data(ctr2).how_inf<>"thin" then
end if
else
dyn_data(ctr2).overdue=1
end if
end if
elseif dyn_data(ctr2).thin=2 then
if dyn_data(ctr2).thinning2=0 then
if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RApickup=1) or (surv_data(ctr2).ca=1 and CAPickup=1)) then
dyn_data(ctr2).thin=0
dyn_data(ctr2).thinning2=0
dyn_data(ctr2).overdue=0

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```

        dyn_data(ctr2).daysoverdue=0
        dyn_data(ctr2).currentcap=0
        surv_data(ctr2).vdays=0
        if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or
dyn_data(ctr2).inf_day<>dayctr or dyn_data(ctr2).how_inf<>"thin" then
            end if
        else
            dyn_data(ctr2).overdue=1
        end if
    end if
end if
if mit_inc=1 and surv_data(ctr2).ra=1 and RApickup=1 and dyn_data(ctr2).populated=1 then
    if dyn_data(ctr2).thinning1=1 or dyn_data(ctr2).thinning2=1 then
        if surv_data(ctr2).surv_status<=1 then
            surv_data(ctr2).surv_status=3
            surv_data(ctr2).survno=1
            surv_data(ctr2).daystilldiag=1
            nsera=nsera+svsera
            nswabs=nswabs+dbswab
            costtest=costtest+(svswab*costperswab)+(svsera+costpersera)
        if dyn_data(ctr2).status>1 and dyn_data(ctr2).status<5 and random()<=Sevisit then
            surv_data(ctr2).diagoutcome=1
        else
            surv_data(ctr2).diagoutcome=2
            if acceldepop=1 then
                dyn_data(ctr2).endofthisbatch=1
                dyn_data(ctr2).thinning1=0
                dyn_data(ctr2).thinning2=0
                dyn_data(ctr2).thinning3=1
                dyn_data(ctr2).thin=3
            end if
        end if
    end if
end if
end if
end if
end if
end case
end case
elseif dyn_data(ctr2).multiaged=1 then

```

```

do case dyn_data(ctr2).species
case 1
  do case dyn_data(ctr2).typeofbirds
  case 3
    if dyn_data(ctr2).vaccinate=1 and dyn_data(ctr2).vacc_day1=0 then

      if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
        dyn_data(ctr2).vacc_day2=beta_pert(popp(13).lowv,popp(13).modev,popp(13).highv)-
dyn_data(ctr2).cycleday
        dyn_data(ctr2).vaccinate=2
        if dyn_data(ctr2).vacc_day2>365\popp(42).other then
          dyn_data(ctr2).vacc_day2=dyn_data(ctr2).vacc_day2 mod 365\popp(42).other
        end if
        if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
          end if
        end if
      end if
    if dyn_data(ctr2).vaccinate=2 and dyn_data(ctr2).vacc_day2=0 then
      if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
        dyn_data(ctr2).vacc_day3=beta_pert(popp(14).lowv,popp(14).modev,popp(14).highv)-
dyn_data(ctr2).cycleday
        dyn_data(ctr2).vaccinate=3
        if dyn_data(ctr2).vacc_day3>365\popp(42).other then
          dyn_data(ctr2).vacc_day3=dyn_data(ctr2).vacc_day3 mod 365\popp(42).other
        end if
        if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
          end if
        end if
      end if
    if dyn_data(ctr2).vaccinate=3 and dyn_data(ctr2).vacc_day3=0 then
      if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
        dyn_data(ctr2).vaccinate=0
        if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then

```

```

        end if
    end if
end if
case 4
    if dyn_data(ctr2).vaccinate=1 and dyn_data(ctr2).vacc_day1=0 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
            dyn_data(ctr2).vacc_day2=beta_pert(popp(10).lowv,popp(10).modev,popp(10).highv)-
dyn_data(ctr2).cycleday
            dyn_data(ctr2).vaccinate=2
            if dyn_data(ctr2).vacc_day2>365\popp(42).other then
                dyn_data(ctr2).vacc_day2=dyn_data(ctr2).vacc_day2 mod 365\popp(42).other
            end if
            if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                end if
            end if
        end if
        if dyn_data(ctr2).vaccinate=2 and dyn_data(ctr2).vacc_day2=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vacc_day3=beta_pert(popp(11).lowv,popp(11).modev,popp(11).highv)-
dyn_data(ctr2).cycleday
                dyn_data(ctr2).vaccinate=3
                if dyn_data(ctr2).vacc_day3>365\popp(42).other then
                    dyn_data(ctr2).vacc_day3=dyn_data(ctr2).vacc_day3 mod 365\popp(42).other
                end if
                if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                    end if
                end if
            end if
            if dyn_data(ctr2).vaccinate=3 and dyn_data(ctr2).vacc_day3=0 then
                if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                    dyn_data(ctr2).vaccinate=0
                    if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                        end if
                    end if
                end if
            end if
        end if
    end if
end if

```

```

        end if
    end if
case 6
    if dyn_data(ctr2).vaccinate=1 and dyn_data(ctr2).vacc_day1=0 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
            dyn_data(ctr2).vacc_day2=beta_pert(popp(19).lowv,popp(19).modev,popp(19).highv)-
dyn_data(ctr2).cycleday
            dyn_data(ctr2).vaccinate=2
            if dyn_data(ctr2).vacc_day2>365\popp(42).other then
                dyn_data(ctr2).vacc_day2=dyn_data(ctr2).vacc_day2 mod 365\popp(42).other
            end if
            if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                end if
            end if
        end if
    if dyn_data(ctr2).vaccinate=2 and dyn_data(ctr2).vacc_day2=0 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
            dyn_data(ctr2).vacc_day3=beta_pert(popp(20).lowv,popp(20).modev,popp(20).highv)-
dyn_data(ctr2).cycleday
            dyn_data(ctr2).vaccinate=3
            if dyn_data(ctr2).vacc_day3>365\popp(42).other then
                dyn_data(ctr2).vacc_day3=dyn_data(ctr2).vacc_day3 mod 365\popp(42).other
            end if
            if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                end if
            end if
        end if
    if dyn_data(ctr2).vaccinate=3 and dyn_data(ctr2).vacc_day3=0 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
            dyn_data(ctr2).vaccinate=0
            if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                end if
            end if
        end if
    end if
end if

```

```

        end if
    case 7
        if dyn_data(ctr2).vaccinate=1 and dyn_data(ctr2).vacc_day1=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vacc_day2=beta_pert(popp(16).lowv,popp(16).modev,popp(16).highv)-
dyn_data(ctr2).cycleday
                dyn_data(ctr2).vaccinate=2
                if dyn_data(ctr2).vacc_day2>365\popp(42).other then
                    dyn_data(ctr2).vacc_day2=dyn_data(ctr2).vacc_day2 mod 365\popp(42).other
                end if
                if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                    end if
                end if
            end if
        if dyn_data(ctr2).vaccinate=2 and dyn_data(ctr2).vacc_day2=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vacc_day3=beta_pert(popp(17).lowv,popp(17).modev,popp(17).highv)-
dyn_data(ctr2).cycleday
                dyn_data(ctr2).vaccinate=3
                if dyn_data(ctr2).vacc_day3>365\popp(42).other then
                    dyn_data(ctr2).vacc_day3=dyn_data(ctr2).vacc_day3 mod 365\popp(42).other
                end if
                if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                    end if
                end if
            end if
        if dyn_data(ctr2).vaccinate=3 and dyn_data(ctr2).vacc_day3=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vaccinate=0
                if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                    end if
                end if
            end if
        end if
    end if

```

```

    end case
case 2
do case dyn_data(ctr2).typeofbirds
case 2
    if dyn_data(ctr2).vaccinate=1 and dyn_data(ctr2).vacc_day1=0 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
            if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                end if
            end if
        end if
    case 3
        if dyn_data(ctr2).vaccinate=1 and dyn_data(ctr2).vacc_day1=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vaccinate=2
                dyn_data(ctr2).vacc_day2=beta_pert (popp (54) .lowv, popp (54) .modev, popp (54) .highv) -
dyn_data(ctr2).cycleday
                if dyn_data(ctr2).vacc_day2>365\popp(56).other then
                    dyn_data(ctr2).vacc_day2=dyn_data(ctr2).vacc_day2 mod 365\popp(56).other
                end if
                if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                    end if
                end if
            end if
        if dyn_data(ctr2).vaccinate=2 and dyn_data(ctr2).vacc_day2=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vacc_day3=beta_pert (popp (55) .lowv, popp (55) .modev, popp (55) .highv) -
dyn_data(ctr2).cycleday
                dyn_data(ctr2).vaccinate=3
                if dyn_data(ctr2).vacc_day3>365\popp(56).other then
                    dyn_data(ctr2).vacc_day3=dyn_data(ctr2).vacc_day3 mod 365\popp(56).other
                end if
                if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                    end if
            end if
        end if
    end case
end case
end do
end case

```

```

        end if
    end if
    if dyn_data(ctr2).vaccinate=3 and dyn_data(ctr2).vacc_day3=0 then
        if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
            dyn_data(ctr2).vaccinate=0
            if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                end if
            end if
        end if
    end if
    case 4
        if dyn_data(ctr2).vaccinate=1 and dyn_data(ctr2).vacc_day1=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vaccinate=2
                dyn_data(ctr2).vacc_day2=beta_pert(popp(54).lowv,popp(54).modev,popp(54).highv)-
dyn_data(ctr2).cycleday
                if dyn_data(ctr2).vacc_day2>365\popp(56).other then
                    dyn_data(ctr2).vacc_day2=dyn_data(ctr2).vacc_day2 mod 365\popp(56).other
                end if
                if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                    end if
                end if
            end if
        end if
        if dyn_data(ctr2).vaccinate=2 and dyn_data(ctr2).vacc_day2=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vacc_day3=beta_pert(popp(55).lowv,popp(55).modev,popp(55).highv)-
dyn_data(ctr2).cycleday
                dyn_data(ctr2).vaccinate=3
                if dyn_data(ctr2).vacc_day3>365\popp(56).other then
                    dyn_data(ctr2).vacc_day3=dyn_data(ctr2).vacc_day3 mod 365\popp(56).other
                end if
                if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                    end if
                end if
            end if
        end if
    end if

```



```

        end if
        if dyn_data(ctr2).vaccinate=3 and dyn_data(ctr2).vacc_day3=0 then
            if surv_data(ctr2).surv_status<=1 and ((surv_data(ctr2).ra=0 and surv_data(ctr2).ca=0) or
(surv_data(ctr2).ra=1 and RAvacc=1) or (surv_data(ctr2).ca=1 and CAvacc=1)) then
                dyn_data(ctr2).vaccinate=0
                if (dyn_data(ctr2).status<>1 and dyn_data(ctr2).status<>6) or dyn_data(ctr2).inf_day<>dayctr or
dyn_data(ctr2).how_inf<>"vac" then
                    end if
                end if
            end if
        end if

        end case
    case 3
    case 4
    end case
end if
next
end sub

```

AI_model_functions_5September09.mb

```

Include "Mapbasic.def"
Include "AI_Model.def"

```

```

function triangle (ByVal l as integer, ByVal m as integer, ByVal h as integer) as integer

```

```

    dim u,x1 as float

```

```

    u=random()

```

```

        if u<=(m-1)/(h-1) then x1=1+((h-1)*(m-1)*u)^0.5
        elseif u>(m-1)/(h-1) then x1=h-((h-1)*(h-m)*(1-u))^0.5
        end if

```

```

        triangle=round(x1,1)

```

```

end function

```

```

function uniform (ByVal l as integer, ByVal h as integer) as integer

```

```

    dim u,x1 as float

```

```
u=random()  
x1=(u*(h-1)+1)  
uniform=round(x1,1)
```

```
end function
```

```
function poisson (ByVal la as float) as integer
```

```
'procedure for randomly selecting a number from a poisson distribution
```

```
dim a,r,u as float  
dim n as integer
```

```
'la=lamba, average or expected value
```

```
  r=1  
  n=-1  
  a=exp(-la)  
  do while r>a  
    u=random()  
    r=r*u  
    n=n+1  
  loop  
  poisson=round(n,1)
```

```
end function
```

```
function beta_pert (ByVal l as float, ByVal m as float, ByVal h as float) as integer
```

```
dim f1, f2, f3, u, a1, a2, mode, x, y, pbetamode, pbeta, B_value, BP_value as float  
a1 = (4*m + h - 5*1)/(h-1)  
a2 = (5*h - 1 - 4*m)/(h-1)  
mode = (a1-1)/(a1+a2-2)
```

```
n0 = a1-1  
call factorial  
f1=f
```

```
n0 = a2-1
```

```

call factorial
f2=f

n0 = a1+a2-1
call factorial
f3=f

'beta probability density function
' for max density at mode

pbetamode = (mode^(a1-1))*((1-mode)^(a2-1))*f3/(f1*f2)
B_value = -1

do
  x = random()
  pbeta = (x^(a1-1))*((1-x)^(a2-1))*f3/(f1*f2)

  y = random()

  if y <=pbeta/pbetamode then
    B_value = x
  end if
loop while B_value = -1

beta_pert=round(1 + (h-1)*B_value,1)      'rescale B_value using pert parameters

end function

sub factorial

'Code to calculate factorial

dim i as integer

if n0 < 0 then
  note "Error: n0 (" + n0 + ") must be non-negative. Program will end."
  close all
  end program
elseif n0 = 0 then

```

```

        f = 1
    else
        f = 1
        for i = 1 to n0
            f = f*i
        next
    end if

```

```
end sub
```

```
function tsp (ByVal l,m,h as integer, n as float) as integer
```

```
'procedure for randomly drawing value from a two-sided power distribution
```

```
dim u,w as float
```

```
u=random()
```

```
if u<=(m-1)/(h-1) then w=1+(m-1)*(u*(h-1)/(m-1))^(1/n)
```

```
    elseif u>(m-1)/(h-1) then w=h-(h-m)*((1-u)*(h-1)/(h-m))^(1/n)
```

```
end if
```

```
tsp=round(w,1)
```

```
end function
```

```
function normal (ByVal mean,sd as float) as integer
```

```
'procedure for randomly selecting a number from a normal distribution
```

```
dim u1,u2,v1,v2,r,w,y,r1 as float
```

```
start:
```

```
    u1=random()
```

```
    u2=random()
```

```
    v1=2*u1-1
```

```
    v2=2*u2-1
```

```
    w=v1^2+v2^2
```

```
    if w<1 then
```

```
        y=sqr(-2*log(w)/w)
```

```
        r1=round(mean+sd*v1*y,1)
```

```

        else goto start
        end if
        if r1<0 then
            r1=0
        end if

        normal=r1
end function

function lognormal (ByVal mean,sd as float) as integer

    'procedure for randomly selecting a number from a lognormal distribution

    dim mlog,sdlog,r1,r2,r3,pi as float

    pi=3.141592654
    mlog=log(mean)-0.5*log((1+(sd/mean)^2))    'mean and SD of log distribution
    sdlog=sqr(log(1+(sd/mean)^2))

    r1=sqr(-2*log(random()))*sin(2*pi*random())
    r2=mlog+r1*sdlog
    r3=exp(r2)
    lognormal=round(r3,1)                    'returns integer value

end function

function weibull (ByVal alpha,beta,shift as float) as integer

    dim z,w as float

    z=random()
    w=beta*((-1*log(1-z))^(1/alpha))+shift

    weibull=round(w,1)

end function

function gamma (ByVal alpha as float, ByVal scale as float) as float

```

```

dim a,b,c,d,u1,u2,x,z as float

x=-1
if alpha<1 and alpha>0 then                                'Method of Kundu and Gupta 2007

    d=1.0334-0.0766*exp(2.2942*alpha)
    a=(2^alpha)*(1-exp(-d/2))^alpha
    b=alpha*d^(alpha-1)*exp(-d)
    c=a+b

do
    u1=random()
    if u1<=a/c then
        z=-2*log(1-((c*u1)^(1/alpha))/2)
    else
        z=-log(c*(1-u1)/(alpha*d^(alpha-1)))
    end if

    u2=random()
    if z<=d then
        if u2<=(z^(alpha-1))*exp(-z/2)/((2^(alpha-1))*(1-exp(-z/2))^(alpha-1)) then
            x=z
        end if
    else
        if u2<=(d/z)^(1-alpha) then
            x=z
        end if
    end if
loop until x<>-1

elseif alpha=1 then
    x=-log(random())

elseif alpha>1 then                                        'Method detailed in "32. Monte Carlo Techniques"
http://pdg.lbl.gov/2002/monterpp.pdf

do
    u1=random()

```

```

a=u1*(1-u1)
b=(u1-0.5)*(c/a)^0.5

if alpha+b-1>0 then
  u2=random()
  d=64*(a^3)*(u2^2)
  if d<=1-(2*b^2)/(alpha+b-1) or log(d)<=2*((alpha-1)*log((alpha+b-1)/(alpha-1))-b) then
    x=alpha+b-1
  end if
end if
loop until x<>-1

```

end if

gamma=x/scale

end function

AI_model_main_1March10.mb

Include "Mapbasic.def"

Include "AI_model.def"

global scenario as string

sub main

set distance units "km"

set area units "sq km"

set progressbars off

set format date "local"

close all

app_path=ApplicationDirectory\$()

Open table app_path+"\parameters\pop_parameters" as pop_p

Open table app_path+"\parameters\dis_parameters20May2009" as dis_p

open table app_path+"\screen\blank" as blank

Open table app_path+"\databases\Austria" as states

open table app_path+"\results\it_output" as iteroutput

```
open table app_path+"\results\inc_output" as incoutput

map from blank
max
set window windowID(1) title "AISpread version 1.0"

call load_para_data
call menu

end sub

sub AISpread
dim ctr2, nexposed as integer
dim MCH, tempobj as object
dim tempR, tempgrid as smallint
dim kth, frac as float
dim exitloop as logical

timer1=timer()

savedpop=0

itctr=1

do while itctr<=itnumber

    seed=999999999+9000

    call seedrandom(seed+itctr)

    nfarms=0
    dayctr=0
    nsus=0
    ntobelat=0
    nIP7d=0
    nlat=0
    ninf=0
    ndead=0
    nimm=0
```


nrem=0
ncont=0
nvaccimm1=0
nvaccimm2=0
rep=0
diag=0
dayssincediag=0
idno1=0
idno2=0
pickupid=0
x=0
X1=0
Y1=0
l=0
m=0
h=0
z=0
ctr4=0
Rarea=createpoint (0,0)
Carea=createpoint (0,0)
nculled=0
ndeadb=0
nfvaccl=0
nbvaccl=0
nvdoses=0
nfvaccl2=0
nbvaccl2=0
vstarted=0
vtime=0
npec=0
npecculled=0
nswabs=0
nsera=0
costcomp=0
costcull=0
costdecont=0
costtest=0
costvacc=0
costop=0

```
costoverdue=0
truscott=0
TOTCM1=0
TOTCM2=0
TOTCM3=0
TOTCM4=0
TOTCM5=0
TOTCM6=0
TOTCM7=0
TOTCM8=0
TOTCL1=0
TOTCL2=0
TOTCL3=0
TOTCL4=0
TOTDU1=0
TOTDU2=0
TOTDU3=0
TOTTU1=0
TOTTU2=0
TOTTU3=0
exitloop=0
dayend=0
```

```
redim exposures(0)
redim inflist(0)
```

```
call load_data
```

```
if itctr<=100 then
  nexposed=1
  vacc_type=0
  scenario="bcs"
  RAbuffer=3
  CAbuffer=10
  acceldepop=0
  vacc_inc=1
  preemptsl=0
end if
```

```
dayctr=1

if dyn_data(12).populated=1 then
  dyn_data(12).become_lat=1
end if

do

  newsus1=0
  newsus2=0
  newlat1=0
  newlat2=0
  newlat3=0
  newinf=0
  newdead=0
  newimm=0
  newrem1=0
  newrem2=0
  newrem3=0
  newrem4=0
  newrem5=0
  newrem6=0
  newcont2=0
  newcont4a=0
  newcont4b=0
  newcont4c=0
  newcont4d=0
  noduesurv=0
  noduediag=0
  noduedepop=0
  nodepop=0
  noresolved=0
  notraced=0
  nosps=0
  withinRA=0
  withinCA=0
  nfvdue=0

  call progresswin
```

```
for ctr1=1 to nfarms
  call culled
  call susceptible
  call latent
  call infectious
  call immune
  call dead
  call removed
  call contaminated
  if mit_inc=1 and vacc_type>0 then
    call vaccimm
  end if
next

call disease_update

if mit_inc=1 and rep=1 then
  call mitigations
end if

call daily_update

call newcycle

call updatecounters

call dis_results

if vstarted=1 and nfvdue>0 then
  vtime=vtime+1
end if

if (rep=1 and nlat+ninf+ncont+ndead=0) or (rep=0 and nlat+ninf+ncont+ndead=0) then
  if dayend=0 then
    dayend=dayctr
  end if
  if vacc_type=0 then
    exitloop=1
  end if
end if
```

```
        elseif vacc_type>0 then
            if rep=1 and vstarted=1 and nfvdue=0 then
                exitloop=1
            elseif rep=0 and vstarted=0 then
                exitloop=1
            end if
        end if
    end if
end if
```

```
    dayctr=dayctr+1
```

```
    loop until exitloop=1 or dayctr>loopend
redim it_results(itctr)
```

```
it_results(itctr).scenario=scenario
it_results(itctr).itno=itctr
it_results(itctr).endday=dayend
it_results(itctr).nIP7d=nIP7d
it_results(itctr).ninf=ubound(inflist)
it_results(itctr).ncul=nculled
it_results(itctr).ndeadbirds=ndeadb
it_results(itctr).nfarmvacc1=nfvacc1
it_results(itctr).nfarmvacc2=nfvacc2
it_results(itctr).nbirdsvacc1=nbvacc1
it_results(itctr).nbirdsvacc2=nbvacc2
it_results(itctr).nvaccdoses=nvdoses
it_results(itctr).nfarmvaccimm1=nvaccimm1
it_results(itctr).nfarmvaccimm2=nvaccimm2
it_results(itctr).vacctime=vtime
it_results(itctr).npec_due=npec
it_results(itctr).npec_culled=npecculled
it_results(itctr).swabs=nswabs
it_results(itctr).sera=nsera
it_results(itctr).costcomp=costcomp
it_results(itctr).costcull=costcull
it_results(itctr).costdecont=costdecont
it_results(itctr).costtest=costtest
it_results(itctr).costvacc=costvacc
it_results(itctr).costop=costop
```

```
it_results(itctr).costoverdue=costoverdue
it_results(itctr).cost=costcomp+costcull+costdecont+costttest+costvacc+costop+costoverdue
it_results(itctr).TOT_CM1=TOTCM1
it_results(itctr).TOT_CM2=TOTCM2
it_results(itctr).TOT_CM3=TOTCM3
it_results(itctr).TOT_CM4=TOTCM4
it_results(itctr).TOT_CM5=TOTCM5
it_results(itctr).TOT_CM6=TOTCM6
it_results(itctr).TOT_CM7=TOTCM7
it_results(itctr).TOT_CM8=TOTCM8
it_results(itctr).TOT_CL1=TOTCL1
it_results(itctr).TOT_CL2=TOTCL2
it_results(itctr).TOT_CL3=TOTCL3
it_results(itctr).TOT_CL4=TOTCL4
it_results(itctr).TOT_DU1=TOTDU1
it_results(itctr).TOT_DU2=TOTDU2
it_results(itctr).TOT_DU3=TOTDU3
it_results(itctr).TOT_TU1=TOTTU1
it_results(itctr).TOT_TU2=TOTTU2
it_results(itctr).TOT_TU3=TOTTU3
```

```
for ctrl=1 to nfarms
  if dyn_data(ctrl).overdue=1 and dyn_data(ctrl).populated=1 then
    do case dyn_data(ctrl).species
      case 1
        do case dyn_data(ctrl).typeofbirds
          case 1
            it_results(itctr).OD_CM1=it_results(itctr).OD_CM1+1
          case 2
            it_results(itctr).OD_CM2=it_results(itctr).OD_CM2+1
          case 3
            it_results(itctr).OD_CM3=it_results(itctr).OD_CM3+1
          case 4
            it_results(itctr).OD_CM4=it_results(itctr).OD_CM4+1
          case 5
            it_results(itctr).OD_CM5=it_results(itctr).OD_CM5+1
        case 6
          it_results(itctr).OD_CM6=it_results(itctr).OD_CM6+1
```

```

        case 7
            it_results(itctr).OD_CM7=it_results(itctr).OD_CM7+1
        case 8
            it_results(itctr).OD_CM8=it_results(itctr).OD_CM8+1
        end case
    case 2
        do case dyn_data(ctr1).typeofbirds
            case 1
                it_results(itctr).OD_CL1=it_results(itctr).OD_CL1+1
            case 2
                it_results(itctr).OD_CL2=it_results(itctr).OD_CL2+1
            case 3
                it_results(itctr).OD_CL3=it_results(itctr).OD_CL3+1
            case 4
                it_results(itctr).OD_CL4=it_results(itctr).OD_CL4+1
            end case
        case 3
            do case dyn_data(ctr1).typeofbirds
                case 1
                    it_results(itctr).OD_DU1=it_results(itctr).OD_DU1+1
                case 2
                    it_results(itctr).OD_DU2=it_results(itctr).OD_DU2+1
                case 3
                    it_results(itctr).OD_DU3=it_results(itctr).OD_DU3+1
                end case
            case 4
                do case dyn_data(ctr1).typeofbirds
                    case 1
                        it_results(itctr).OD_TU1=it_results(itctr).OD_TU1+1
                    case 2
                        it_results(itctr).OD_TU2=it_results(itctr).OD_TU2+1
                    case 3
                        it_results(itctr).OD_TU3=it_results(itctr).OD_TU3+1
                    end case
                end case
            end case
        end if
    next

if objectinfo(rarea, obj_info_type)=obj_type_region then

```

```

it_results(itctr).RA_area=area(Rarea, "sq km")
select * from locs where locs.obj within rarea into temp1
it_results(itctr).n_inRA=tableinfo("temp1",tab_info_nrows)
close table temp1
end if
if objectinfo(carea, obj_info_type)=obj_type_region then
it_results(itctr).CA_area=area(Carea, "sq km")

select * from locs where locs.obj within Carea into temp2
it_results(itctr).n_inCA=tableinfo("temp2",tab_info_nrows)
close table temp2
end if

if itctr=1 then
open table app_path+"\Databases\PoultryGrid2" as grid
update grid set naffected=0
open table app_path+"\results\how" as howlist
end if

if ubound(inflist)>0 then

create table temp3 (id smallint,R smallint, gridid smallint) file app_path+"\results\deleteme"
' Create Map For temp3 CoordSys Earth Projection 1, 0
' insert into DR (it,DR) values (itctr,dyn_data(inflist(1).id).R) 'XXX
for ctr2=1 to ubound(inflist)
insert into howlist (itno,how) values (itctr,dyn_data(inflist(ctr2).id).how_inf)
do case dyn_data(inflist(ctr2).id).species
case 1
do case dyn_data(inflist(ctr2).id).typeofbirds
case 1
it_results(itctr).IN_CM1=it_results(itctr).IN_CM1+1
case 2
it_results(itctr).IN_CM2=it_results(itctr).IN_CM2+1
case 3
it_results(itctr).IN_CM3=it_results(itctr).IN_CM3+1
case 4
it_results(itctr).IN_CM4=it_results(itctr).IN_CM4+1
case 5

```



```

        it_results(itctr).IN_CM5=it_results(itctr).IN_CM5+1
    case 6
        it_results(itctr).IN_CM6=it_results(itctr).IN_CM6+1
    case 7
        it_results(itctr).IN_CM7=it_results(itctr).IN_CM7+1
    case 8
        it_results(itctr).IN_CM8=it_results(itctr).IN_CM8+1
    end case
case 2
do case dyn_data(inflist(ctr2).id).typeofbirds
case 1
    it_results(itctr).IN_CL1=it_results(itctr).IN_CL1+1
case 2
    it_results(itctr).IN_CL2=it_results(itctr).IN_CL2+1
case 3
    it_results(itctr).IN_CL3=it_results(itctr).IN_CL3+1
case 4
    it_results(itctr).IN_CL4=it_results(itctr).IN_CL4+1
end case
case 3
do case dyn_data(inflist(ctr2).id).typeofbirds
case 1
    it_results(itctr).IN_DU1=it_results(itctr).IN_DU1+1
case 2
    it_results(itctr).IN_DU2=it_results(itctr).IN_DU2+1
case 3
    it_results(itctr).IN_DU3=it_results(itctr).IN_DU3+1
end case
case 4
do case dyn_data(inflist(ctr2).id).typeofbirds
case 1
    it_results(itctr).IN_TU1=it_results(itctr).IN_TU1+1
case 2
    it_results(itctr).IN_TU2=it_results(itctr).IN_TU2+1
case 3
    it_results(itctr).IN_TU3=it_results(itctr).IN_TU3+1
end case
end case

```

```

        insert into temp3 (id,R,gridid) values (inflist(ctr2).id,
dyn_data(inflist(ctr2).id).R,dyn_data(inflist(ctr2).id).gridid)
    next
    commit table temp3
    select * from temp3 group by gridid into temp7
    it_results(itctr).ngrid=tableinfo("temp7",tab_info_nrows)
    for ctr2=1 to tableinfo("temp7",tab_info_nrows)
        fetch rec ctr2 from temp7
        update grid set naffected=naffected+1 where rowid=temp7.gridid
    next
close table temp7

```

```

select * from temp3 order by R into temp5

```

```

fetch first from temp5
it_results(itctr).Rmin=temp5.R
fetch last from temp5
it_results(itctr).Rmax=temp5.R
kth=(1/4)*(tableinfo("temp5",tab_info_nrows)-1)+1
frac=kth-int(kth)
kth=int(kth)
if frac=0 then
    fetch rec kth from temp5
    it_results(itctr).R25=temp5.R
else
    fetch rec kth from temp5
    tempR=temp5.R
    fetch rec kth+1 from temp5
    it_results(itctr).R25=tempR+(frac*(temp5.R-tempR))
end if
kth=(2/4)*(tableinfo("temp5",tab_info_nrows)-1)+1
frac=kth-int(kth)
kth=int(kth)
if frac=0 then
    fetch rec kth from temp5
    it_results(itctr).Rmed=temp5.R
else
    fetch rec kth from temp5

```

```

        tempR=temp5.R
        fetch rec kth+1 from temp5
        it_results(itctr).Rmed=tempR+(frac*(temp5.R-tempR))

end if

kth=(3/4)*(tableinfo("temp5",tab_info_nrows)-1)+1
frac=kth-int(kth)
kth=int(kth)

if frac=0 then
    fetch rec kth from temp5
    it_results(itctr).R75=temp5.R
else
    fetch rec kth from temp5
    tempR=temp5.R
    fetch rec kth+1 from temp5
    it_results(itctr).R75=tempR+(frac*(temp5.R-tempR))
end if
select avg(R) from temp3 into temp6
fetch first from temp6

it_results(itctr).Ravg=temp6.col1
close table temp3
end if

if itctr=100 then
    call results
elseif itctr=200 then
    call results
elseif itctr=300 then
    call results
elseif itctr=400 then
    call results
elseif itctr=500 then
    call results
elseif itctr=600 then
    call results
elseif itctr=700 then

```

```
    call results
elseif itctr=800 then
    call results
elseif itctr=900 then
    call results
end if

if itctr=itnumber then
    call results
end if

itctr=itctr+1

loop

close table locs
close table blank
close table states

browse * from iteroutput

end sub

sub load_para_data

dim ppctr, nppara, dpctr, ndpara as smallint

itnumber=100
loopend=365
includecm=1
includecl=1
includedu=1
includetu=1

local inc=1
feed_inc=1
dbc_inc=1
vacc_inc=1
lrem_inc=1
```

ldel_inc=1
san_inc=1
thin_inc=1
slau_inc=1
egg_inc=1
doc_inc=1
live_inc=1
spk_inc=1
mit_inc=1
preempts1=0
acceldepop=0
nrepvisits=10
survlimit=1579
culllimit=6
dbswab=10
svswab=120
svsera=60
costpercull=18500
costperdecont=5656
costperswab=33.43
costpersera=5.9
costpervacc=0.39
costperop=47271
truscott=0
cost11=2.33
cost12=14
cost13=14.96
cost14=17.5
cost15=45.5
cost16=55.67
cost17=79
cost18=125.31
cost21=4.25
cost22=4.47
cost23=5.25
cost24=7.06
cost31=9.02
cost32=36.44
cost33=61.96

cost41=17.75
cost42=83.32
cost43=164.84
contdays=5
Sevisit=0.95
Sevaccvisit=0.93
Sedbc=0.95
ptrace=0.95
p_feed1=0.15229
p_dbc1=0.2027
p_lrem1=0.47504
p_san1=0.142945
p_ldell1=0.162135
p_vacc1=0.438575
p_pul1=0.776445

p_slau1=0.664
p_egg1=0.45117
p_doc1=0.081067
biocont11=1

biocont1i=1
biocont12=0.33
biocont13=0.33
biocont14=0.33
biocont15=0.25
biocont16=0.25
biocont17=0.25
biocont18=0.25
biocont21=1
biocont22=1
biocont23=1
biocont24=0.33
biocont31=0.75
biocont3i=1
biocont32=0.33
biocont33=0.25
biocont41=0.75
biocont4i=1

biocont42=0.33
biocont43=0.25
bioexcl11=1
bioexcl1i=1
bioexcl12=0.33
bioexcl13=0.33
bioexcl14=0.33
bioexcl15=0.2
bioexcl16=0.2
bioexcl17=0.2
bioexcl18=0.2
bioexcl21=1
bioexcl22=1
bioexcl23=1
bioexcl24=0.33
bioexcl31=0.75
bioexcl3i=1
bioexcl32=0.33
bioexcl33=0.2
bioexcl41=1
bioexcl4i=1
bioexcl42=0.33
bioexcl43=0.2
totvcrews=10
vcrewscap=15000
vacc_type=0
vaccinfec=0.2
v1susclx=1
v1suscl2x=0.99
v1suscl3x=0.98
v1suscl4x=1
v2susclx=0.65
v2suscl2x=0.75
v2suscl3x=0.96
v2suscl4x=0.62
v1Se1x=0.53
v1Se2x=0.47
v1Se3x=1
v1Se4x=0.43

v2Se1x=0.06
v2Se2x=0.08
v2Se3x=0.95
v2Se4x=0.19
v1IP1x_l=1
v1IP1x_m=7
v1IP1x_h=27
v1IP2x_l=1
v1IP2x_m=2
v1IP2x_h=20
v1IP3x_l=1
v1IP3x_m=2
v1IP3x_h=20
v1IP4x_l=1
v1IP4x_m=2
v1IP4x_h=25
v2IP1x_l=1
v2IP1x_m=1
v2IP1x_h=8
v2IP2x_l=1
v2IP2x_m=1
v2IP2x_h=8
v2IP3x_l=1
v2IP3x_m=1
v2IP3x_h=1
v2IP4x_l=1
v2IP4x_m=1
v2IP4x_h=7
v1RP1x_l=3
v1RP1x_m=4
v1RP1x_h=28
v1RP2x_l=3
v1RP2x_m=6
v1RP2x_h=20
v1RP3x_l=3
v1RP3x_m=5
v1RP3x_h=7
v1RP4x_l=3
v1RP4x_m=4


```
v1RP4x_h=19
v2RP1x_l=3
v2RP1x_m=4
v2RP1x_h=5
v2RP2x_l=3
v2RP2x_m=5
v2RP2x_h=5
v2RP3x_l=3
v2RP3x_m=5
v2RP3x_h=10
v2RP4x_l=3
v2RP4x_m=4
v2RP4x_h=11
vrounds=2
if mit_inc=1 then
  RAmove=0
  RAfeed=1
  RAdbc=0
  RApickup=0
  RAslau=0
  RAeggs=1
  RAvacc=0
  RAlrem=0
  RAsan=0
  RAldel=0
  RAdoc=0
  CAmove=1
  CAfeed=1
  CAdbc=1
  CAPickup=1
  CAslau=1
  CAeggs=1
  CAvacc=1
  CAlrem=1
  CAsan=1
  CAldel=1
  CAdoc=1
  jurisd=0
  RAbuffer=3
```

```

    CAbuffer=10
    v_inner=0.001
    v_outer=5
end if
nppara=tableinfo("pop_p", tab_info_nrows)

redim popp(nppara)
for ppctr = 1 to nppara
    fetch rec ppctr from pop_p
    popp(ppctr).description=pop_p.description
    popp(ppctr).lowv=pop_p.l
    popp(ppctr).modev=pop_p.m

    popp(ppctr).highv=pop_p.h
    popp(ppctr).other=pop_p.other
next

close table pop_p
ndpara=tableinfo("dis_p", tab_info_nrows)
redim disp(ndpara)

for dpctr=1 to ndpara

    fetch rec dpctr from dis_p
    disp(dpctr).description=dis_p.description
    disp(dpctr).lowv=dis_p.l
    disp(dpctr).modev=dis_p.m

    disp(dpctr).highv=dis_p.h
    disp(dpctr).other=dis_p.other
next
close table dis_p

loc_par.Ho=0.0078

loc_par.Rd=1.8
loc_par.alpha=3.9
loc_par.maxrad=2

```

```

end sub

sub load_data

dim ctr2 as integer

if savedpop=true then
    Open table app_path+"\Databases\start_pop" as dataset
    Open table app_path+"\Databases\locations_v_2" as locs
else
    call initialdata
end if

    nfarms=tableinfo("dataset", tab_info_nrows)
    redim dyn_data(nfarms)
    redim disoutputs(nfarms)
    redim surv_data(nfarms)

for ctr2=1 to nfarms
    fetch rec ctr2 from dataset
    dyn_data(ctr2).id=dataset.id
    dyn_data(ctr2).typeofbirds=dataset.typeofbirds
    dyn_data(ctr2).species=dataset.species
    dyn_data(ctr2).multiaged=dataset.multiaged
    dyn_data(ctr2).integrator=dataset.integrator
    dyn_data(ctr2).dbc_id=dataset.dbc_id
    dyn_data(ctr2).feed_source1=dataset.feed_source1
    dyn_data(ctr2).feed_source2=dataset.feed_source2
    dyn_data(ctr2).pickup_id1=dataset.pickup_id1
    dyn_data(ctr2).Lrem_id1=dataset.Lrem_id1
    dyn_data(ctr2).Lrem_id2=dataset.Lrem_id2
    dyn_data(ctr2).swd_id1=dataset.swd_id1
    dyn_data(ctr2).swd_id2=dataset.swd_id2
    dyn_data(ctr2).Ldel_id1=dataset.Ldel_id1
    dyn_data(ctr2).Ldel_id2=dataset.Ldel_id2

    dyn_data(ctr2).Ldel_id3=dataset.Ldel_id3
    dyn_data(ctr2).slauid1=dataset.slauid1

```

```
dyn_data(ctr2).slavid2=dataset.slavid2
dyn_data(ctr2).eggid1=dataset.eggid1
dyn_data(ctr2).eggid2=dataset.eggid2
dyn_data(ctr2).docid1=dataset.docid1
dyn_data(ctr2).docid2=dataset.docid2
dyn_data(ctr2).vaccid1=dataset.vaccid1
dyn_data(ctr2).dbc=dataset.dbc
dyn_data(ctr2).cycleday=dataset.cycleday
dyn_data(ctr2).endofthisbatch=dataset.endofthisbatch
```

```
dyn_data(ctr2).overdue=dataset.overdue
dyn_data(ctr2).daysoverdue=dataset.daysoverdue
dyn_data(ctr2).daystocycle=dataset.daystocycle
dyn_data(ctr2).daystofeeddelivery=dataset.daystofeeddelivery
dyn_data(ctr2).daystodbc=dataset.daystodbc
dyn_data(ctr2).thinning1=dataset.thinning1
dyn_data(ctr2).thinning2=dataset.thinning2
dyn_data(ctr2).thinning3=dataset.thinning3
dyn_data(ctr2).litterremoval=dataset.litterremoval
dyn_data(ctr2).swd=dataset.swd
dyn_data(ctr2).litterdelivery=dataset.litterdelivery
dyn_data(ctr2).turn_time=dataset.turn_time
dyn_data(ctr2).populated=dataset.populated
dyn_data(ctr2).batchdue=dataset.batchdue
dyn_data(ctr2).spikingday=dataset.spikingday
dyn_data(ctr2).layingcyclelength=dataset.layingcyclelength
dyn_data(ctr2).startoflay=dataset.startoflay
dyn_data(ctr2).vacc_day1=dataset.vacc_day1
dyn_data(ctr2).vacc_day2=dataset.vacc_day2
dyn_data(ctr2).vacc_day3=dataset.vacc_day3
```

```
dyn_data(ctr2).feed_del=dataset.feed_del
dyn_data(ctr2).dead_bird=dataset.dead_bird
dyn_data(ctr2).thin=dataset.thin
dyn_data(ctr2).spiking=dataset.spiking
dyn_data(ctr2).daytosetegg=dataset.daytosetegg
dyn_data(ctr2).litter_c=dataset.litter_c
dyn_data(ctr2).san=dataset.san
```

```
dyn_data(ctr2).litter_d=dataset.litter_d
dyn_data(ctr2).vaccinate=dataset.vaccinate
dyn_data(ctr2).in_lay=dataset.in_lay
dyn_data(ctr2).fate=dataset.fate
dyn_data(ctr2).status=dataset.status
dyn_data(ctr2).become_lat=dataset.become_lat
dyn_data(ctr2).daystillatent=dataset.daystillatent
dyn_data(ctr2).become_cont=dataset.become_cont
dyn_data(ctr2).daystilcont=dataset.daystilcont
dyn_data(ctr2).daysleftcont=dataset.daysleftcont
dyn_data(ctr2).daysleftlatent=dataset.daysleftlatent
dyn_data(ctr2).daystildead=dataset.daystildead
dyn_data(ctr2).dayssincedead=dataset.dayssincedead
dyn_data(ctr2).daystilimmune=dataset.daystilimmune
dyn_data(ctr2).daysleftimmune=dataset.daysleftimmune
dyn_data(ctr2).inf_day=dataset.inf_day
dyn_data(ctr2).when_inf=dataset.when_inf

dyn_data(ctr2).how_inf=dataset.how_inf

dyn_data(ctr2).exp_by=dataset.exp_by
dyn_data(ctr2).report=dataset.report
dyn_data(ctr2).daystillreport=dataset.daystillreport
dyn_data(ctr2).R=0
dyn_data(ctr2).capacity=dataset.capacity
dyn_data(ctr2).currentcap=dataset.currentcap

dyn_data(ctr2).state=dataset.state
dyn_data(ctr2).gridid=dataset.gridid
dyn_data(ctr2).xx=dataset.xx
dyn_data(ctr2).yy=dataset.yy
dyn_data(ctr2).loc=dataset.obj

disoutputs(ctr2).id=dataset.id

if dataset.status=0 then
  nsus=nsus+1
elseif dataset.status=1 then
```

```

disoutputs(ctr2).daylat=1
disoutputs(ctr2).howinf="st1"
nlat=nlat+1
redim inflist(ubound(inflist)+1)
inflist(ubound(inflist)).id=ctr2
elseif dataset.status=2 then
disoutputs(ctr2).dayinf=1
disoutputs(ctr2).howinf="st2"
ninf=ninf+1
redim inflist(ubound(inflist)+1)
inflist(ubound(inflist)).id=ctr2
elseif dataset.status=3 then
ndead=ndead+1
redim inflist(ubound(inflist)+1)
inflist(ubound(inflist)).id=ctr2
elseif dataset.status=4 then
nimm=nimm+1
redim inflist(ubound(inflist)+1)
inflist(ubound(inflist)).id=ctr2
elseif dataset.status=5 then
nrem=nrem+1
elseif dataset.status=6 then
ncont=ncont+1
end if

if mit_inc=1 then

surv_data(ctr2).id=ctr2
surv_data(ctr2).surv_status=0
surv_data(ctr2).self_report=0
surv_data(ctr2).daystilldiag=0
surv_data(ctr2).diagoutcome=0
surv_data(ctr2).days_sched_surv=0
surv_data(ctr2).SurvNo=0
surv_data(ctr2).days since surv=0
surv_data(ctr2).days_sched_depop=0
surv_data(ctr2).days_since_depop=0
surv_data(ctr2).daysleftdepop=0
surv_data(ctr2).traced=0

```

```

surv_data(ctr2).RA=0
surv_data(ctr2).CA=0
surv_data(ctr2).VA=0
surv_data(ctr2).diagnosed=0
surv_data(ctr2).DCP=0
surv_data(ctr2).SP=0
surv_data(ctr2).cdays=dataset.cdays
surv_data(ctr2).partculled=0
surv_data(ctr2).vacc_status=0
surv_data(ctr2).vdue_day=0
surv_data(ctr2).why_vacc=0
surv_data(ctr2).daystovaccimm=0
surv_data(ctr2).duepec=0

if dyn_data(ctr2).currentcap>vcrewscap then
  if dyn_data(ctr2).currentcap mod vcrewscap=0 then
    surv_data(ctr2).vdays=dyn_data(ctr2).currentcap/vcrewscap
  else
    surv_data(ctr2).vdays=dyn_data(ctr2).currentcap\vcrewscap+1
  end if
else
  surv_data(ctr2).vdays=1
end if

end if
next

close table dataset

end sub

sub culled
if surv_data(ctr1).toremoved=1 then
  do case dyn_data(ctr1).status
  case 0
    newrem1=newrem1+1
  case 1
    newrem4=newrem4+1
  case 2

```

```

        newrem6=newrem6+1
    case 3

        newrem5=newrem5+1
    case 4
        newrem2=newrem2+1
    end case
    surv_data(ctrl1).toremoved=0
    dyn_data(ctrl1).status=5
    dyn_data(ctrl1).populated=0
end if
end sub

sub susceptible
if dyn_data(ctrl1).status=4 and dyn_data(ctrl1).daysleftimmune=0 then
    dyn_data(ctrl1).status=0
    newsus2=newsus2+1
end if
end sub

sub latent

if dyn_data(ctrl1).status=0 and dyn_data(ctrl1).daystilllatent=0 and dyn_data(ctrl1).become_lat=1 and
dyn_data(ctrl1).populated=1 then
    if surv_data(ctrl1).surv_status<=1 then
        if (surv_data(ctrl1).vacc_status>=4 and surv_data(ctrl1).vacc_status<=8) and
random()<=vaccsusc(dyn_data(ctrl1).species,surv_data(ctrl1).vacc_status) then
            dyn_data(ctrl1).become_lat=0
            dyn_data(ctrl1).daystilllatent=0
            dyn_data(ctrl1).exp_by=0
            dyn_data(ctrl1).how_inf=""
        else
            dyn_data(ctrl1).status=1
            dyn_data(ctrl1).become_lat=0
            dyn_data(ctrl1).inf_day=dayctr
            newlat1=newlat1+1
            redim inflist(ubound(inflist)+1)
            inflist(ubound(inflist)).id=ctrl1
            if dyn_data(ctrl1).exp_by>0 then

```



```

        dyn_data(dyn_data(ctrl).exp_by).R=dyn_data(dyn_data(ctrl).exp_by).R+1
    end if
    if dyn_data(ctrl).species=3 then
        dyn_data(ctrl).daysleftlatent=uniform(dis(4).lowv,dis(4).highv)
    else
        dyn_data(ctrl).daysleftlatent=uniform(dis(1).lowv,dis(1).highv)
    end if

    if mit_inc=1 then
        redim exposures(ubound(exposures)+1)
        exposures(ubound(exposures)).day=dayctr
        exposures(ubound(exposures)).id=ctrl
        exposures(ubound(exposures)).from=dyn_data(ctrl).exp_by
        exposures(ubound(exposures)).how=dyn_data(ctrl).how_inf
        exposures(ubound(exposures)).effective=1
    end if
end if
else
    dyn_data(ctrl).become_lat=0
    dyn_data(ctrl).daystilllatent=0
    dyn_data(ctrl).exp_by=0
    dyn_data(ctrl).how_inf=""
end if
end if
end sub

```

```

sub infectious
if dyn_data(ctrl).status=1 and dyn_data(ctrl).daysleftlatent=0 then
    dyn_data(ctrl).status=2
    disoutputs(ctrl).dayinf=dayctr
    disoutputs(ctrl).howinf=dyn_data(ctrl).how_inf
    newinf=newinf+1
    if surv_data(ctrl).vacc_status<4 then
        if dyn_data(ctrl).species=1 then
            if random()<=dis(3).other then
                dyn_data(ctrl).report=1
                call repday(1,surv_data(ctrl).vacc_status)
                dyn_data(ctrl).daystillreport=reportday
            end if
        end if
    end if
end if
end sub

```

```

        dyn_data(ctrl).daystildead=beta_pert (disp(2).lowv,disp(2).modev,disp(2).highv)
        dyn_data(ctrl).when_inf=1
        dyn_data(ctrl).inf_day=dayctr
        dyn_data(ctrl).fate=1
    else
        dyn_data(ctrl).report=0
        dyn_data(ctrl).daystilimmune=beta_pert (disp(2).lowv,disp(2).modev,disp(2).highv)
        dyn_data(ctrl).when_inf=1
        dyn_data(ctrl).inf_day=dayctr
        dyn_data(ctrl).fate=2
    end if
elseif dyn_data(ctrl).species=2 then
    if random()<=disp(3).other then
        dyn_data(ctrl).report=1
        call repday(2,surv_data(ctrl).vacc_status)
        dyn_data(ctrl).daystillreport=reportday
        dyn_data(ctrl).daystildead=beta_pert (disp(7).lowv,disp(7).modev,disp(7).highv)
        dyn_data(ctrl).when_inf=1
        dyn_data(ctrl).inf_day=dayctr
        dyn_data(ctrl).fate=1
    else
        dyn_data(ctrl).report=0
        dyn_data(ctrl).daystilimmune=beta_pert (disp(7).lowv,disp(7).modev,disp(7).highv)
        dyn_data(ctrl).when_inf=1
        dyn_data(ctrl).inf_day=dayctr
        dyn_data(ctrl).fate=2
    end if
elseif dyn_data(ctrl).species=3 then
    if random()<=disp(6).other then
        dyn_data(ctrl).report=1
        call repday(3,surv_data(ctrl).vacc_status)
        dyn_data(ctrl).daystillreport=reportday
        dyn_data(ctrl).daystildead=beta_pert (disp(5).lowv,disp(5).modev,disp(5).highv)
        dyn_data(ctrl).when_inf=1
        dyn_data(ctrl).inf_day=dayctr
        dyn_data(ctrl).fate=1
    else
        dyn_data(ctrl).report=0
        dyn_data(ctrl).daystilimmune=beta_pert (disp(5).lowv,disp(5).modev,disp(5).highv)

```

```

        dyn_data(ctrl1).when_inf=1
        dyn_data(ctrl1).inf_day=dayctr
        dyn_data(ctrl1).fate=2
    end if
elseif dyn_data(ctrl1).species=4 then
    if random()<=disp(3).other then
        dyn_data(ctrl1).report=1
        call repday(4,surv_data(ctrl1).vacc_status)
        dyn_data(ctrl1).daystillreport=reportday
        dyn_data(ctrl1).daystildead=beta_pert(disp(8).lowv,disp(8).modev,disp(8).highv)
        dyn_data(ctrl1).when_inf=1
        dyn_data(ctrl1).inf_day=dayctr
        dyn_data(ctrl1).fate=1
    else
        dyn_data(ctrl1).report=0
        dyn_data(ctrl1).daystilimmune=beta_pert(disp(8).lowv,disp(8).modev,disp(8).highv)
        dyn_data(ctrl1).when_inf=1
        dyn_data(ctrl1).inf_day=dayctr
        dyn_data(ctrl1).fate=2
    end if
end if
else
    if random()<=vaccSe(dyn_data(ctrl1).species,surv_data(ctrl1).vacc_status) then
        dyn_data(ctrl1).report=1
        call repday(dyn_data(ctrl1).species,surv_data(ctrl1).vacc_status)
        dyn_data(ctrl1).daystillreport=reportday
        dyn_data(ctrl1).daystildead=reportday+28 'so it stops being infectious after it is reported
        dyn_data(ctrl1).when_inf=1
        dyn_data(ctrl1).inf_day=dayctr
        dyn_data(ctrl1).fate=1
    else
        dyn_data(ctrl1).report=0
        call vaccIP(dyn_data(ctrl1).species,surv_data(ctrl1).vacc_status)
        dyn_data(ctrl1).daystilimmune=reportday 'reportday is a spare variable name
        dyn_data(ctrl1).when_inf=1

        dyn_data(ctrl1).inf_day=dayctr
        dyn_data(ctrl1).fate=2
    end if
end if

```

```

    end if
end if
end sub

sub immune
if dyn_data(ctrl1).fate=2 and dyn_data(ctrl1).status=2 and dyn_data(ctrl1).daystilimmune=0 then
    dyn_data(ctrl1).status=4
    dyn_data(ctrl1).daysleftimmune=beta_pert (disp (20) .lowv,disp (20) .modev,disp (20) .highv)
    dyn_data(ctrl1).fate=0
    newimm=newimm+1
    disoutputs(ctrl1).endinf=dayctr
    disoutputs(ctrl1).endstat=4
end if
end sub

sub dead
if dyn_data(ctrl1).status=2 and ((dyn_data(ctrl1).fate=1 and dyn_data(ctrl1).daystildead=0) or (dyn_data(ctrl1).report=1
and dyn_data(ctrl1).daystillreport=0)) then
    if surv_data(ctrl1).vacc_status<4 then
        dyn_data(ctrl1).status=3
        dyn_data(ctrl1).fate=0
        dyn_data(ctrl1).dead_bird=0
        dyn_data(ctrl1).spiking=0
        dyn_data(ctrl1).litter_c=0
        dyn_data(ctrl1).san=0
        dyn_data(ctrl1).litter_d=0
        dyn_data(ctrl1).vaccinate=0
        dyn_data(ctrl1).in_lay=0
        dyn_data(ctrl1).feed_del=0
        dyn_data(ctrl1).daystocycle=999 'not allowed to restock here
        newdead=newdead+1
        disoutputs(ctrl1).endinf=dayctr
        disoutputs(ctrl1).endstat=3
        if mit_inc=1 then
            rep=1
        end if
    else
        dyn_data(ctrl1).status=4
        dyn_data(ctrl1).daysleftimmune=beta_pert (disp (20) .lowv,disp (20) .modev,disp (20) .highv)
    end if
end if
end sub

```

```

        dyn_data(ctrl1).fate=0
        newimm=newimm+1
        disoutputs(ctrl1).endinf=dayctr
        disoutputs(ctrl1).endstat=4
    end if
end if
end sub

sub contaminated
if dyn_data(ctrl1).status=5 and dyn_data(ctrl1).become_cont=1 and dyn_data(ctrl1).daystilcont=0 then
    if surv_data(ctrl1).surv_status<=1 or (surv_data(ctrl1).RA=1 and dyn_data(ctrl1).how_inf="lc" and RAlrem=1)
        or (surv_data(ctrl1).RA=1 and dyn_data(ctrl1).how_inf="san" and RAsan=1) or (surv_data(ctrl1).RA=1 and
dyn_data(ctrl1).how_inf="ld" and RAldel=1)

        or (surv_data(ctrl1).CA=1 and dyn_data(ctrl1).how_inf="lc" and CArem=1) or (surv_data(ctrl1).CA=1 and
dyn_data(ctrl1).how_inf="san" and CAsan=1)
        or (surv_data(ctrl1).RA=1 and dyn_data(ctrl1).how_inf="ld" and CAldel=1) then
            newcont4a=newcont4a+1
            dyn_data(ctrl1).status=6
            dyn_data(ctrl1).become_cont=0
            dyn_data(ctrl1).daysleftcont=beta_pert(disp(19).lowv,disp(19).modev,disp(19).highv)
            dyn_data(ctrl1).inf_day=dayctr
            if mit_inc=1 then
                redim exposures(ubound(exposures)+1)
                exposures(ubound(exposures)).day=dayctr
                exposures(ubound(exposures)).id=ctrl1
                exposures(ubound(exposures)).from=dyn_data(ctrl1).exp_by
                exposures(ubound(exposures)).how=dyn_data(ctrl1).how_inf
                exposures(ubound(exposures)).effective=1
            end if
        else
            dyn_data(ctrl1).become_cont=0
            dyn_data(ctrl1).daystilcont=0

            dyn_data(ctrl1).exp_by=0
            dyn_data(ctrl1).how_inf=""
        end if
    end if
end if

```

```
end sub
```

```
sub removed
```

```
if dyn_data(ctr1).status=6 and dyn_data(ctr1).daysleftcont=0 then
```

```
    newrem3=newrem3+1
```

```
    dyn_data(ctr1).status=5
```

```
end if
```

```
end sub
```

```
sub updatecounters
```

```
dim ctr2 as integer
```

```
for ctr2=1 to nfarms
```

```
    if dyn_data(ctr2).become_lat=1 then
```

```
        ntobelat=ntobelat+1
```

```
    end if
```

```
    if dyn_data(ctr2).status=1 then
```

```
        dyn_data(ctr2).daysleftlatent=dyn_data(ctr2).daysleftlatent-1
```

```
    elseif dyn_data(ctr2).status=2 and dyn_data(ctr2).fate=1 then
```

```
        dyn_data(ctr2).daystildead=dyn_data(ctr2).daystildead-1
```

```
        dyn_data(ctr2).when_inf=dyn_data(ctr2).when_inf+1
```

```
    elseif dyn_data(ctr2).status=2 and dyn_data(ctr2).fate=2 then
```

```
        dyn_data(ctr2).daystilimmune=dyn_data(ctr2).daystilimmune-1
```

```
        dyn_data(ctr2).when_inf=dyn_data(ctr2).when_inf+1
```

```
    elseif dyn_data(ctr2).status=3 then
```

```
        dyn_data(ctr2).when_inf=dyn_data(ctr2).when_inf+1
```

```
        dyn_data(ctr2).dayssincedead=dyn_data(ctr2).dayssincedead+1
```

```
    elseif dyn_data(ctr2).status=4 then
```

```
        dyn_data(ctr2).daysleftimmune=dyn_data(ctr2).daysleftimmune-1
```

```
        dyn_data(ctr2).when_inf=dyn_data(ctr2).when_inf+1
```

```
    elseif dyn_data(ctr2).status=0 and dyn_data(ctr2).become_lat=1 and dyn_data(ctr2).daystilllatent>0 then
```

```
        dyn_data(ctr2).daysleftlatent=dyn_data(ctr2).daysleftlatent-1
```

```
        dyn_data(ctr2).daystilllatent=dyn_data(ctr2).daystilllatent-1
```

```
    elseif dyn_data(ctr2).status=6 and dyn_data(ctr2).daysleftcont>0 then
```

```
        dyn_data(ctr2).daysleftcont=dyn_data(ctr2).daysleftcont-1
```

```

end if

if (dyn_data(ctr2).populated=1 and dyn_data(ctr2).multiaged=0) or (dyn_data(ctr2).batchdue=0 and
dyn_data(ctr2).multiaged=1) then
  dyn_data(ctr2).cycleday=dyn_data(ctr2).cycleday+1
  if dyn_data(ctr2).overdue=0 then
    dyn_data(ctr2).endofthisbatch=dyn_data(ctr2).endofthisbatch-1
  else
    dyn_data(ctr2).daysoverdue=dyn_data(ctr2).daysoverdue+1
  end if
  if dyn_data(ctr2).feed_del=1 then
    dyn_data(ctr2).daystofeeddelivery=dyn_data(ctr2).daystofeeddelivery-1
  end if
  if dyn_data(ctr2).dead_bird=1 and dyn_data(ctr2).dbc<>0 then
    dyn_data(ctr2).daystodbc=dyn_data(ctr2).daystodbc-1
  end if
  if dyn_data(ctr2).vaccinate=1 then
    dyn_data(ctr2).vacc_day1=dyn_data(ctr2).vacc_day1-1
  elseif dyn_data(ctr2).vaccinate=2 then
    dyn_data(ctr2).vacc_day2=dyn_data(ctr2).vacc_day2-1
  elseif dyn_data(ctr2).vaccinate=3 then
    dyn_data(ctr2).vacc_day3=dyn_data(ctr2).vacc_day3-1
  end if
  if dyn_data(ctr2).spiking=1 then
    dyn_data(ctr2).spikingday=dyn_data(ctr2).spikingday-1
  end if

if dyn_data(ctr2).species=1 then
  if dyn_data(ctr2).typeofbirds=1 then
    if dyn_data(ctr2).multiaged=0 and dyn_data(ctr2).populated=1 then
      if dyn_data(ctr2).thin=1 then
        dyn_data(ctr2).thinning1=dyn_data(ctr2).thinning1-1
        dyn_data(ctr2).thinning2=dyn_data(ctr2).thinning2-1
        dyn_data(ctr2).thinning3=dyn_data(ctr2).thinning3-1
      elseif dyn_data(ctr2).thin=2 then
        dyn_data(ctr2).thinning2=dyn_data(ctr2).thinning2-1
        dyn_data(ctr2).thinning3=dyn_data(ctr2).thinning3-1
      elseif dyn_data(ctr2).thin=3 then

```

```

        dyn_data(ctr2).thinning3=dyn_data(ctr2).thinning3-1
    end if
end if
end if
if dyn_data(ctr2).typeofbirds=2 or dyn_data(ctr2).typeofbirds=3 or dyn_data(ctr2).typeofbirds=5 or
    dyn_data(ctr2).typeofbirds=6 or dyn_data(ctr2).typeofbirds=8 then

    if dyn_data(ctr2).in_lay=0 and dyn_data(ctr2).populated=1 and dyn_data(ctr2).daytosetegg>0 and
dyn_data(ctr2).status<>3 then
        dyn_data(ctr2).daytosetegg=dyn_data(ctr2).daytosetegg-1
    end if
end if
elseif dyn_data(ctr2).species=2 then
    if dyn_data(ctr2).typeofbirds=1 or dyn_data(ctr2).typeofbirds=2 or dyn_data(ctr2).typeofbirds=4 then
        if dyn_data(ctr2).in_lay=0 and dyn_data(ctr2).populated=1 and dyn_data(ctr2).daytosetegg>0 and
dyn_data(ctr2).status<>3 then
            dyn_data(ctr2).daytosetegg=dyn_data(ctr2).daytosetegg-1
        end if
    end if
elseif dyn_data(ctr2).species=3 then
    if dyn_data(ctr2).typeofbirds=2 or dyn_data(ctr2).typeofbirds=3 then
        if dyn_data(ctr2).in_lay=0 and dyn_data(ctr2).populated=1 and dyn_data(ctr2).daytosetegg>0 and
dyn_data(ctr2).status<>3 then
            dyn_data(ctr2).daytosetegg=dyn_data(ctr2).daytosetegg-1
        end if
    end if
elseif dyn_data(ctr2).species=4 then
    if dyn_data(ctr2).typeofbirds=1 then
        if dyn_data(ctr2).multiaged=0 then
            if dyn_data(ctr2).thin=1 then
                dyn_data(ctr2).thinning1=dyn_data(ctr2).thinning1-1
            end if
        end if
    elseif dyn_data(ctr2).typeofbirds=2 or dyn_data(ctr2).typeofbirds=3 then
        if dyn_data(ctr2).in_lay=0 and dyn_data(ctr2).populated=1 and dyn_data(ctr2).daytosetegg>0 and
dyn_data(ctr2).status<>3 then
            dyn_data(ctr2).daytosetegg=dyn_data(ctr2).daytosetegg-1
        end if
    end if
end if
end if

```



```

        end if
    end if

    elseif (dyn_data(ctr2).populated=0 and dyn_data(ctr2).multiaged=0) or (dyn_data(ctr2).batchdue=1 and
dyn_data(ctr2).multiaged=1) then
        dyn_data(ctr2).daystocycle=dyn_data(ctr2).daystocycle-1
        if dyn_data(ctr2).litter_c=1 then
            dyn_data(ctr2).litterremoval=dyn_data(ctr2).litterremoval-1
        end if
        if dyn_data(ctr2).san=1 then
            dyn_data(ctr2).swd=dyn_data(ctr2).swd-1
        end if
        if dyn_data(ctr2).litter_d=1 then
            dyn_data(ctr2).litterdelivery=dyn_data(ctr2).litterdelivery-1

        end if
        if dyn_data(ctr2).become_cont=1 and dyn_data(ctr2).daystilcont>0 then
            dyn_data(ctr2).daystilcont=dyn_data(ctr2).daystilcont-1
        end if
    end if

    if dyn_data(ctr2).report=1 and dyn_data(ctr2).daystillreport>0 then
        dyn_data(ctr2).daystillreport=dyn_data(ctr2).daystillreport-1
    elseif dyn_data(ctr2).report=1 and dyn_data(ctr2).daystillreport=0 then
        rep=1
    end if

    if surv_data(ctr2).surv_status=1 and surv_data(ctr2).daystilldiag>0 then
        surv_data(ctr2).daystilldiag=surv_data(ctr2).daystilldiag-1
    elseif surv_data(ctr2).surv_status=2 then
        surv_data(ctr2).days_sched_surv=surv_data(ctr2).days_sched_surv+1
    elseif surv_data(ctr2).surv_status=3 then
        surv_data(ctr2).days_since_surv=surv_data(ctr2).days_since_surv+1
        surv_data(ctr2).daystilldiag=surv_data(ctr2).daystilldiag-1
    elseif surv_data(ctr2).surv_status=4 then
        surv_data(ctr2).days_since_surv=surv_data(ctr2).days_since_surv+1
        surv_data(ctr2).days_sched_depop=surv_data(ctr2).days_sched_depop+1
    elseif surv_data(ctr2).surv_status=5 then

```

```

        surv_data(ctr2).days_since_surv=surv_data(ctr2).days_since_surv+1
        surv_data(ctr2).days_since_depop=surv_data(ctr2).days_since_depop+1
        surv_data(ctr2).daysleftdepop=surv_data(ctr2).daysleftdepop-1
    elseif surv_data(ctr2).surv_status=6 then
        surv_data(ctr2).days_since_surv=surv_data(ctr2).days_since_surv+1
        surv_data(ctr2).days_since_depop=surv_data(ctr2).days_since_depop+1
    end if
    if vstarted=1 and surv_data(ctr2).vacc_status=3 or surv_data(ctr2).vacc_status=7 then
        surv_data(ctr2).daystovaccimm=surv_data(ctr2).daystovaccimm-1
    end if
    if vacc_type>0 then
        if vrounds=1 then
            if vstarted=1 then
                if surv_data(ctr2).vacc_status>0 and surv_data(ctr2).vacc_status<3 then
                    nfvdue=nfvdue+1
                end if
            end if
        elseif vrounds=2 then
            if vstarted=1 then
                if surv_data(ctr2).vacc_status>0 and surv_data(ctr2).vacc_status<7 then
                    nfvdue=nfvdue+1
                end if
            end if
        end if
    end if
end if
next

if diag=1 then
    dayssincediag=dayssincediag+1
end if

end sub

sub dis_results
dim ctr2 as integer

    nsus=nsus+newsus1+newsus2-newlat1-newrem1
    nlat=nlat+newlat1+newlat2+newlat3-newinf-newrem4
    ninf=ninf+newinf-newimm-newdead-newcont2-newrem6

```

```
nimm=nimm+newimm-newsus2-newrem2
ndead=ndead+newdead-newrem5
ncont=ncont+newcont2+newcont4a+newcont4b+newcont4c+newcont4d-newlat2-newrem3
nrem=nrem+newrem1+newrem2+newrem3+newrem4+newrem5+newrem6-newsus1-newcont4a-newcont4b-newcont4c-newcont4d-
newlat3
```

```
for ctrl = 1 to nfarms
  if mit_inc=1 and rep=1 then
    do case surv_data(ctrl).surv_status
      case 1
        noduediag=noduediag+1
      case 2
        noduesurv=noduesurv+1
      case 3
        noduediag=noduediag+1
      case 4
        noduedepop=noduedepop+1
      case 5
        nodepop=nodepop+1
      case 6
        noresolved=noresolved+1
    end case
    if surv_data(ctrl).dcp=1 and surv_data(ctrl).surv_status<=3 then
      notraced=notraced+1
    end if
    if surv_data(ctrl).sp=1 and surv_data(ctrl).surv_status<=3 then
      nosps=nosps+1
    end if
  end if
  if dyn_data(ctrl).status=0 then
    do case dyn_data(ctrl).species
      case 1
        do case dyn_data(ctrl).typeofbirds
          case 1
            TOTCM1=TOTCM1+1
          case 2
            TOTCM2=TOTCM2+1
          case 3
```

```
TOTCM3=TOTCM3+1
case 4
TOTCM4=TOTCM4+1
case 5
TOTCM5=TOTCM5+1
case 6
TOTCM6=TOTCM6+1
case 7
TOTCM7=TOTCM7+1
case 8
TOTCM8=TOTCM8+1
end case
case 2
do case dyn_data(ctrl1).typeofbirds
case 1
TOTCL1=TOTCL1+1
case 2
TOTCL2=TOTCL2+1
case 3
TOTCL3=TOTCL3+1
case 4
TOTCL4=TOTCL4+1
end case
case 3
do case dyn_data(ctrl1).typeofbirds
case 1
TOTDU1=TOTDU1+1
case 2
TOTDU2=TOTDU2+1
case 3
TOTDU3=TOTDU3+1
end case
case 4
do case dyn_data(ctrl1).typeofbirds
case 1
TOTTU1=TOTTU1+1
case 2
TOTTU2=TOTTU2+1
case 3
```

```

        TOTTU3=TOTTU3+1
    end case
end case
end if
next

if itnumber=1 then
    ctr2=ubound(disease_results)+1
    redim disease_results(ctr2)
    disease_results(ctr2).it=itctr
    disease_results(ctr2).day=dayctr
    disease_results(ctr2).nsus=nsus
    disease_results(ctr2).nlat=nlat
    disease_results(ctr2).ninf=ninf
    disease_results(ctr2).ndead=ndead
    disease_results(ctr2).nimm=nimm
    disease_results(ctr2).nrem=nrem
    disease_results(ctr2).ncont=ncont
    disease_results(ctr2).newsus=newsus1+newsus2
    disease_results(ctr2).newlat=newlat1+newlat2+newlat3
    disease_results(ctr2).newinf=newinf
    disease_results(ctr2).newimm=newimm
    disease_results(ctr2).newdead=newdead
    disease_results(ctr2).newrem=newrem1+newrem2+newrem3+newrem4
    disease_results(ctr2).newcont=newcont2+newcont3+newcont4a+newcont4b+newcont4c+newcont4d
    disease_results(ctr2).nduesurv=noduesurv
    disease_results(ctr2).nduediag=noduediag
    disease_results(ctr2).nduedepop=noduedepop
    disease_results(ctr2).ndepop=nodepop
    disease_results(ctr2).ntraced=notraced
    disease_results(ctr2).nsps=nosps
    disease_results(ctr2).withinCA=withinCA
    disease_results(ctr2).withinRA=withinRA
end if
end sub

sub results
dim ctr2 as integer

```

```

if itnumber=1 then
  open table app_path+"\results\disease_results" as dis_results
  for ctr2=1 to ubound(disease_results)

    insert into dis_results values
      (disease_results(ctr2).it,disease_results(ctr2).day,disease_results(ctr2).nsus,disease_results(ctr2).nlat,
disease_results(ctr2).ninf,

      disease_results(ctr2).ndead,disease_results(ctr2).nimm,disease_results(ctr2).nrem,disease_results(ctr2).ncont,disease_results(ctr2).newsus,

      disease_results(ctr2).newlat,disease_results(ctr2).newinf,disease_results(ctr2).newimm,disease_results(ctr2).newdead,

      disease_results(ctr2).newrem,disease_results(ctr2).newcont,disease_results(ctr2).nduesurv,disease_results(ctr2).nduediag,

      disease_results(ctr2).nduedepop,disease_results(ctr2).ndepop,disease_results(ctr2).nresolved,disease_results(ctr2).ntraced,
      disease_results(ctr2).nsps,disease_results(ctr2).withinCA,disease_results(ctr2).withinRA)
  next
end if
for ctr2=1 to itctr
  insert into iteroutput
  values
  (it_results(ctr2).scenario,it_results(ctr2).itno,it_results(ctr2).endday,it_results(ctr2).nIP7d,it_results(ctr2).ninf,
it_results(ctr2).ncul,it_results(ctr2).ndeadbirds,it_results(ctr2).RA_area,
it_results(ctr2).n_inRA,it_results(ctr2).CA_area,it_results(ctr2).n_inCA,
it_results(ctr2).MCHarea,it_results(ctr2).n_inMCH,it_results(ctr2).nfarmvaccl,
it_results(ctr2).nfarmvacc2,it_results(ctr2).nbirdsvacc1,it_results(ctr2).nbirdsvacc2,
it_results(ctr2).nvaccdoses,it_results(ctr2).nfarmvaccimm1,it_results(ctr2).nfarmvaccimm2,
it_results(ctr2).vacctime,it_results(ctr2).npec_due,it_results(ctr2).npec_culled,
it_results(ctr2).swabs,it_results(ctr2).sera,
it_results(ctr2).costcomp,it_results(ctr2).costcull,it_results(ctr2).costdecont,
it_results(ctr2).costtest,it_results(ctr2).costvacc,it_results(ctr2).costop,it_results(ctr2).costoverdue,
it_results(ctr2).cost,it_results(ctr2).Rmin,it_results(ctr2).R25,it_results(ctr2).Rmed,
it_results(ctr2).R75,it_results(ctr2).Rmax,it_results(ctr2).Ravg,it_results(ctr2).nagrids,
it_results(ctr2).od_cm1,it_results(ctr2).od_cm2,it_results(ctr2).od_cm3,

```

```
it_results(ctr2).od_cm4,it_results(ctr2).od_cm5,it_results(ctr2).od_cm6,
it_results(ctr2).od_cm7,it_results(ctr2).od_cm8,it_results(ctr2).od_cl1,
it_results(ctr2).od_cl2,it_results(ctr2).od_cl3,it_results(ctr2).od_cl4,
it_results(ctr2).od_du1,it_results(ctr2).od_du2,it_results(ctr2).od_du3,
it_results(ctr2).od_tu1,it_results(ctr2).od_tu2,it_results(ctr2).od_tu3,
it_results(ctr2).od_cm1+it_results(ctr2).od_cm2+it_results(ctr2).od_cm3+it_results(ctr2).od_cm4+
it_results(ctr2).od_cm5+it_results(ctr2).od_cm6+it_results(ctr2).od_cm7+it_results(ctr2).od_cm8+
it_results(ctr2).od_cl1+it_results(ctr2).od_cl2+it_results(ctr2).od_cl3+it_results(ctr2).od_cl4+
it_results(ctr2).od_du1+it_results(ctr2).od_du2+it_results(ctr2).od_du3+
it_results(ctr2).od_tu1+it_results(ctr2).od_tu2+it_results(ctr2).od_tu3
```

```
insert into incoutput
```

```
values (it_results(ctr2).itno,
it_results(ctr2).IN_CM1,it_results(ctr2).IN_CM2,it_results(ctr2).IN_CM3,it_results(ctr2).IN_CM4,
it_results(ctr2).IN_CM5,it_results(ctr2).IN_CM6,it_results(ctr2).IN_CM7,it_results(ctr2).IN_CM8,
it_results(ctr2).IN_CL1,it_results(ctr2).IN_CL2,it_results(ctr2).IN_CL3,it_results(ctr2).IN_CL4,
it_results(ctr2).IN_DU1,it_results(ctr2).IN_DU2,it_results(ctr2).IN_DU3,it_results(ctr2).IN_TU1,
it_results(ctr2).IN_TU2,it_results(ctr2).IN_TU3,it_results(ctr2).TOT_CM1,it_results(ctr2).TOT_CM2,
it_results(ctr2).TOT_CM3,it_results(ctr2).TOT_CM4,it_results(ctr2).TOT_CM5,it_results(ctr2).TOT_CM6,
it_results(ctr2).TOT_CM7,it_results(ctr2).TOT_CM8,it_results(ctr2).TOT_CL1,it_results(ctr2).TOT_CL2,
it_results(ctr2).TOT_CL3,it_results(ctr2).TOT_CL4,it_results(ctr2).TOT_DU1,it_results(ctr2).TOT_DU2,
it_results(ctr2).TOT_DU3,it_results(ctr2).TOT_TU1,it_results(ctr2).TOT_TU2,it_results(ctr2).TOT_TU3)
```

```
next
```

```
commit table incoutput as "D:\AISPREADresults\Mitigations\inc_output_"+scenario
```

```
commit table iteroutput as "D:\AISPREADresults\Mitigations\it_output_"+scenario
```

```
commit table grid as "D:\AISPREADresults\Mitigations\maps\map_"+scenario
```

```
update grid set naffected=0
```

```
end sub
```

```
sub progresswin
```

```
dim aff as smallint
```

```
if rep=0 then
```

```
aff=nlat+ninf+ncont
```

```
elseif rep=1 then
```

```
aff=nlat+ninf+ncont+ndead
```

```
end if
```

```
set window windowID(1)
```

```
front
```

```
    title "AISpread version 1.0   Progress:  Iteration " + str$(itctr) + " of " + str$(itnumber) + ", Day " +
str$(dayctr) + ", Affected Farms: " + str$(aff)
end sub
```

AI_model_menu_31October09.mb

```
include "mapbasic.def"
include "ai_model.def"
```

```
sub menu
```

```
create menu "Production Parameters" as
"Chicken Meat" calling CMprodpara,
"Chicken Layer" calling CLprodpara,
"Duck" calling DUprodpara,
"Turkey" calling TUpodpara
```

```
create menu "Disease Parameters" as
"Farm-level parameters" calling FarmPara,
"Local spread parameters" calling LocalPara,
"Direct spread parameters" calling DirPara,
"Indirect spread parameters" calling IndirPara
```

```
create menu "Biosecurity Parameters" as
"Biocontainment" calling biocontpara,
"Bioexclusion" calling bioexcpa
```

```
create menu "Mitigations Parameters" as
"Surveillance" calling survpara,
"Diagnosis" calling diagpara,
"Tracing" calling tracpara,
"Zoning" calling zoningpara,
"Movement restrictions" calling movepara,
"Stamping out" calling cullpara,
"Emergency Vaccination" calling vaccpara
```

```
create menu "Economic Parameters" as
"Compensation parameters" calling ecopara1,
"Other economic parameters" calling ecopara2
```



```
create menu "AISpread" as
"Production Parameters" as "Production Parameters",
"Biosecurity Parameters" as "Biosecurity Parameters",
"Disease Parameters" as "Disease Parameters",
"Mitigations Parameters" as "Mitigations Parameters",
"Economic Parameters" as "Economic Parameters",
"(-",
"Simulation Options" calling Pref1,
"(-",
"Run AISpread" calling AISpread,
"(-",
"View Results" calling view1,
"(-",
"Exit AISpread" calling exit1
```

```
alter Menu Bar Remove ID 7
```

```
alter menu bar add "AISpread", ID 7
```

```
end sub
```

```
sub CMprodpara
`under construction
end sub
```

```
sub CLprodpara
`under construction
end sub
```

```
sub DUpodpara
`under construction
end sub
```

```
sub TUpodpara
`under construction
end sub
```

```
sub farmpara
`under construction
```

```
end sub
```

```
sub localpara
```

```
Dialog
```

```
Title "Local spread parameters"
```

```
Width 287 Height 220
```

```
Control OKButton
```

```
ID 1
```

```
Title "OK"
```

```
Position 81, 191
```

```
Width 50 Height 15
```

```
Control CancelButton
```

```
ID 2
```

```
Title "Cancel"
```

```
Position 158, 192
```

```
Width 50 Height 15
```

```
Control StaticText
```

```
ID 3
```

```
Title "Parameter name"
```

```
Position 27, 62
```

```
Width 54 Height 8
```

```
Control StaticText
```

```
ID 4
```

```
Title "r"
```

```
Position 27, 86
```

```
Width 63 Height 8
```

```
Control StaticText
```

```
ID 5
```

```
Title "Ho"
```

```
Position 27, 111
```

```
Width 36 Height 8
```

```
Control StaticText
```

```
ID 6
```

Title "ro"
Position 27, 135
Width 36 Height 8

Control StaticText
ID 7
Title "Description"
Position 107, 62
Width 36 Height 8

Control StaticText
ID 8
Title "Hazard function: $h(r)=H_0/[1+(r/r_0)^\alpha]$ "
Position 27, 12
Width 132 Height 8

Control StaticText
ID 9
Title "Daily transmission probability: $1-e^{-h(r)}$ "
Position 27, 37
Width 123 Height 8

Control StaticText
ID 10
Title "alpha"
Position 27, 160
Width 36 Height 8

Control StaticText
ID 11
Title "Max distance between farms (km)"
Position 107, 86
Width 90 Height 8

Control StaticText
ID 12
Title "Hazard at 0 km"
Position 107, 111
Width 49 Height 8

Control StaticText
ID 13
Title "Shape parameter 1"
Position 107, 135
Width 63 Height 8

Control StaticText
ID 14
Title "Shape parameter 2"
Position 107, 160
Width 62 Height 8

Control StaticText
ID 15
Title "Value"
Position 213, 62
Width 40 Height 8

Control EditText
ID 16
Value loc_par.maxrad
Into loc_par.maxrad
Position 213, 85
Width 27 Height 12

Control EditText
ID 17
Value loc_par.ho
Into loc_par.ho
Position 213, 108
Width 27 Height 12

Control EditText
ID 18
Value loc_par.rd
Into loc_par.rd
Position 213, 132
Width 27 Height 12

```
Control EditText
  ID 19
  Value loc_par.alpha
  Into loc_par.alpha
  Position 213, 158
  Width 27 Height 12
end sub
```

```
sub dirpara
end sub
```

```
sub indirpara
Dialog
  Title "Indirect spread parameters"
  Width 249 Height 266
  Control OKButton
    ID 1
    Title "OK"
    Position 57, 239
    Width 50 Height 15

  Control CancelButton
    ID 2
    Title "Cancel"
    Position 135, 238
    Width 50 Height 15

  Control StaticText
    ID 3
    Title "Pathway"
    Position 37, 25
    Width 36 Height 8

  Control StaticText
    ID 4
    Title "Probability"
    Position 173, 25
    Width 36 Height 8
```

Control StaticText
ID 5
Title "Feed deliveries"
Position 37, 43
Width 49 Height 8

Control StaticText
ID 6
Title "Dead bird collection"
Position 37, 62
Width 65 Height 8

Control StaticText
ID 7
Title "Litter/manure collection"
Position 37, 80
Width 75 Height 8

Control StaticText
ID 8
Title "Day old chick delivery"
Position 37, 98
Width 70 Height 8

Control StaticText
ID 9
Title "Litter delivery"
Position 37, 117
Width 49 Height 8

Control StaticText
ID 10
Title "Sanitation"
Position 37, 135
Width 36 Height 8

Control StaticText
ID 11

Title "Re-used egg trays"
Position 37, 154
Width 57 Height 8

Control StaticText
ID 12
Title "Routine vaccination"
Position 37, 172
Width 65 Height 8

Control StaticText
ID 13
Title "Slaughter crews"
Position 37, 191
Width 59 Height 8

Control StaticText
ID 14
Title "Broiler/turkey grower pickup crews"
Position 37, 209
Width 67 Height 8

Control EditText
ID 15
Value p_feed1
into p_feed1
Position 173, 41
Width 40 Height 12

Control EditText
ID 16
Value p_dbc1
into p_dbc1
Position 173, 59
Width 40 Height 12

Control EditText
ID 17
Value p_lrem1

into p_lrem1
Position 173, 78
Width 40 Height 12

Control EditText
ID 18
Value p_doc1
into p_doc1
Position 173, 96
Width 40 Height 12

Control EditText
ID 19
Value p_ldell
into p_ldell
Position 173, 114
Width 40 Height 12

Control EditText
ID 20
Value p_san1
into p_san1
Position 173, 133
Width 40 Height 12

Control EditText
ID 21
Value p_egg1
into p_egg1
Position 173, 151
Width 40 Height 12

Control EditText
ID 22
Value p_vaccl
into p_vaccl
Position 173, 170
Width 40 Height 12

Control EditText
ID 23
Value p_slaul
into p_slaul
Position 173, 188
Width 40 Height 12

Control EditText
ID 24
Value p_pul
into p_pul
Position 173, 207
Width 40 Height 12

Control CheckBox
ID 25
Title ""
Position 120, 43
Width 9 Height 8
Value feed_inc
Into feed_inc

Control StaticText
ID 26
Title "Include (y/n)"
Position 101, 25
Width 40 Height 8

Control CheckBox
ID 27
Position 120, 62
Width 9 Height 8
Value dbc_inc
Into dbc_inc

Control CheckBox
ID 28
Position 120, 80
Width 9 Height 8

Value lrem_inc
Into lrem_inc

Control CheckBox
ID 29
Position 120, 98
Width 9 Height 8
Value doc_inc
Into doc_inc

Control CheckBox
ID 30
Position 120, 117
Width 9 Height 8
Value ldel_inc
Into ldel_inc

Control CheckBox
ID 31
Position 120, 135
Width 9 Height 8
Value san_inc
Into san_inc

Control CheckBox
ID 32
Position 120, 154
Width 9 Height 8
Value egg_inc
Into egg_inc

Control CheckBox
ID 33
Position 120, 172
Width 9 Height 8
Value vacc_inc
Into vacc_inc

Control CheckBox

```
ID 34
Position 120, 191
Width 9 Height 8
Value slau_inc
Into slau_inc
```

```
Control CheckBox
ID 35
Position 120, 209
Width 9 Height 8
Value thin_inc
Into thin_inc
```

```
Control StaticText
ID 36
Title "pickup crews"
Position 37, 218
Width 47 Height 8
```

```
end sub
```

```
sub biocontpara
```

```
Dialog
```

```
Title "Biocontainment parameters"
Width 283 Height 356
```

```
Control OKButton
ID 1
Title "OK"
Position 79, 326
Width 50 Height 15
```

```
Control StaticText
ID 2
Title "Industry"
Position 13, 12
Width 49 Height 8
```

```
Control StaticText
ID 3
Title "Chicken Meat"
```

Position 13, 31
Width 46 Height 8

Control StaticText
ID 4
Title "Farm type"
Position 80, 12
Width 36 Height 8

Control StaticText
ID 5
Title "Broiler"
Position 80, 31
Width 36 Height 8

Control StaticText
ID 6
Title "Parent Breeder"
Position 80, 43
Width 51 Height 8

Control StaticText
ID 7
Title "Rearer and Parent Breeder"
Position 80, 55
Width 87 Height 8

Control StaticText
ID 8
Title "Rearer Parent Breeder"
Position 80, 68
Width 74 Height 8

Control StaticText
ID 9
Title "Grandparent Breeder"
Position 80, 80
Width 68 Height 8

Control StaticText
ID 10
Title "Rearer and Grandparent Breeder"
Position 80, 92
Width 107 Height 8

Control StaticText
ID 11
Title "Rearer Grandparent Breeder"
Position 80, 105
Width 90 Height 8

Control StaticText
ID 12
Title "Great-Grandparent Breeder"
Position 80, 117
Width 88 Height 8

Control StaticText
ID 13
Title "Layer"
Position 80, 148
Width 40 Height 8

Control StaticText
ID 14
Title "Pullet and Layer"
Position 80, 160
Width 53 Height 8

Control StaticText
ID 15
Title "Pullet"
Position 80, 172
Width 40 Height 8

Control StaticText
ID 16
Title "Breeder"

Position 80, 185
Width 40 Height 8

Control StaticText
ID 17
Title "Grower"
Position 80, 203
Width 40 Height 8

Control StaticText
ID 18
Title "Parent Breeder"
Position 80, 215
Width 57 Height 8

Control StaticText
ID 19
Title "Elite"
Position 80, 228
Width 40 Height 8

Control StaticText
ID 20
Title "Grower"
Position 80, 258
Width 40 Height 8

Control StaticText
ID 21
Title "Parent Breeder"
Position 80, 271
Width 51 Height 8

Control StaticText
ID 22
Title "Elite"
Position 80, 283
Width 40 Height 8

Control StaticText
ID 23
Title "Value"
Position 200, 12
Width 40 Height 8

Control EditText
ID 24
Value biocont11
Into biocont11
Position 200, 28
Width 27 Height 12

Control EditText
ID 25
Value biocont12
Into biocont12
Position 200, 40
Width 27 Height 12

Control EditText
ID 26
Value biocont13
Into biocont13
Position 200, 52
Width 27 Height 12

Control EditText
ID 27
Value biocont14
Into biocont14

Position 200, 64
Width 27 Height 12

Control EditText
ID 28
Value biocont15
Into biocont15

Position 200, 76
Width 27 Height 12

Control EditText
ID 29
Value biocont16
Into biocont16
Position 200, 88
Width 27 Height 12

Control EditText
ID 30
Value biocont17
Into biocont17

Position 200, 100
Width 27 Height 12

Control EditText
ID 31
Value biocont18
Into biocont18
Position 200, 112
Width 27 Height 12

Control EditText
ID 32
Value biocont1i
Into biocont1i
Position 200, 124
Width 27 Height 12

Control EditText
ID 33
Value biocont21
Into biocont21
Position 200, 142
Width 27 Height 12

Control EditText
ID 34
Value biocont22
Into biocont22

Position 200, 154
Width 27 Height 12

Control EditText
ID 35
Value biocont23
Into biocont23
Position 200, 166
Width 27 Height 12

Control EditText
ID 36
Value biocont24
Into biocont24
Position 200, 178
Width 27 Height 12

Control EditText
ID 37
Value biocont31
Into biocont31

Position 200, 196
Width 27 Height 12

Control EditText
ID 38
Value biocont32
Into biocont32
Position 200, 208
Width 27 Height 12

Control EditText
ID 39

Value biocont33
Into biocont33

Position 200, 220
Width 27 Height 12

Control EditText
ID 40
Value biocont3i
Into biocont3i
Position 200, 232
Width 27 Height 12

Control EditText
ID 41
Value biocont41
Into biocont41
Position 200, 250
Width 27 Height 12

Control EditText
ID 42
Value biocont42
Into biocont42
Position 200, 262
Width 27 Height 12

Control EditText
ID 43
Value biocont43
Into biocont43

Position 200, 274
Width 27 Height 12

Control EditText
ID 44
Value biocont4i
Into biocont4i

Position 200, 286
Width 27 Height 12

Control StaticText
ID 45
Title "Chicken Layer"
Position 13, 148
Width 51 Height 8

Control StaticText
ID 46
Title "Duck"
Position 13, 203
Width 40 Height 8

Control StaticText
ID 47
Title "Turkey"
Position 13, 258
Width 40 Height 8

Control CancelButton
ID 48
Title "Cancel"
Position 159, 326
Width 50 Height 15

Control StaticText
ID 49
Title "Independent Grower"
Position 80, 295
Width 68 Height 8

Control StaticText
ID 50
Title "Independent Grower"
Position 80, 240
Width 66 Height 8

```
Control StaticText
  ID 51
  Title "Independent Grower"
  Position 80, 128
  Width 67 Height 8
```

```
end sub
```

```
sub bioexcpa
Dialog
Title "Bioexclusion parameters"
Width 283 Height 356
Control OKButton
  ID 1
  Title "OK"
  Position 79, 326
  Width 50 Height 15
Control StaticText
  ID 2
  Title "Industry"
  Position 13, 12
  Width 49 Height 8
Control StaticText
  ID 3
  Title "Chicken Meat"
  Position 13, 31
  Width 46 Height 8
Control StaticText
  ID 4
  Title "Farm type"
  Position 80, 12
  Width 36 Height 8
Control StaticText
  ID 5
  Title "Broiler"
  Position 80, 31
  Width 36 Height 8
Control StaticText
```

ID 6
Title "Parent Breeder"
Position 80, 43
Width 51 Height 8
Control StaticText
ID 7
Title "Rearer and Parent Breeder"
Position 80, 55
Width 87 Height 8
Control StaticText
ID 8
Title "Rearer Parent Breeder"
Position 80, 68
Width 74 Height 8
Control StaticText
ID 9
Title "Grandparent Breeder"
Position 80, 80
Width 68 Height 8
Control StaticText
ID 10
Title "Rearer and Grandparent Breeder"
Position 80, 92
Width 107 Height 8
Control StaticText
ID 11
Title "Rearer Grandparent Breeder"
Position 80, 105
Width 90 Height 8
Control StaticText
ID 12
Title "Great-Grandparent Breeder"
Position 80, 117
Width 88 Height 8
Control StaticText
ID 13
Title "Layer"
Position 80, 148
Width 40 Height 8

```
Control StaticText
  ID 14
  Title "Pullet and Layer"
  Position 80, 160
  Width 53 Height 8
Control StaticText
  ID 15
  Title "Pullet"
  Position 80, 172
  Width 40 Height 8
Control StaticText
  ID 16
  Title "Breeder"
  Position 80, 185
  Width 40 Height 8
Control StaticText
  ID 17
  Title "Grower"
  Position 80, 203
  Width 40 Height 8
Control StaticText
  ID 18
  Title "Parent Breeder"
  Position 80, 215
  Width 57 Height 8
Control StaticText
  ID 19
  Title "Elite"
  Position 80, 228
  Width 40 Height 8
Control StaticText
  ID 20
  Title "Grower"
  Position 80, 258
  Width 40 Height 8
Control StaticText
  ID 21
  Title "Parent Breeder"
```

Position 80, 271
Width 51 Height 8
Control StaticText
ID 22
Title "Elite"
Position 80, 283
Width 40 Height 8
Control StaticText
ID 23
Title "Value"
Position 200, 12
Width 40 Height 8
Control EditText
ID 24
Value bioexcl11
Into bioexcl11
Position 200, 28
Width 27 Height 12
Control EditText
ID 25
Value bioexcl12
Into bioexcl12
Position 200, 40
Width 27 Height 12
Control EditText
ID 26
Value bioexcl13
Into bioexcl13
Position 200, 52
Width 27 Height 12
Control EditText
ID 27
Value bioexcl14
Into bioexcl14
Position 200, 64
Width 27 Height 12
Control EditText
ID 28
Value bioexcl15

Into bioexcl15
Position 200, 76
Width 27 Height 12
Control EditText
ID 29
Value bioexcl16
Into bioexcl16
Position 200, 88
Width 27 Height 12
Control EditText
ID 30
Value bioexcl17
Into bioexcl17
Position 200, 100
Width 27 Height 12
Control EditText
ID 31
Value bioexcl18
Into bioexcl18
Position 200, 112
Width 27 Height 12
Control EditText
ID 32
Value bioexcl1i
Into bioexcl1i
Position 200, 124
Width 27 Height 12
Control EditText
ID 33
Value bioexcl21
Into bioexcl21
Position 200, 142
Width 27 Height 12
Control EditText
ID 34
Value bioexcl22
Into bioexcl22
Position 200, 154
Width 27 Height 12

Control EditText
ID 35
Value bioexcl23
Into bioexcl23
Position 200, 166
Width 27 Height 12
Control EditText
ID 36
Value bioexcl24
Into bioexcl24
Position 200, 178
Width 27 Height 12
Control EditText
ID 37
Value bioexcl31
Into bioexcl31
Position 200, 196
Width 27 Height 12
Control EditText
ID 38
Value bioexcl32
Into bioexcl32
Position 200, 208
Width 27 Height 12
Control EditText
ID 39
Value bioexcl33
Into bioexcl33
Position 200, 220
Width 27 Height 12
Control EditText
ID 40
Value bioexcl3i
Into bioexcl3i
Position 200, 232
Width 27 Height 12
Control EditText
ID 41
Value bioexcl41

```
    Into bioexcl41
    Position 200, 250
    Width 27 Height 12
Control EditText
    ID 42
    Value bioexcl42
    Into bioexcl42
    Position 200, 262
    Width 27 Height 12
Control EditText
    ID 43
    Value bioexcl43
    Into bioexcl43
    Position 200, 274
    Width 27 Height 12
Control EditText
    ID 44
    Value bioexcl4i
    Into bioexcl4i
    Position 200, 286
    Width 27 Height 12
Control StaticText
    ID 45
    Title "Chicken Layer"
    Position 13, 148
    Width 51 Height 8
Control StaticText
    ID 46
    Title "Duck"
    Position 13, 203
    Width 40 Height 8
Control StaticText
    ID 47
    Title "Turkey"
    Position 13, 258
    Width 40 Height 8
Control CancelButton
    ID 48
    Title "Cancel"
```

```
    Position 159, 326
    Width 50 Height 15
Control StaticText
  ID 49
  Title "Independent Grower"
  Position 80, 295
  Width 68 Height 8
Control StaticText
  ID 50
  Title "Independent Grower"
  Position 80, 240
  Width 66 Height 8
Control StaticText
  ID 51
  Title "Independent Grower"
  Position 80, 128
  Width 67 Height 8
end sub
```

```
sub survpara
`under construction
end sub
```

```
sub diagpara
`under construction
end sub
```

```
sub tracpara
`under construction
end sub
```

```
sub zoningpara
`under construction
end sub
```

```
sub movepara
`under construction
end sub
```

```
sub cullpara
`under construction
end sub
```

```
sub vaccpara
`under construction
end sub
```

```
sub ecopara1
Dialog
Title "Compensation parameters"
Width 352 Height 313
' Calling Dialog1_OnShow
'//{{$Controls}
Control OKButton
ID 1
Title "OK"
Position 95, 289
Width 50 Height 15
' Calling Dialog1btnOK_OnClick

Control StaticText
ID 2
Title "Industry"
Position 13, 12
Width 49 Height 8

Control StaticText
ID 3
Title "Chicken Meat"
Position 13, 31
Width 46 Height 8

Control StaticText
ID 4
Title "Farm type"
Position 80, 12
Width 36 Height 8
```

Control StaticText
ID 5
Title "Broiler"
Position 80, 31
Width 36 Height 8

Control StaticText
ID 6
Title "Parent Breeder"
Position 80, 43
Width 51 Height 8

Control StaticText
ID 7
Title "Rearer and Parent Breeder"
Position 80, 55
Width 87 Height 8

Control StaticText
ID 8
Title "Rearer Parent Breeder"
Position 80, 68
Width 74 Height 8

Control StaticText
ID 9
Title "Grandparent Breeder"
Position 80, 80
Width 68 Height 8

Control StaticText
ID 10
Title "Rearer and Grandparent Breeder"
Position 80, 92
Width 107 Height 8

Control StaticText
ID 11
Title "Rearer Grandparent Breeder"

Position 80, 105
Width 90 Height 8

Control StaticText
ID 12
Title "Great-Grandparent Breeder"
Position 80, 117
Width 88 Height 8

Control StaticText
ID 13
Title "Layer"
Position 80, 135
Width 40 Height 8

Control StaticText
ID 14
Title "Pullet and Layer"
Position 80, 148
Width 53 Height 8

Control StaticText
ID 15
Title "Pullet"
Position 80, 160
Width 40 Height 8

Control StaticText
ID 16
Title "Breeder"
Position 80, 172
Width 40 Height 8

Control StaticText
ID 17
Title "Grower"
Position 80, 191
Width 40 Height 8

Control StaticText
ID 18
Title "Parent Breeder"
Position 80, 203
Width 57 Height 8

Control StaticText
ID 19
Title "Elite"
Position 80, 215
Width 40 Height 8

Control StaticText
ID 20
Title "Grower"
Position 80, 234
Width 40 Height 8

Control StaticText
ID 21
Title "Parent Breeder"
Position 80, 246
Width 51 Height 8

Control StaticText
ID 22
Title "Elite"
Position 80, 258
Width 40 Height 8

Control StaticText
ID 23
Title "Value"
Position 200, 12
Width 40 Height 8

Control EditText
ID 24
Value cost11

Into cost11
Position 200, 28
Width 27 Height 12

Control EditText
ID 25
Value cost12
Into cost12
Position 200, 40
Width 27 Height 12

Control EditText
ID 26
Value cost13
Into cost13
Position 200, 52
Width 27 Height 12

Control EditText
ID 27
Value cost14
Into cost14
Position 200, 64
Width 27 Height 12

Control EditText
ID 28
Value cost15
Into cost15
Position 200, 76
Width 27 Height 12

Control EditText
ID 29
Value cost16
Into cost16
Position 200, 88
Width 27 Height 12

Control EditText
ID 30
Value cost17
Into cost17
Position 200, 100
Width 27 Height 12

Control EditText
ID 31
Value cost18
Into cost18
Position 200, 112
Width 27 Height 12

Control EditText
ID 32
Value cost21
Into cost21
Position 200, 130
Width 27 Height 12

Control EditText
ID 33
Value cost22
Into cost22
Position 200, 142
Width 27 Height 12

Control EditText
ID 34
Value cost23
Into cost23
Position 200, 154
Width 27 Height 12

Control EditText
ID 35
Value cost24
Into cost24

Position 200, 166
Width 27 Height 12

Control EditText
ID 36
Value cost31
Into cost31
Position 200, 184
Width 27 Height 13

Control EditText
ID 37
Value cost32
Into cost32
Position 200, 196
Width 27 Height 12

Control EditText
ID 38
Value cost33
Into cost33
Position 200, 208
Width 27 Height 12

Control EditText
ID 39
Value cost41
Into cost41
Position 200, 226
Width 27 Height 12

Control EditText
ID 40
Value cost42
Into cost42
Position 200, 238
Width 27 Height 12

Control EditText

ID 41
Value cost43
Into cost43
Position 200, 250
Width 27 Height 12

Control StaticText
ID 42
Title "Chicken Layer"
Position 13, 135
Width 51 Height 8

Control StaticText
ID 43
Title "Duck"
Position 13, 191
Width 40 Height 8

Control StaticText
ID 44
Title "Turkey"
Position 13, 231
Width 40 Height 8

Control StaticText
ID 45
Title "Unit(s)"
Position 280, 12
Width 40 Height 8

Control StaticText
ID 46
Title "\$AUS per bird"
Position 280, 31
Width 46 Height 8

Control StaticText
ID 47
Title "\$AUS per bird"
Position 280, 43

Width 46 Height 8
Control StaticText
ID 48
Title "\$AUS per bird"
Position 280, 55
Width 46 Height 8
Control StaticText
ID 49
Title "\$AUS per bird"
Position 280, 68
Width 46 Height 8
Control StaticText
ID 50
Title "\$AUS per bird"
Position 280, 80
Width 46 Height 8
Control StaticText
ID 51
Title "\$AUS per bird"
Position 280, 92
Width 46 Height 8
Control StaticText
ID 52
Title "\$AUS per bird"
Position 280, 105
Width 46 Height 8
Control StaticText
ID 53
Title "\$AUS per bird"
Position 280, 117
Width 46 Height 8
Control StaticText
ID 54
Title "\$AUS per bird"
Position 280, 135
Width 46 Height 8
Control StaticText
ID 55
Title "\$AUS per bird"

Position 280, 148
Width 46 Height 8
Control StaticText
ID 56
Title "\$AUS per bird"
Position 280, 160
Width 46 Height 8
Control StaticText
ID 57
Title "\$AUS per bird"
Position 280, 172
Width 46 Height 8
Control StaticText
ID 58
Title "\$AUS per bird"
Position 280, 191
Width 46 Height 8
Control StaticText
ID 59
Title "\$AUS per bird"
Position 280, 203
Width 46 Height 8
Control StaticText
ID 60
Title "\$AUS per bird"
Position 280, 215
Width 46 Height 8
Control StaticText
ID 61
Title "\$AUS per bird"
Position 280, 234
Width 46 Height 8
Control StaticText
ID 62
Title "\$AUS per bird"
Position 280, 246
Width 46 Height 8
Control StaticText
ID 63

```
Title "$AUS per bird"  
Position 280, 258  
Width 46 Height 8
```

```
Control CancelButton  
ID 64  
Title "Cancel"  
Position 201, 289  
Width 50 Height 15
```

```
end sub
```

```
sub ecopara2  
`under construction  
end sub
```

```
sub pref1  
`under construction  
end sub
```

```
sub seed1  
`under construction  
end sub
```

```
sub view1  
`under construction  
end sub
```

```
sub exit1  
dim ans as logical  
ans=ask("Are you sure you want to quit AISpread?", "Yes", "No")  
if ans=1 then  
    end program  
end if  
end sub
```

AI_model_mitigations_8February10.mb

```
include "mapbasic.def"  
include "ai_model.def"
```

```

sub mitigations
' Note this sub is called when suspected clinical signs have been reported

call updatesurv

call surveillance

call tracing

call areas

call depopulation

call tacticalvacc

close table survtemp
close table depoptemp

end sub

sub updatesurv

' .....
```

' Hierarchy of farms for surveillance based on time since declared, species, typeofbirds, if self reported & area
' Metadata for surv_status: surv_status=0 (no surveillance), surv_status=1 (within RA/CA dead bird pickup),
' surv_status=2 (surveillance visit due), surv_status=3 (diagnosis pending), surv_status=4 (depop pending),
' surv_status=5 (depopulated as a control measure) and surv_status=6 (resolved)

```

Open Table app_path+"\Databases\template1.tab" as survtemp
Open Table app_path+"\Databases\template2.tab" as depoptemp

for ctrl = 1 to nfarms

' .....
```

' Step 1 identify farms due for surveillance - dead bird pickup and due to true self reporting

```

    if (dyn_data(ctrl).report=1 and dyn_data(ctrl).daystillreport=0) or
        (dyn_data(ctrl).status=3 and surv_data(ctrl).self_report=0) then
```

```

    dyn_data(ctrl1).report=0
    surv_data(ctrl1).self_report=1
    surv_data(ctrl1).sp=1
    if surv_data(ctrl1).surv_status<=1 and dyn_data(ctrl1).populated=1 then
        surv_data(ctrl1).surv_status=2
    end if
end if
if surv_data(ctrl1).surv_status=0 and dyn_data(ctrl1).populated=1 then
    z=random()
    if ( surv_data(ctrl1).ra=1 and z<1/14) or (surv_data(ctrl1).ca=1 and z<1/70) and dyn_data(ctrl1).populated=1
then
    if dayssincediag>=4 then
        surv_data(ctrl1).surv_status=1
        nswabs=nswabs+dbswab
        costtest=costtest+(dbswab*costperswab)
        if (dyn_data(ctrl1).status=2 or dyn_data(ctrl1).status=3) and random()<=Sedbc then
            surv_data(ctrl1).diagoutcome=1
            surv_data(ctrl1).daystilldiag=1
        else
            surv_data(ctrl1).diagoutcome=2
            surv_data(ctrl1).daystilldiag=1
        end if
    end if
end if
end if
end if

call diagnosis

call resolved

if surv_data(ctrl1).surv_status=2 then

    insert into survtemp
(id,surv_status,self_report,daystilldiag,diagoutcome,days_sched_surv,SurvNo,days_since_surv,
days_sched_depop,days_since_depop,traced,RA,CA,diagnosed,DCP,SP,obj)
values
(surv_data(ctrl1).id,surv_data(ctrl1).surv_status,surv_data(ctrl1).self_report,surv_data(ctrl1).daystilldiag,

```



```

    surv_data(ctrl1).diagoutcome,surv_data(ctrl1).days_sched_surv,surv_data(ctrl1).SurvNo,surv_data(ctrl1).days_since_surv,
rv,
    surv_data(ctrl1).days_sched_depop,surv_data(ctrl1).days_since_depop,surv_data(ctrl1).traced,surv_data(ctrl1).RA,
    surv_data(ctrl1).CA,surv_data(ctrl1).diagnosed,surv_data(ctrl1).DCP,surv_data(ctrl1).SP,dyn_data(ctrl1).loc)

end if
if surv_data(ctrl1).surv_status>=4 then

    insert into depoptemp
(id,surv_status,self_report,daystilldiag,diagoutcome,days_sched_surv,SurvNo,days_since_surv,
    days_sched_depop,days_since_depop,traced,RA,CA,diagnosed,DCP,SP,state,obj)
    values
(surv_data(ctrl1).id,surv_data(ctrl1).surv_status,surv_data(ctrl1).self_report,surv_data(ctrl1).daystilldiag,
    surv_data(ctrl1).diagoutcome,surv_data(ctrl1).days_sched_surv,surv_data(ctrl1).SurvNo,surv_data(ctrl1).days_since_surv,
rv,
    surv_data(ctrl1).days_sched_depop,surv_data(ctrl1).days_since_depop,surv_data(ctrl1).traced,surv_data(ctrl1).RA,
    surv_data(ctrl1).CA,surv_data(ctrl1).diagnosed,surv_data(ctrl1).DCP,surv_data(ctrl1).SP,dyn_data(ctrl1).state,dyn_data(ctrl1).loc)

elseif surv_data(ctrl1).dcp=1 then

    insert into depoptemp
(id,surv_status,self_report,daystilldiag,diagoutcome,days_sched_surv,SurvNo,days_since_surv,
    days_sched_depop,days_since_depop,traced,RA,CA,diagnosed,DCP,SP,obj)
    values
(surv_data(ctrl1).id,surv_data(ctrl1).surv_status,surv_data(ctrl1).self_report,surv_data(ctrl1).daystilldiag,
    surv_data(ctrl1).diagoutcome,surv_data(ctrl1).days_sched_surv,surv_data(ctrl1).SurvNo,surv_data(ctrl1).days_since_surv,
rv,
    surv_data(ctrl1).days_sched_depop,surv_data(ctrl1).days_since_depop,surv_data(ctrl1).traced,surv_data(ctrl1).RA,
    surv_data(ctrl1).CA,surv_data(ctrl1).diagnosed,surv_data(ctrl1).DCP,surv_data(ctrl1).SP,dyn_data(ctrl1).loc)

elseif preemptsl=1 and dyn_data(ctrl1).populated=1 and surv_data(ctrl1).ra=1 and dayssincediag>=7 then
    if surv_data(ctrl1).duepec=0 then
        surv_data(ctrl1).duepec=1
        npec=npec+1
    end if
end if

```

```

        end if
        insert into depoptemp
(id,surv_status,self_report,daystilldiag,diagoutcome,days_sched_surv,SurvNo,days_since_surv,
    days_sched_depop,days_since_depop,traced,RA,CA,diagnosed,DCP,SP,state,obj)
    values
(surv_data(ctrl).id,surv_data(ctrl).surv_status,surv_data(ctrl).self_report,surv_data(ctrl).daystilldiag,
    surv_data(ctrl).diagoutcome,surv_data(ctrl).days_sched_surv,surv_data(ctrl).SurvNo,surv_data(ctrl).days_since_surv,
rv,
    surv_data(ctrl).days_sched_depop,surv_data(ctrl).days_since_depop,surv_data(ctrl).traced,surv_data(ctrl).RA,
    surv_data(ctrl).CA,surv_data(ctrl).diagnosed,surv_data(ctrl).DCP,surv_data(ctrl).SP,dyn_data(ctrl).state,dyn_data(ctrl).loc)
    end if
next
end sub

sub diagnosis

dim npos,nneg as smallint

.....
' Step 2 Diagnosis from dead bird surveillance and from test results from farm visits

if (surv_data(ctrl).surv_status=1 or surv_data(ctrl).surv_status=3) then
    if surv_data(ctrl).daystilldiag=0 then
        if surv_data(ctrl).diagoutcome=1 then
            diag=1
            surv_data(ctrl).surv_status=4
            surv_data(ctrl).diagnosed=1
            surv_data(ctrl).diagoutcome=0
            surv_data(ctrl).sp=0
            surv_data(ctrl).days_since_surv=0
        elseif surv_data(ctrl).diagoutcome=2 then
            if surv_data(ctrl).surv_status=3 then
                if surv_data(ctrl).SurvNo<nrepvisits then
                    if surv_data(ctrl).sp=1 or surv_data(ctrl).dcp=1 then
                        surv_data(ctrl).surv_status=2
                        surv_data(ctrl).days_since_surv=0
                    end if
                end if
            end if
        end if
    end if
end if

```

```
        else
            surv_data(ctrl1).diagoutcome=0
            surv_data(ctrl1).days_since_surv=0
            surv_data(ctrl1).surv_status=0
            surv_data(ctrl1).SurvNo=0
        end if
    else
        surv_data(ctrl1).diagoutcome=0
        surv_data(ctrl1).days_since_surv=0
        surv_data(ctrl1).surv_status=0
        surv_data(ctrl1).sp=0
        surv_data(ctrl1).SurvNo=0
    end if
elseif surv_data(ctrl1).surv_status=1 then
    surv_data(ctrl1).diagoutcome=0
    surv_data(ctrl1).days_since_surv=0
    surv_data(ctrl1).sp=0
    surv_data(ctrl1).SurvNo=0
    if surv_data(ctrl1).sp=1 or surv_data(ctrl1).dcp=1 then
        surv_data(ctrl1).surv_status=2
    else
        surv_data(ctrl1).surv_status=0
    end if
end if
end if
end if
end if
```

end sub

sub resolved

.....

' Step 3 Resolve IPS

```
if surv_data(ctrl1).surv_status=5 and surv_data(ctrl1).daysleftdepop=0 then
    surv_data(ctrl1).surv_status=6
end if
```

```
end sub
```

```
sub surveillance
```

```
.....  
' Step 4 Do surveillance by conducting farm visits
```

```
dim survctr, survlist, thisfarm, nsurv as smallint
```

```
select
```

```
(RA*2+CA*1),id,surv_status,self_report,daystilldiag,diagoutcome,days_sched_surv,SurvNo,days_since_surv,days_sched_de
```

```
pop,days_since_depop,traced,RA,CA,diagnosed,DCP,SP
```

```
from survtemp order by DCP desc, self_report desc, coll, days_sched_surv desc into survorder
```

```
nsurv=tableinfo("survorder",tab_info_nrows)
```

```
if nsurv=0 then
```

```
    exit sub
```

```
elseif nsurv<survlimit then
```

```
    survlist=nsurv
```

```
else
```

```
    survlist=survlimit
```

```
end if
```

```
for survctr=1 to survlist
```

```
    fetch rec survctr from survorder
```

```
        thisfarm=survorder.id
```

```
    update survorder set days_sched_surv=0 where rowid=survctr
```

```
    if dyn_data(thisfarm).populated=1 then
```

```
        if dyn_data(thisfarm).status>=2 and dyn_data(thisfarm).status<=4 then
```

```
            if (surv_data(thisfarm).vacc_status<4 and random()<=Sevisit) or (surv_data(thisfarm).vacc_status>=4 and  
random()<=Sevaccvisit) then
```

```
                surv_data(thisfarm).surv_status=3
```

```
                surv_data(thisfarm).daystilldiag=1
```

```
                surv_data(thisfarm).diagoutcome=1
```

```
                surv_data(thisfarm).survno=surv_data(thisfarm).survno+1
```

```
                nswabs=nswabs+svswab
```

```
                nsera=nsera+svsera
```

```
                costtest=costtest+(svswab*costperswab)+(svsera+costpersera)
```

```
            else
```

```
                surv_data(thisfarm).surv_status=3
```

```

        surv_data(thisfarm).daystilldiag=1
        surv_data(thisfarm).diagoutcome=2
        surv_data(thisfarm).survno=surv_data(thisfarm).survno+1
        nswabs=nswabs+svswab
        nsera=nsera+svsera
        costtest=costtest+(svswab*costperswab)+(svsera+costpersera)

    end if
else
    surv_data(thisfarm).surv_status=3
    surv_data(thisfarm).daystilldiag=1
    surv_data(thisfarm).diagoutcome=2
    surv_data(thisfarm).survno=surv_data(thisfarm).survno+1
    nswabs=nswabs+svswab
    nsera=nsera+svsera
    costtest=costtest+(svswab*costperswab)+(svsera+costpersera)

end if
end if
next
close table survorder

end sub

sub tracing
.....
' Step 5 Tracing
'   I: identify all contact events (stored in exposures table)
'   II: for all diagnosed farms do backwards and forwards tracing by:
'   III: finding effective contacts to a farm over past 21 days & applying a Se
'   IV: finding all effective contacts off a farm over past 21 days & applying a Se

dim ctr2, contacts, thisfarm, otherfarm, nexp, expctr as integer
dim alreadyincluded as logical
nexp=ubound(exposures)
for thisfarm = 1 to nfarms
    if surv_data(thisfarm).diagnosed=1 and surv_data(thisfarm).traced=0 then
        for expctr=1 to nexp

```

```

then
  if exposures(expctr).id=thisfarm and exposures(expctr).day>=dayctr-21 and exposures(expctr).effective=1
    otherfarm=exposures(expctr).from
    do case exposures(expctr).how
    case "loc"
      if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
          if random()<=0.00 then
            if dyn_data(otherfarm).populated=1 then
              surv_data(otherfarm).dcp=1
            end if
          end if
        end if
      end if
    case "feed"
      if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
          if random()<=Ptrace then
            if dyn_data(otherfarm).populated=1 then
              surv_data(otherfarm).dcp=1
            end if
          end if
        end if
      end if
    case "dbc"
      if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
          if random()<=Ptrace then
            if dyn_data(otherfarm).populated=1 then
              surv_data(otherfarm).dcp=1
            end if
          end if
        end if
      end if
    case "lc"
      if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
          if random()<=Ptrace then
            if dyn_data(otherfarm).populated=1 then

```

```

        surv_data(otherfarm).dcp=1
    end if
end if
end if
end if
case "san"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
end if
case "ld"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
end if
case "vac"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
end if
case "thin"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then

```

```

                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
case "slau"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
case "egg"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
case "doc"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
case "live"
    if exposures(expctr).effective=1 then

```



```

        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
end if
case "spike"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
end case

elseif exposures(expctr).from=thisfarm and exposures(expctr).day>=dayctr-21 and
exposures(expctr).effective=1 then
    otherfarm=exposures(expctr).id
    do case exposures(expctr).how
    case "loc"
        if exposures(expctr).effective=1 then
            if surv_data(otherfarm).surv_status<4 then
                if random()<=0.00 then
                    if dyn_data(otherfarm).populated=1 then
                        surv_data(otherfarm).dcp=1
                    end if
                end if
            end if
        end if
    case "feed"
        if exposures(expctr).effective=1 then
            if surv_data(otherfarm).surv_status<4 then
                if random()<=Ptrace then
                    if dyn_data(otherfarm).populated=1 then

```

```

        surv_data(otherfarm).dcp=1
    end if
end if
end if
end if
case "dbc"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
end if
case "lc"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
end if
case "san"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
end if
case "ld"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then

```

```

                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
case "vac"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
case "thin"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
case "slau"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
case "egg"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then

```

```

        if random()<=Ptrace then
            if dyn_data(otherfarm).populated=1 then
                surv_data(otherfarm).dcp=1
            end if
        end if
    end if
end if
case "doc"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
case "live"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
case "spike"
    if exposures(expctr).effective=1 then
        if surv_data(otherfarm).surv_status<4 then
            if random()<=Ptrace then
                if dyn_data(otherfarm).populated=1 then
                    surv_data(otherfarm).dcp=1
                end if
            end if
        end if
    end if
end case
end if

```

```

alreadyincluded=0
if otherfarm<>0 then
  if surv_data(otherfarm).dcp=1 then
    for ctr2=1 to tableinfo("depoptemp",tab_info_nrows)
      fetch rec ctr2 from depoptemp
      if depoptemp.id=otherfarm then
        update depoptemp set dcp=1 where rowid=ctr2
        alreadyincluded=1
      end if
    next
    if alreadyincluded=0 then
      insert into depoptemp
(id,surv_status,self_report,daystilldiag,diagoutcome,days_sched_surv,SurvNo,days_since_surv,
days_sched_depop,days_since_depop,traced,RA,CA,diagnosed,DCP,SP,obj)
values
(surv_data(otherfarm).id,surv_data(otherfarm).surv_status,surv_data(otherfarm).self_report,surv_data(otherfarm).days
tilldiag,

surv_data(otherfarm).diagoutcome,surv_data(otherfarm).days_sched_surv,surv_data(otherfarm).SurvNo,surv_data(othe
rfarm).days_since_surv,

surv_data(otherfarm).days_sched_depop,surv_data(otherfarm).days_since_depop,surv_data(otherfarm).traced,surv_dat
a(otherfarm).RA,

surv_data(otherfarm).CA,surv_data(otherfarm).diagnosed,surv_data(otherfarm).DCP,surv_data(otherfarm).SP,dyn_data
(otherfarm).loc)
      if surv_data(otherfarm).surv_status<=1 then
        surv_data(otherfarm).surv_status=2
      end if
    end if
  end if
end if
next
surv_data(thisfarm).traced=1
end if
next
end sub

```

```

sub areas
dim nstates, tempctr as smallint

' Step 6 Set RA and CA based upon IPs and DCPs

withinra=0
withinca=0

if tableinfo("depoptemp",tab_info_nrows)=0 then
  exit sub
end if

select * from depoptemp where surv_status>=4 into depoptempl
select * from depoptempl group by state into fred1

nstates=tableinfo("fred1",tab_info_nrows)
close table fred1
costop=costop+nstates*costperop

if dayssincediag=7 then
  nIP7d=tableinfo("depoptempl",tab_info_nrows)
end if

for tempctr=1 to tableinfo("depoptempl",tab_info_nrows)
  fetch rec tempctr from depoptempl
  if tempctr=1 then
    Rarea=buffer(depoptempl.obj,20,RAbuffer,"km")
    if jurisd=0 then
      Carea=buffer(depoptempl.obj,20,CAbuffer,"km")
    end if
  else
    Rarea=combine(Rarea,buffer(depoptempl.obj,20,RAbuffer,"km"))
    if jurisd=0 then
      Carea=combine(Carea,buffer(depoptempl.obj,20,CAbuffer,"km"))
    end if
  end if
end if

```

```

next

if jurisd=1 then
  commit table depoptemp1 as app_path+"\cache\depoptemp1"
  close table depoptemp1
  open table app_path+"\cache\depoptemp1" as depoptemp1
  select * from states, depoptemp1 where depoptemp1.obj within states.obj into tempCA
  commit table tempCA as app_path+"\cache\tempCA"
  close table tempCA
  open table app_path+"\cache\tempCA" as tempCA
  create object as buffer from tempCA into variable Carea width 0 units "km" resolution 12
  close table tempCA
end if

close table depoptemp1

for ctrl=1 to nfarms
  if dyn_data(ctrl).loc within carea then
    if dyn_data(ctrl).loc within rarea then
      if surv_data(ctrl).ra=0 then
        surv_data(ctrl).ra=1
        surv_data(ctrl).ca=0
        if dyn_data(ctrl).become_lat=1 or dyn_data(ctrl).become_cont=1 then
          call updatelatent
        end if
      end if
      withinra=withinra+1
    else
      if surv_data(ctrl).ca=0 then
        surv_data(ctrl).ca=1
        surv_data(ctrl).ra=0
        if dyn_data(ctrl).become_lat=1 or dyn_data(ctrl).become_cont=1 then
          call updatelatent
        end if
      end if
      withinca=withinca+1
    end if
  end if
end if
next

```

```

end sub

sub updatelatent
if dyn_data(ctrl1).how_inf="feed" then
  if surv_data(ctrl1).ra=1 then
    if RAfeed=0 then
      dyn_data(ctrl1).become_lat=0
      dyn_data(ctrl1).daystillatent=0
      dyn_data(ctrl1).exp_by=0
      dyn_data(ctrl1).how_inf=""
    end if
  end if
  if surv_data(ctrl1).ca=1 then
    if CAfeed=0 then
      dyn_data(ctrl1).become_lat=0
      dyn_data(ctrl1).daystillatent=0
      dyn_data(ctrl1).exp_by=0
      dyn_data(ctrl1).how_inf=""
    end if
  end if
elseif dyn_data(ctrl1).how_inf="dbc" then
  if surv_data(ctrl1).ra=1 then
    if RAdbc=0 then
      dyn_data(ctrl1).become_lat=0
      dyn_data(ctrl1).daystillatent=0
      dyn_data(ctrl1).exp_by=0
      dyn_data(ctrl1).how_inf=""
    end if
  end if
  if surv_data(ctrl1).ca=1 then
    if CAdbc=0 then
      dyn_data(ctrl1).become_lat=0
      dyn_data(ctrl1).daystillatent=0
      dyn_data(ctrl1).exp_by=0
      dyn_data(ctrl1).how_inf=""
    end if
  end if
elseif dyn_data(ctrl1).how_inf="lc" then

```



```

if surv_data(ctrl1).ra=1 then
  if RAlrem=0 then
    dyn_data(ctrl1).become_lat=0
    dyn_data(ctrl1).daystillatent=0
    dyn_data(ctrl1).become_cont=0
    dyn_data(ctrl1).daystilcont=0
    dyn_data(ctrl1).exp_by=0
    dyn_data(ctrl1).how_inf=""
  end if
end if
if surv_data(ctrl1).ca=1 then
  if CAAlrem=0 then
    dyn_data(ctrl1).become_lat=0
    dyn_data(ctrl1).daystillatent=0
    dyn_data(ctrl1).become_cont=0
    dyn_data(ctrl1).daystilcont=0
    dyn_data(ctrl1).exp_by=0
    dyn_data(ctrl1).how_inf=""
  end if
end if
elseif dyn_data(ctrl1).how_inf="san" then
  if surv_data(ctrl1).ra=1 then
    if RAsan=0 then
      dyn_data(ctrl1).become_lat=0
      dyn_data(ctrl1).daystillatent=0
      dyn_data(ctrl1).become_cont=0
      dyn_data(ctrl1).daystilcont=0
      dyn_data(ctrl1).exp_by=0
      dyn_data(ctrl1).how_inf=""
    end if
  end if
  if surv_data(ctrl1).ca=1 then
    if CAsan=0 then
      dyn_data(ctrl1).become_lat=0
      dyn_data(ctrl1).daystillatent=0
      dyn_data(ctrl1).become_cont=0
      dyn_data(ctrl1).daystilcont=0
      dyn_data(ctrl1).exp_by=0
      dyn_data(ctrl1).how_inf=""
    end if
  end if
end if

```

```

        end if
    end if
elseif dyn_data(ctrl1).how_inf="vac" then
    if surv_data(ctrl1).ra=1 then
        if RAvacc=0 then
            dyn_data(ctrl1).become_lat=0

            dyn_data(ctrl1).daystillatent=0
            dyn_data(ctrl1).exp_by=0
            dyn_data(ctrl1).how_inf=""

        end if
    end if
    if surv_data(ctrl1).ca=1 then
        if CAvacc=0 then
            dyn_data(ctrl1).become_lat=0
            dyn_data(ctrl1).daystillatent=0

            dyn_data(ctrl1).exp_by=0
            dyn_data(ctrl1).how_inf=""
        end if
    end if
elseif dyn_data(ctrl1).how_inf="ld" then
    if surv_data(ctrl1).ra=1 then
        if RAldel=0 then
            dyn_data(ctrl1).become_lat=0
            dyn_data(ctrl1).daystillatent=0
            dyn_data(ctrl1).become_cont=0
            dyn_data(ctrl1).daystilcont=0
            dyn_data(ctrl1).exp_by=0
            dyn_data(ctrl1).how_inf=""
        end if
    end if
    if surv_data(ctrl1).ca=1 then
        if CALdel=0 then
            dyn_data(ctrl1).become_lat=0
            dyn_data(ctrl1).daystillatent=0
            dyn_data(ctrl1).become_cont=0

```

```

        dyn_data(ctrl1).daystilcont=0
        dyn_data(ctrl1).exp_by=0
        dyn_data(ctrl1).how_inf=""
    end if
end if
elseif dyn_data(ctrl1).how_inf="thin" then
    if (dyn_data(ctrl1).species=1 or dyn_data(ctrl1).species=4) and surv_data(ctrl1).ra=1 and RApickup=0 then
        dyn_data(ctrl1).become_lat=0
        dyn_data(ctrl1).daystillatent=0
        dyn_data(ctrl1).exp_by=0
        dyn_data(ctrl1).how_inf=""
    end if
    if (dyn_data(ctrl1).species=1 or dyn_data(ctrl1).species=4) and surv_data(ctrl1).ca=1 and CApickup=0 then
        dyn_data(ctrl1).become_lat=0
        dyn_data(ctrl1).daystillatent=0
        dyn_data(ctrl1).exp_by=0
        dyn_data(ctrl1).how_inf=""
    end if
elseif dyn_data(ctrl1).how_inf="slau" then
    if surv_data(ctrl1).ra=1 then
        if (dyn_data(ctrl1).species=3 and dyn_data(ctrl1).typeofbirds=1) then
            if RApickup=0 then
                dyn_data(ctrl1).become_lat=0
                dyn_data(ctrl1).daystillatent=0
                dyn_data(ctrl1).exp_by=0
                dyn_data(ctrl1).how_inf=""
            end if
        else
            if RAslau=0 then
                dyn_data(ctrl1).become_lat=0
                dyn_data(ctrl1).daystillatent=0
                dyn_data(ctrl1).exp_by=0
                dyn_data(ctrl1).how_inf=""
            end if
        end if
    end if
    if surv_data(ctrl1).ca=1 then
        if (dyn_data(ctrl1).species=3 and dyn_data(ctrl1).typeofbirds=1) then
            if CApickup=0 then

```

```

        dyn_data(ctrl).become_lat=0
        dyn_data(ctrl).daystillatent=0
        dyn_data(ctrl).exp_by=0
        dyn_data(ctrl).how_inf=""
    end if
else
    if CAslau=0 then
        dyn_data(ctrl).become_lat=0
        dyn_data(ctrl).daystillatent=0
        dyn_data(ctrl).exp_by=0
        dyn_data(ctrl).how_inf=""
    end if
end if
elseif dyn_data(ctrl).how_inf="egg" then
    if surv_data(ctrl).ra=1 then
        if RAeggs=0 then
            dyn_data(ctrl).become_lat=0
            dyn_data(ctrl).daystillatent=0
            dyn_data(ctrl).exp_by=0
            dyn_data(ctrl).how_inf=""
        end if
    end if
    if surv_data(ctrl).ca=1 then
        if CAeggs=0 then
            dyn_data(ctrl).become_lat=0
            dyn_data(ctrl).daystillatent=0
            dyn_data(ctrl).exp_by=0
            dyn_data(ctrl).how_inf=""
        end if
    end if
elseif dyn_data(ctrl).how_inf="doc" then
    if surv_data(ctrl).ra=1 then
        if RAdoc=0 then
            dyn_data(ctrl).become_lat=0
            dyn_data(ctrl).daystillatent=0
            dyn_data(ctrl).become_cont=0
            dyn_data(ctrl).daystilcont=0
            dyn_data(ctrl).exp_by=0
        end if
    end if
end if

```

```

        dyn_data(ctrl1).how_inf=""
    end if
end if
if surv_data(ctrl1).ca=1 then
    if CADoc=0 then
        dyn_data(ctrl1).become_lat=0
        dyn_data(ctrl1).daystillatent=0
        dyn_data(ctrl1).become_cont=0
        dyn_data(ctrl1).daystilcont=0
        dyn_data(ctrl1).exp_by=0
        dyn_data(ctrl1).how_inf=""
    end if
end if
end if
end sub

```

```

sub depopulation

```

```

dim ndep, thisfarm as smallint

```

```

.....
' Step 7 depopulate farms hierarchy days scheduled for depopulation, species
' note that daysleftcont set to 4 days - hardwired estimate of time to virus decomp - today plus 3 days from canada

```

```

if preempts1=0 then
    select * from depoptemp where surv_status=4 order by partculled desc, days_sched_depop desc into duefordepop
elseif preempts1=1 then
    select * from depoptemp where surv_status=4 or (surv_status<=4 and RA=1) order by partculled desc, surv_status
desc, days_sched_depop desc into duefordepop
end if

```

```

ndep=tableinfo("duefordepop",tab_info_nrows)

```

```

if ndep=0 then
    exit sub
elseif ndep>culllimit then
    ndep=culllimit
end if

```

```

for ctrl=1 to ndep
  fetch rec ctrl from duefordepop
  thisfarm=duefordepop.id
  surv_data(thisfarm).cdays=surv_data(thisfarm).cdays-1
  costcull=costcull+costpercull
  costdecont=costdecont+costperdecont
  if surv_data(thisfarm).cdays=0 then
    do case dyn_data(thisfarm).status
      case 0
        surv_data(thisfarm).toremoved=1
      case 1
        surv_data(thisfarm).toremoved=1
      case 2
        surv_data(thisfarm).toremoved=1
      case 3
        surv_data(thisfarm).toremoved=1
      case 4
        surv_data(thisfarm).toremoved=1
      case 5
        note "trying to depopulate unpop farm, status "+dyn_data(thisfarm).status+" farm "+thisfarm
        STOP
      case 6
        note "trying to depopulate unpop farm, status "+dyn_data(thisfarm).status+" farm "+thisfarm
        stop
    end case
    ndeadb=ndeadb+dyn_data(thisfarm).currentcap
    costcomp=costcomp+compo(thisfarm)*dyn_data(thisfarm).currentcap
    nculled=nculled+1
    if preemptsl=1 and surv_data(thisfarm).duepec=1 and surv_data(thisfarm).surv_status<4 then
      npecculled=npecculled+1
    end if

    dyn_data(thisfarm).daystocycle=0
    dyn_data(thisfarm).cycleday=0
    dyn_data(thisfarm).endofthisbatch=0
    dyn_data(thisfarm).fate=0
    dyn_data(thisfarm).become_lat=0
    dyn_data(thisfarm).daystillatent=0
    dyn_data(thisfarm).become_cont=0
  end if
end for

```

```

dyn_data(thisfarm).daystilcont=0
dyn_data(thisfarm).daysleftcont=0
dyn_data(thisfarm).daysleftlatent=0
dyn_data(thisfarm).daystildead=0
dyn_data(thisfarm).daystilimmune=0
dyn_data(thisfarm).daysleftimmune=0
dyn_data(thisfarm).populated=0
dyn_data(thisfarm).thin=0
dyn_data(thisfarm).overdue=0
dyn_data(thisfarm).daysoverdue=0
dyn_data(thisfarm).currentcap=0
surv_data(thisfarm).surv_status=5
surv_data(thisfarm).daysleftdepop=21
surv_data(thisfarm).vacc_status=0
surv_data(thisfarm).why_vacc=0
surv_data(thisfarm).vdue_day=0
surv_data(thisfarm).vdays=0
surv_data(thisfarm).daystovaccimm=0
surv_data(thisfarm).partculled=0

else
    surv_data(thisfarm).partculled=1
end if
next
close table duefordepop

end sub

sub tacticalvacc
dim varea1, varea2 as object
dim vcrews, ndueforv, vctr, nearestIPid as smallint

open table app_path+"\Databases\template3.tab" as vaccschedule

if vacc type=1 and dayssincediag>=7 then                'target
    vstarted=1
    vacc_inc=0
elseif vacc_type=2 and dayssincediag>=7 then          'ring vaccination
    vstarted=1

```

```

vacc_inc=0
select * from depoptemp where surv_status>=4 into depoptemp1
for vctr=1 to tableinfo("depoptemp1",tab_info_nrows)
  fetch rec vctr from depoptemp1
  if vctr=1 then
    Varea1=buffer(depoptemp1.obj,20,v_inner,"km")
    Varea2=buffer(depoptemp1.obj,20,v_outer,"km")
  else
    Varea1=combine(Varea1,buffer(depoptemp1.obj,20,v_inner,"km"))
    Varea2=combine(Varea2,buffer(depoptemp1.obj,20,v_outer,"km"))
  end if
next

for ctrl=1 to nfarms
  if (dyn_data(ctrl).species=1 and dyn_data(ctrl).typeofbirds=1) or (dyn_data(ctrl).species=3 and
dyn_data(ctrl).typeofbirds=1) or (dyn_data(ctrl).species=4 and dyn_data(ctrl).typeofbirds=1) then
  else
    if dyn_data(ctrl).loc within varea2 then
      if dyn_data(ctrl).loc within varea1 then
        else
          surv_data(ctrl).VA=1
          if surv_data(ctrl).surv_status<=1 and dyn_data(ctrl).populated=1 then
            open table app_path+"\Databases\template4.tab" as nearestIP
            nearest from variable dyn_data(ctrl).loc to depoptemp1 into nearestIP type spherical data
id=depoptemp1.id
            fetch rec 1 from nearestIP
            nearestIPid=nearestIP.id
            close table nearestIP
            if surv_data(ctrl).vacc_status=0 then
              surv_data(ctrl).vacc_status=1
              surv_data(ctrl).vdue_day=dayctr+1
              surv_data(ctrl).why_vacc=2
              insert into vaccschedule (id, vacc_status, vdue_day, why_vacc, vdays,vaccno,dist,partdone)
              values
(ctrl1,surv data(ctrl).vacc_status,surv_data(ctrl).vdue_day,surv_data(ctrl).why_vacc,surv_data(ctrl).vdays,1,
distance(dyn_data(ctrl).xx,dyn_data(ctrl).yy,dyn_data(nearestIPid).xx,dyn_data(nearestIPid).yy,"km"),0)
            elseif surv_data(ctrl).vacc_status=1 then
              insert into vaccschedule (id, vacc_status, vdue_day, why_vacc, vdays,vaccno,dist,partdone)

```



```

                values
(ctrl1,surv_data(ctrl1).vacc_status,surv_data(ctrl1).vdue_day,surv_data(ctrl1).why_vacc,surv_data(ctrl1).vdays,1,
    distance(dyn_data(ctrl1).xx,dyn_data(ctrl1).yy,dyn_data(nearestIPid).xx,dyn_data(nearestIPid).yy,"km"),0)
    elseif surv_data(ctrl1).vacc_status=2 then
        insert into vaccschedule (id, vacc_status, vdue_day, why_vacc, vdays,vaccno,dist,partdone)
            values
(ctrl1,surv_data(ctrl1).vacc_status,surv_data(ctrl1).vdue_day,surv_data(ctrl1).why_vacc,surv_data(ctrl1).vdays,1,
    distance(dyn_data(ctrl1).xx,dyn_data(ctrl1).yy,dyn_data(nearestIPid).xx,dyn_data(nearestIPid).yy,"km"),1)
    elseif surv_data(ctrl1).vacc_status=5 and vrounds=2 then
        insert into vaccschedule (id, vacc_status, vdue_day, why_vacc, vdays,vaccno,dist,partdone)
            values
(ctrl1,surv_data(ctrl1).vacc_status,surv_data(ctrl1).vdue_day,surv_data(ctrl1).why_vacc,surv_data(ctrl1).vdays,2,
    distance(dyn_data(ctrl1).xx,dyn_data(ctrl1).yy,dyn_data(nearestIPid).xx,dyn_data(nearestIPid).yy,"km"),0)
    elseif surv_data(ctrl1).vacc_status=6 and vrounds=2 then
        insert into vaccschedule (id, vacc_status, vdue_day, why_vacc, vdays,vaccno,dist,partdone)
            values
(ctrl1,surv_data(ctrl1).vacc_status,surv_data(ctrl1).vdue_day,surv_data(ctrl1).why_vacc,surv_data(ctrl1).vdays,2,
    distance(dyn_data(ctrl1).xx,dyn_data(ctrl1).yy,dyn_data(nearestIPid).xx,dyn_data(nearestIPid).yy,"km"),1)
        end if
    end if
    end if
    end if
    end if
next
close table depoptemp1
elseif vacc_type=3 and dayssincediag>=7 then          'blanket in RA

vstarted=1
vacc_inc=0
select * from depoptemp where surv_status>=4 into depoptemp1

for ctrl=1 to nfarms
    if (dyn_data(ctrl).species=1 and dyn_data(ctrl).typeofbirds=1) or (dyn_data(ctrl).species=3 and
dyn_data(ctrl).typeofbirds=1) or (dyn_data(ctrl).species=4 and dyn_data(ctrl).typeofbirds=1) then
        else

```

```

if surv_data(ctrl1).surv_status<=1 and surv_data(ctrl1).ra=1 and dyn_data(ctrl1).populated=1 then
  open table app_path+"\Databases\template4.tab" as nearestIP
  nearest from variable dyn_data(ctrl1).loc to depoptempl into nearestIP type spherical data
id=depoptempl.id
  fetch rec 1 from nearestIP
  nearestIPid=nearestIP.id
  close table nearestIP
  if surv_data(ctrl1).vacc_status=0 then
    surv_data(ctrl1).vacc_status=1
    surv_data(ctrl1).vdue_day=dayctr+1
    surv_data(ctrl1).why_vacc=2
    insert into vaccschedule (id, vacc_status, vdue_day, why_vacc, vdays,vaccno,dist,partdone)
    values
(ctrl1,surv_data(ctrl1).vacc_status,surv_data(ctrl1).vdue_day,surv_data(ctrl1).why_vacc,surv_data(ctrl1).vdays,1,
distance(dyn_data(ctrl1).xx,dyn_data(ctrl1).yy,dyn_data(nearestIPid).xx,dyn_data(nearestIPid).yy,"km"),0)
  elseif surv_data(ctrl1).vacc_status=1 then
    insert into vaccschedule (id, vacc_status, vdue_day, why_vacc, vdays,vaccno,dist,partdone)
    values
(ctrl1,surv_data(ctrl1).vacc_status,surv_data(ctrl1).vdue_day,surv_data(ctrl1).why_vacc,surv_data(ctrl1).vdays,1,
distance(dyn_data(ctrl1).xx,dyn_data(ctrl1).yy,dyn_data(nearestIPid).xx,dyn_data(nearestIPid).yy,"km"),0)
  elseif surv_data(ctrl1).vacc_status=2 then
    insert into vaccschedule (id, vacc_status, vdue_day, why_vacc, vdays,vaccno,dist,partdone)
    values
(ctrl1,surv_data(ctrl1).vacc_status,surv_data(ctrl1).vdue_day,surv_data(ctrl1).why_vacc,surv_data(ctrl1).vdays,1,
distance(dyn_data(ctrl1).xx,dyn_data(ctrl1).yy,dyn_data(nearestIPid).xx,dyn_data(nearestIPid).yy,"km"),1)
  elseif surv_data(ctrl1).vacc_status=5 and vrounds=2 then
    insert into vaccschedule (id, vacc_status, vdue_day, why_vacc, vdays,vaccno,dist,partdone)
    values
(ctrl1,surv_data(ctrl1).vacc_status,surv_data(ctrl1).vdue_day,surv_data(ctrl1).why_vacc,surv_data(ctrl1).vdays,2,
distance(dyn_data(ctrl1).xx,dyn_data(ctrl1).yy,dyn_data(nearestIPid).xx,dyn_data(nearestIPid).yy,"km"),0)
  elseif surv_data(ctrl1).vacc_status=6 and vrounds=2 then
    insert into vaccschedule (id, vacc_status, vdue_day, why_vacc, vdays,vaccno,dist,partdone)
    values
(ctrl1,surv_data(ctrl1).vacc_status,surv_data(ctrl1).vdue_day,surv_data(ctrl1).why_vacc,surv_data(ctrl1).vdays,2,

```

```

        distance(dyn_data(ctrl).xx,dyn_data(ctrl).yy,dyn_data(nearestIPid).xx,dyn_data(nearestIPid).yy,"km"),1)
            end if
        end if
    end if
next
close table depoptemp1
end if

ndueforv=tableinfo("vaccschedule",tab_info_nrows)

if ndueforv=0 then
    close table vaccschedule
    exit sub
elseif ndueforv<totvcrews then
    vcrews=ndueforv
else
    vcrews=totvcrews
end if

select * from vaccschedule order by partdone desc, vaccno, vdue_day, dist desc into vaccorder

for vctr=1 to vcrews
    fetch rec vctr from vaccorder
    surv_data(vaccorder.id).vdays=surv_data(vaccorder.id).vdays-1
    if surv_data(vaccorder.id).vacc_status<3 then
        if surv_data(vaccorder.id).vdays=0 then
            nfvacc1=nfvacc1+1
            nbvacc1=nbvacc1+dyn_data(vaccorder.id).currentcap
            nvdoses=nvdoses+dyn_data(vaccorder.id).currentcap
            costvacc=costvacc+costpervacc*dyn_data(vaccorder.id).currentcap
            surv_data(vaccorder.id).vacc_status=3
            surv_data(vaccorder.id).daystovaccimm=14
        else
            surv_data(vaccorder.id).vacc_status=2
        end if
    elseif surv_data(vaccorder.id).vacc_status<7 then
        if surv_data(vaccorder.id).vdays=0 then
            nfvacc2=nfvacc2+1

```

```

        nfvacc1=nfvacc1-1
        nbvacc2=nbvacc2+dyn_data(vaccorder.id).currentcap
        nbvacc1=nbvacc1-dyn_data(vaccorder.id).currentcap
        nvdoses=nvdoses+dyn_data(vaccorder.id).currentcap
        costvacc=costvacc+costpervacc*dyn_data(vaccorder.id).currentcap
        surv_data(vaccorder.id).vacc_status=7
        surv_data(vaccorder.id).daystovaccimm=14
    else
        surv_data(vaccorder.id).vacc_status=6
    end if
end if
next
close table vaccschedule

end sub

sub vaccimm
if surv_data(ctrl1).daystovaccimm=0 then
    if surv_data(ctrl1).vacc_status=3 then
        surv_data(ctrl1).vacc_status=4
        nvaccimm1=nvaccimm1+1
        if vrounds=2 then
            surv_data(ctrl1).vdue_day=dayctr+1
            surv_data(ctrl1).vacc_status=5
            if dyn_data(ctrl1).currentcap>vcrewscap then
                if dyn_data(ctrl1).currentcap mod vcrewscap=0 then
                    surv_data(ctrl1).vdays=dyn_data(ctrl1).currentcap/vcrewscap
                else
                    surv_data(ctrl1).vdays=dyn_data(ctrl1).currentcap\vcrewscap+1
                end if
            else
                surv_data(ctrl1).vdays=1
            end if
        end if
    elseif surv_data(ctrl1).vacc_status=7 then
        surv_data(ctrl1).vacc_status=8
        nvaccimm2=nvaccimm2+1
    end if
end if

```

```

        nvaccimml=nvaccimml-1
    end if
end if

end sub

sub repday(ByVal spp as integer, ByVal vacs as integer)
'minus one for latent period as reporting is called when become infectious (although estimated from when infected)
if vacs<3 then
    if spp=1 then
        reportday=beta_pert(dis(9).lowv,dis(9).modev,dis(9).highv)-1
    elseif spp=2 then
        reportday=beta_pert(dis(10).lowv,dis(10).modev,dis(10).highv)-1
    elseif spp=3 then
        reportday=beta_pert(dis(11).lowv,dis(11).modev,dis(11).highv)-1
    elseif spp=4 then
        reportday=beta_pert(dis(12).lowv,dis(12).modev,dis(12).highv)-1
    end if
elseif vacs>3 and vacs<8 then
    if spp=1 then
        reportday=beta_pert(v1RP1x_l,v1RP1x_m,v1RP1x_h)-1
    elseif spp=2 then
        reportday=beta_pert(v1RP2x_l,v1RP2x_m,v1RP2x_h)-1
    elseif spp=3 then
        reportday=beta_pert(v1RP3x_l,v1RP3x_m,v1RP3x_h)-1
    elseif spp=4 then
        reportday=beta_pert(v1RP4x_l,v1RP4x_m,v1RP4x_h)-1
    end if
elseif vacs=8 then
    if spp=1 then
        reportday=beta_pert(v2RP1x_l,v2RP1x_m,v2RP1x_h)-1
    elseif spp=2 then
        reportday=beta_pert(v2RP2x_l,v2RP2x_m,v2RP2x_h)-1
    elseif spp=3 then
        reportday=beta_pert(v2RP3x_l,v2RP3x_m,v2RP3x_h)-1
    elseif spp=4 then
        reportday=beta_pert(v2RP4x_l,v2RP4x_m,v2RP4x_h)-1
    end if
end if
end if

```

```
end sub
```

```
function vaccsusc(ByVal spp as integer, ByVal vacs as integer) as float
```

```
if vacs<3 then
```

```
    if spp=1 then
```

```
        vaccsusc=1
```

```
    elseif spp=2 then
```

```
        vaccsusc=1
```

```
    elseif spp=3 then
```

```
        vaccsusc=1
```

```
    elseif spp=4 then
```

```
        vaccsusc=1
```

```
    end if
```

```
elseif vacs>3 and vacs<8 then
```

```
    if spp=1 then
```

```
        vaccsusc=v1susclx
```

```
    elseif spp=2 then
```

```
        vaccsusc=v1suscl2x
```

```
    elseif spp=3 then
```

```
        vaccsusc=v1suscl3x
```

```
    elseif spp=4 then
```

```
        vaccsusc=v1suscl4x
```

```
    end if
```

```
elseif vacs=8 then
```

```
    if spp=1 then
```

```
        vaccsusc=v2susclx
```

```
    elseif spp=2 then
```

```
        vaccsusc=v2suscl2x
```

```
    elseif spp=3 then
```

```
        vaccsusc=v2suscl3x
```

```
    elseif spp=4 then
```

```
        vaccsusc=v2suscl4x
```

```
    end if
```

```
end if
```

```
end function
```

```
function vaccinfect(ByVal spp as integer, ByVal vacs as integer) as float
```

```
if vacs<3 then
```

```

    if spp=1 then
        vaccinfect=1
    elseif spp=2 then
        vaccinfect=1
    elseif spp=3 then
        vaccinfect=1
    elseif spp=4 then
        vaccinfect=1
    end if
elseif vacs>3 and vacs<8 then
    if spp=1 then
        vaccinfect=vaccinfec
    elseif spp=2 then
        vaccinfect=vaccinfec
    elseif spp=3 then
        vaccinfect=vaccinfec

        elseif spp=4 then
            vaccinfect=vaccinfec
        end if
elseif vacs=8 then
    if spp=1 then
        vaccinfect=vaccinfec
    elseif spp=2 then
        vaccinfect=vaccinfec
    elseif spp=3 then
        vaccinfect=vaccinfec
    elseif spp=4 then
        vaccinfect=vaccinfec
    end if
end if
end function

```

```

function vaccSe(ByVal spp as integer, ByVal vacs as integer) as float
if vacs<3 then
    if spp=1 then
        vaccSe=1
    elseif spp=2 then
        vaccSe=1

```

```

elseif spp=3 then
    vaccSe=1
elseif spp=4 then
    vaccSe=1
end if
elseif vacs>3 and vacs<8 then
    if spp=1 then
        vaccSe=v1Se1x
    elseif spp=2 then
        vaccSe=v1Se2x
    elseif spp=3 then
        vaccSe=v1Se3x
    elseif spp=4 then
        vaccSe=v1Se4x
    end if
elseif vacs=8 then
    if spp=1 then
        vaccSe=v2Se1x
    elseif spp=2 then
        vaccSe=v2Se2x
    elseif spp=3 then
        vaccSe=v2Se3x
    elseif spp=4 then
        vaccSe=v2Se4x
    end if
end if
end function

```

```

sub vaccIP(ByVal spp as integer, ByVal vacs as integer)
if vacs>3 and vacs<8 then
    if spp=1 then
        reportday=beta_pert(v1IP1x_l,v1IP1x_m,v1IP1x_h)
    elseif spp=2 then
        reportday=beta_pert(v1IP2x_l,v1IP2x_m,v1IP2x_h)
    elseif spp=3 then
        reportday=beta_pert(v1IP3x_l,v1IP3x_m,v1IP3x_h)
    elseif spp=4 then
        reportday=beta_pert(v1IP4x_l,v1IP4x_m,v1IP4x_h)
    end if
end if

```



```

elseif vacs=8 then
  if spp=1 then
    reportday=beta_pert(v2IP1x_l,v2IP1x_m,v2IP1x_h)
  elseif spp=2 then
    reportday=beta_pert(v2IP2x_l,v2IP2x_m,v2IP2x_h)
  elseif spp=3 then
    reportday=beta_pert(v2IP3x_l,v2IP3x_m,v2IP3x_h)
  elseif spp=4 then
    reportday=beta_pert(v2IP4x_l,v2IP4x_m,v2IP4x_h)
  end if
end if
end sub

```

```

function compo (ByVal farmid as integer) as float

```

```

do case dyn_data(farmid).species
  case 1
    do case dyn_data(farmid).typeofbirds
      case 1
        compo=cost11
      case 2
        compo=cost12
      case 3
        compo=cost13
      case 4
        compo=cost14
      case 5
        compo=cost15
      case 6
        compo=cost16
      case 7
        compo=cost17
      case 8
        compo=cost18
    end case
  case 2
    do case dyn_data(farmid).typeofbirds
      case 1
        compo=cost21

```

```

        case 2
            compo=cost22
        case 3
            compo=cost23
        case 4
            compo=cost24
    end case
case 3
    do case dyn_data(farmid).typeofbirds
        case 1
            compo=cost31
        case 2
            compo=cost32
        case 3
            compo=cost33
    end case
case 4
    do case dyn_data(farmid).typeofbirds
        case 1
            compo=cost41
        case 2
            compo=cost42
        case 3
            compo=cost43
    end case
end case
end function

```

AI_model_populate_5September09.mb

```

Include "Mapbasic.def"
Include "AI_Model.def"
sub initialdata

```

```

Open table app_path+"\Databases\datasetnoinf" as dataset
Open table app_path+"\Databases\locations_v_2" as locs

```

'Procedure to randomly set stage of production cycle for each farm in study population

```

nfarms=tableinfo("dataset", Tab_info_nrows)
for ctrl=1 to nfarms
  fetch rec ctrl from dataset
  do case dataset.species
  case 1
    call cmpopulate
  case 2
    call clpopulate
  case 3
    call dupopulate
  case 4
    call tupopulate
  end case
next

Commit table dataset as app_path+"\databases\start_pop"

end sub

sub cmpopulate

dim day, endday, batchlength, cyclelength, turnaround, agetrans, endage, pop, start, feed, feedday, dbday,
daysdb, litterc, clean, litterd, spike, thin1, thin2, thin3, db, th, spk, lc, cl, ld, vacc, vacc1, vacc2, vacc3,
n, nfarms, batchyr, bdue as smallint

dim currentcapacity as integer

if dataset.multiaged=0 then
  do case dataset.typeofbirds
  case 1
    batchlength=beta_pert (popp(1).lowv, popp(1).modev, popp(1).highv)
    turnaround=beta_pert (popp(21).lowv, popp(21).modev, popp(21).highv)
  case 2
    agetrans=beta_pert (popp(2).lowv, popp(2).modev, popp(2).highv)
    endage=beta_pert (popp(3).lowv, popp(3).modev, popp(3).highv)
    batchlength=endage-agetrans
    turnaround=beta_pert (popp(23).lowv, popp(23).modev, popp(23).highv)
  case 3
    batchlength=beta_pert (popp(4).lowv, popp(4).modev, popp(4).highv)

```

```

    turnaround=beta_pert (popp(24).lowv, popp(24).modev, popp(24).highv)
case 4
    batchlength=beta_pert (popp(2).lowv, popp(2).modev, popp(2).highv)
    turnaround=beta_pert (popp(22).lowv, popp(22).modev, popp(22).highv)
case 5
    agetrans=beta_pert (popp(5).lowv, popp(5).modev, popp(5).highv)
    endage=beta_pert (popp(6).lowv, popp(6).modev, popp(6).highv)
    batchlength=endage-agetrans
    turnaround=beta_pert (popp(26).lowv, popp(26).modev, popp(26).highv)
case 6
    batchlength=beta_pert (popp(7).lowv, popp(7).modev, popp(7).highv)
    turnaround=beta_pert (popp(27).lowv, popp(27).modev, popp(27).highv)
case 7
    batchlength=beta_pert (popp(5).lowv, popp(5).modev, popp(5).highv)
    turnaround=beta_pert (popp(25).lowv, popp(25).modev, popp(25).highv)
case 8
    agetrans=popp(40).other
    endage=beta_pert (popp(8).lowv, popp(8).modev, popp(8).highv)
    batchlength=endage-agetrans
    turnaround=beta_pert (popp(28).lowv, popp(28).modev, popp(28).highv)
end case

cyclelength=batchlength+turnaround
day=round(random()*cyclelength+0.5,1)

if day<=batchlength then
    pop=1
    endday=(batchlength-day)
    start=0
    currentcapacity=dataset.capacity
elseif day>batchlength then
    pop=0
    endday=0
    start=(cyclelength-day)

    if dataset.status=0 or dataset.status=1 or dataset.status=2 then
        update dataset set status=5 where rowid=ctrl
    end if
end if

```

```
feed=0
feedday=0
db=0
dbday=0
th=0
thin1=0
thin2=0
thin3=0
spk=0
spike=0
vacc=0
vacc1=0
vacc2=0
vacc3=0

if pop=1 then
  if dataset.feed_source1<>0 then
    feed=1
    feedday=int(random()*popp(29).other)
    if endday-feedday<0 then
      feed=0
      feedday=0
    end if
  end if
  if dataset.dbc_id<>0 then
    db=1
    if dataset.dbc_id=4 then
      dbday=int(random()*popp(78).other)
    else
      dbday=int(random()*popp(30).other)
    end if
    if endday-dbdays<0 then
      db=0
      dbday=0
    end if
  end if
  do case dataset.typeofbirds
  case 1
```

```

thin1=beta_pert (popp (31) .lowv, popp (31) .modev, popp (31) .highv) -day
thin2=beta_pert (popp (32) .lowv, popp (32) .modev, popp (32) .highv) -day
thin3=endday
if thin1<0 then
  if thin2<0 then
    if thin3<0 then
      note "Error"
    else
      th=3
      thin1=0
      thin2=0
      currentcapacity=int (1/3*dataset.capacity)
    end if
  else
    th=2
    thin1=0
    currentcapacity=int (2/3*dataset.capacity)
  end if
else
  th=1
  currentcapacity=dataset.capacity
end if
case 2
if random()<=popp (34) .other then
  spk=1
  spike=beta_pert (popp (33) .lowv, popp (33) .modev, popp (33) .highv) -day-agetrans
  if spike<0 then
    spike=0
    spk=0
  end if
end if
case 3
vaccl=beta_pert (popp (12) .lowv, popp (12) .modev, popp (12) .highv) -day
vacc=1
if vaccl<0 then
  vaccl=0
  vacc=2
  vacc2=beta_pert (popp (13) .lowv, popp (13) .modev, popp (13) .highv) -day
  if vacc2<0 then

```

```

        vacc2=0
        vacc=3
        vacc3=beta_pert (popp (14) .lowv, popp (14) .modev, popp (14) .highv) -day
        if vacc3<0 then
            vacc3=0
            vacc=0
        end if
    end if
end if
if random() <= popp (34) .other then
    spk=1
    spike=uniform (popp (33) .lowv, popp (33) .highv) -day
    if spike<0 then
        spike=0
        spk=0
    end if
end if
case 4
    vacc1=beta_pert (popp (9) .lowv, popp (9) .modev, popp (9) .highv) -day
    vacc=1
    if vacc1<0 then
        vacc1=0
        vacc=2
        vacc2=beta_pert (popp (10) .lowv, popp (10) .modev, popp (10) .highv) -day
        if vacc2<0 then
            vacc2=0
            vacc=3
            vacc3=beta_pert (popp (11) .lowv, popp (11) .modev, popp (11) .highv) -day
            if vacc3<0 then
                vacc3=0
                vacc=0
            end if
        end if
    end if
end if
case 5
    if random() <= popp (34) .other then
        spk=1
        spike=uniform (popp (33) .lowv, popp (33) .highv) -day - agetrans
        if spike<0 then

```

```

        spike=0
        spk=0
    end if
end if
case 6
    vacc1=beta_pert (popp (18) .lowv, popp (18) .modev, popp (18) .highv) -day
    vacc=1
    if vacc1<0 then
        vacc1=0
        vacc=2
        vacc2=beta_pert (popp (19) .lowv, popp (19) .modev, popp (19) .highv) -day
        if vacc2<0 then
            vacc2=0
            vacc=3
            vacc3=beta_pert (popp (20) .lowv, popp (20) .modev, popp (20) .highv) -day
            if vacc3<0 then
                vacc3=0
                vacc=0
            end if
        end if
    end if
    if random()<=popp (34) .other then
        spk=1
        spike=uniform (popp (33) .lowv, popp (33) .highv) -day
        if spike<0 then
            spike=0
            spk=0
        end if
    end if
case 7
    vacc1=beta_pert (popp (15) .lowv, popp (15) .modev, popp (15) .highv) -day
    vacc=1
    if vacc1<0 then
        vacc1=0
        vacc=2
        vacc2=beta_pert (popp (16) .lowv, popp (16) .modev, popp (16) .highv) -day
        if vacc2<0 then
            vacc2=0
            vacc=3

```



```

        vacc3=beta_pert (popp (17) .lowv, popp (17) .modev, popp (17) .highv) -day
        if vacc3<0 then
            vacc3=0
            vacc=0
        end if
    end if
end if
end case
end if

lc=0
'flags for litter collection, cleaning and litter delivery to be activated
cl=0
ld=0
litterc=0
clean=0
litterd=0
litterd=round((5/6*turnaround),1)
clean=round((1/2*turnaround),1)
litterc=round((1/6*turnaround),1)

if pop=0 then
    if turnaround-start<=litterd and turnaround-start>clean then
        if dataset.ldel_id1<>0 then
            ld=1
            litterd=litterd-turnaround+start
        else
            litterd=0
        end if
        clean=0
        litterc=0
    else
        clean=0
        litterd=0
        litterc=0
    end if
    if turnaround-start<=clean and turnaround-start>litterc then
        if dataset.ldel_id1<>0 then
            ld=1

```

```
        litterd=litterd-turnaround+start
    else
        litterd=0
    end if
    if dataset.swd_id1<>0 then
        cl=1
        clean=clean-turnaround+start
    else
        clean=0
    end if
    litterc=0
end if
if turnaround-start<=litterc then
    if dataset.ldel_id1<>0 then
        ld=1
        litterd=litterd-turnaround+start
    else
        litterd=0
    end if
    if dataset.swd_id1<>0 then
        cl=1
        clean=clean-turnaround+start
    else
        clean=0
    end if
    if dataset.lrem_id1<>0 then
        lc=1
        litterc=litterc-turnaround+start
    else
        litterc=0
    end if
end if
end if
```

```
elseif dataset.multiaged=1 then
```

```
    day=0
    endday=0
    feed=0
```

```

feedday=0
start=0
pop=1
bdue=0
dbday=0
thin1=0
thin2=0
thin3=0
litterc=0
clean=0
litterd=0
spike=0
turnaround=0
vaccl=0
vacc2=0
vacc3=0
db=0
th=0
spk=0
lc=0
cl=0
ld=0
vacc=0

turnaround=beta_pert (popp (41) .lowv, popp (41) .modev, popp (41) .highv)          '!!!!
litterd=round ((5/6*turnaround), 1)
clean=round ((1/2*turnaround), 1)
litterc=round ((1/6*turnaround), 1)

batchyr=popp (42) .other          '!!!!

cyclelength=365\batchyr
batchlength=cyclelength-turnaround

day=round (random () *cyclelength+0.5, 1)

if day<=batchlength then
    bdue=0
    endday=(batchlength-day)

```

```

    start=0
    currentcapacity=dataset.capacity
elseif day>batchlength then
    bdue=1
    endday=0
    start=(cyclelength-day)
    currentcapacity=int(dataset.capacity*(1-1/batchyr))
end if

if dataset.feed_source1<>0 then
    feed=1
    feeday=int(random()*popp(29).other)
end if
if dataset.dbc_id<>0 then
    db=1
    if dataset.dbc_id=4 then
        dbday=int(random()*popp(78).other)
    else
        dbday=int(random()*popp(30).other)
    end if
    if endday-dbday<0 then
        db=0
        dbday=0
    end if
end if
if bdue=1 then
    if turnaround-start<=litterd and turnaround-start>clean then
        if dataset.ldel_id1<>0 then
            ld=1
            litterd=litterd-turnaround+start
        else
            litterd=0
        end if
        clean=0
        litterc=0
    else
        clean=0
        litterd=0
        litterc=0
    end if
end if

```

```

end if
if turnaround-start<=clean and turnaround-start>litterc then
  if dataset.ldel_id1<>0 then
    ld=1
    litterd=litterd-turnaround+start
  else
    litterd=0
  end if
  if dataset.swd_id1<>0 then
    cl=1
    clean=clean-turnaround+start
  else
    clean=0
  end if
  litterc=0
end if
if turnaround-start<=litterc then
  if dataset.ldel_id1<>0 then
    ld=1
    litterd=litterd-turnaround+start
  else
    litterd=0
  end if
  if dataset.swd_id1<>0 then
    cl=1
    clean=clean-turnaround+start
  else
    clean=0
  end if
  if dataset.lrem_id1<>0 then
    lc=1
    litterc=litterc-turnaround+start
  else
    litterc=0
  end if
end if
elseif bdue=0 then
do case dataset.typeofbirds
case 2

```

```

if random()<=popp(34).other then
  spk=1
  spike=beta_pert(popp(33).lowv,popp(33).modev,popp(33).highv)-day
  if spike>cyclelength then
    spike=spike mod cyclelength      'when prev batch due for spiking
  end if
  if spike<0 then
    spk=0
    spike=0
  end if
end if
case 3

vaccl=beta_pert(popp(12).lowv,popp(12).modev,popp(12).highv)-day
vacc=1
if vaccl>cyclelength then
  vaccl=vaccl mod cyclelength      'when prev batch due for vaccination
end if
if vaccl<0 then
  vaccl=0
  vacc=2
  vacc2=beta_pert(popp(13).lowv,popp(13).modev,popp(13).highv)-day      '!!!! MG/AE eye drop ->
see www.ingham.com.au
  if vacc2>cyclelength then
    vacc2=vacc2 mod cyclelength      'when prev batch due for vaccination
  end if
  if vacc2<0 then
    vacc2=0
    vacc=3
    vacc3=beta_pert(popp(14).lowv,popp(14).modev,popp(14).highv)-day      '!!!! Fowl Pox, EDS,
Beak trim -> see www.ingham.com.au
    if vacc3>cyclelength then
      vacc3=vacc3 mod cyclelength      'when prev batch due for vaccination
    end if
    if vacc3<0 then
      vacc3=0
      vacc=0
    end if
  end if
end if

```

```

end if
if random() <= popp(34).other then
  spk=1
  spike=beta_pert(popp(33).lowv, popp(33).modev, popp(33).highv) - day
  if spike > cyclelength then
    spike=spike mod cyclelength      'when prev batch due for spiking
  end if
  if spike < 0 then
    spk=0
    spike=0
  end if
end if
case 4
  vaccl=beta_pert(popp(9).lowv, popp(9).modev, popp(9).highv) - day
  vacc=1
  if vaccl > cyclelength then
    vaccl=vaccl mod cyclelength      'when prev batch due for vaccination
  end if
  if vaccl < 0 then
    vaccl=0
    vacc=2
    vacc2=beta_pert(popp(10).lowv, popp(10).modev, popp(10).highv) - day      '!!!! MG/AE eye drop ->
    see www.inghams.com.au
    if vacc2 > cyclelength then
      vacc2=vacc2 mod cyclelength      'when prev batch due for vaccination
    end if
    if vacc2 < 0 then
      vacc2=0
      vacc=3
      vacc3=beta_pert(popp(11).lowv, popp(11).modev, popp(11).highv) - day      '!!!! Fowl Pox, EDS,
      Beak trim -> see www.inghams.com.au
      if vacc3 > cyclelength then
        vacc3=vacc3 mod cyclelength      'when prev batch due for vaccination
      end if
      if vacc3 < 0 then
        vacc3=0
        vacc=0
      end if
    end if
  end if
end if

```

```

    end if
case 5
  if random() <= popp(34).other then
    spk=1
    spike=beta_pert(popp(33).lowv, popp(33).modev, popp(33).highv) - day
    if spike > cyclelength then
      spike=spike mod cyclelength      'when prev batch due for spiking
    end if
    if spike < 0 then
      spk=0
      spike=0
    end if
  end if
case 6
  vaccl=beta_pert(popp(18).lowv, popp(18).modev, popp(18).highv) - day
  vacc=1
  if vaccl > cyclelength then
    vaccl=vaccl mod cyclelength      'when prev batch due for vaccination
  end if
  if vaccl < 0 then
    vaccl=0
    vacc=2
    vacc2=beta_pert(popp(19).lowv, popp(19).modev, popp(19).highv) - day
    see www.ingham.com.au          '!!!! MG/AE eye drop ->
    if vacc2 > cyclelength then
      vacc2=vacc2 mod cyclelength      'when prev batch due for vaccination
    end if
    if vacc2 < 0 then
      vacc2=0
      vacc=3
      vacc3=beta_pert(popp(20).lowv, popp(20).modev, popp(20).highv) - day
      Beak trim -> see www.ingham.com.au          '!!!! Fowl Pox, EDS,
    if vacc3 > cyclelength then
      vacc3=vacc3 mod cyclelength      'when prev batch due for vaccination
    end if
    if vacc3 < 0 then
      vacc3=0
      vacc=0
    end if
  end if

```



```

        end if
    end if
    if random() <= popp(34).other then
        spk=1
        spike=beta_pert(popp(33).lowv, popp(33).modev, popp(33).highv) - day
        if spike > cyclelength then
            spike=spike mod cyclelength          'when prev batch due for spiking
        end if
        if spike < 0 then
            spk=0
            spike=0
        end if
    end if
case 7
    vacc1=beta_pert(popp(15).lowv, popp(15).modev, popp(15).highv) - day
    vacc=1
    if vacc1 > cyclelength then
        vacc1=vacc1 mod cyclelength          'when prev batch due for vaccination
    end if
    if vacc1 < 0 then
        vacc1=0
        vacc=2
        vacc2=beta_pert(popp(16).lowv, popp(16).modev, popp(16).highv) - day
vacc2 > cyclelength then
        vacc2=vacc2 mod cyclelength          'when prev batch due for vaccination
    end if
    if vacc2 < 0 then
        vacc2=0
        vacc=3
        vacc3=beta_pert(popp(17).lowv, popp(17).modev, popp(17).highv) - day
        if vacc3 > cyclelength then
            vacc3=vacc3 mod cyclelength          'when prev batch due for vaccination
        end if
        if vacc3 < 0 then
            vacc3=0
            vacc=0
        end if
    end if
end if
end if

```

```
        end case
    end if
end if

update dataset
'write these values to the file
  set cycleday=day,
  endofthisbatch=endday,
  feed_del=feed,
  daystofeeddelivery=feedday,
  daystocycle=start,
  populated=pop,
  batchdue=bdue,
  daystodbc=dbday,
  thinning1=thin1,
  thinning2=thin2,
  thinning3=thin3,
  litterremoval=litterc,
  swd=clean,
  litterdelivery=litterd,
  spikingday=spike,
  turn_time=turnaround,
  vacc_day1=vacc1,
  vacc_day2=vacc2,
  vacc_day3=vacc3,
  dead_bird=db,
  thin=th,
  spiking=spk,
  litter_c=lc,
  san=cl,
  litter_d=ld,
  vaccinate=vacc,
  currentcap=currentcapacity
where RowID=ctrl

end sub

sub clpopulate
```

```

dim
feed, feedday, db, dbday, lc, cl, ld, pop, batchlength, cyclelength, endday, turnaround, day, setegg_d, inlay, agetrans, start, litte
rc,
litterd, clean, batchyr, bdue, vacc, vaccl, vacc2, vacc3, spk, spike as smallint

dim currentcapacity as integer

if dataset.multiaged=0 then

do case dataset.typeofbirds
case 1                                'L
    agetrans=beta_pert (popp(44).lowv, popp(44).modev, popp(44).highv)
    batchlength=beta_pert (popp(45).lowv, popp(45).modev, popp(45).highv)
    turnaround=beta_pert (popp(49).lowv, popp(49).modev, popp(49).highv)
case 2                                'L/Pu
    batchlength=beta_pert (popp(43).lowv, popp(43).modev, popp(43).highv)
    turnaround=beta_pert (popp(47).lowv, popp(47).modev, popp(47).highv)
case 3                                'Pu
    batchlength=beta_pert (popp(44).lowv, popp(44).modev, popp(44).highv)
    turnaround=beta_pert (popp(48).lowv, popp(48).modev, popp(48).highv)
case 4                                'Breeder/elite breeder
    batchlength=beta_pert (popp(46).lowv, popp(46).modev, popp(46).highv)
    turnaround=beta_pert (popp(50).lowv, popp(50).modev, popp(50).highv)
end case

cyclelength=batchlength+turnaround
day=round(random()*cyclelength+0.5,1)

if day<=batchlength then
'set whether farm is populated at present
    pop=1
    endday=(batchlength-day)
'time when this batch will be depopulated
    start=0
    currentcapacity=dataset.capacity
elseif day>batchlength then
'if farm is currently not populated, set time to next cycle begins
    pop=0
    endday=0

```

```

        start=(cyclelength-day)
'days til next cycle starts

        if dataset.status=0 or dataset.status=1 then
'nb only equiped to start with state 0 case 1 5 and 6 farms
            update dataset set status=5 where rowid=ctrl
        elseif dataset.status=2 then
            update dataset set
                status=6,
                daysleftcont=beta_pert(displ(19).lowv,displ(19).modev,displ(19).highv),
daystillreport=0
                where rowid=ctrl
        end if
    end if

    feed=0
'flag for feed deliveries occurring
    feedday=0
    db=0
'flag for dead bird collection being active
    dbday=0
    inlay=0
    setegg_d=0
    vacc=0
'flag indicating vaccination active
    vacc1=0
'vaccination times
    vacc2=0
    vacc3=0
    spk=0
    spike=0

    if pop=1 then
        if dataset.feed_source1<>0 then
            feed=1
            feedday=int(random()*popp(29).other)

                if endday-feedday<0 then
'if timing is after depopulation, won't occur

```

```

        feed=0
        feedday=0
    end if
end if
if dataset.dbc_id<>0 then
    db=1
    if dataset.dbc_id=4 then
        dbday=int(random()*popp(78).other)
    else
        dbday=int(random()*popp(30).other)
    end if
    if endday-dbday<0 then
        db=0
        dbday=0
    end if
end if
do case dataset.typeofbirds

case 1
    setegg_d=beta_pert(popp(52).lowv,popp(52).modev,popp(52).highv)-agetrans-day
    if setegg_d<=0 then
'varies depending on type
        inlay=1
        setegg_d=0
    end if

case 2
    setegg_d=beta_pert(popp(52).lowv,popp(52).modev,popp(52).highv)
    if setegg_d<=0 then
'varies depending on type
        inlay=1
        setegg_d=0
    end if
    vaccl=beta_pert(popp(77).lowv,popp(77).modev,popp(77).highv)-day
    vacc=1
    if vaccl<0 then
        vaccl=0
    end if

```

```

case 3
  vacc1=beta_pert (popp (53) .lowv, popp (53) .modev, popp (53) .highv) -day
  vacc=1
  if vacc1<0 then
    vacc1=0
    vacc=2
    vacc2=beta_pert (popp (54) .lowv, popp (54) .modev, popp (54) .highv) -day
    if vacc2<0 then
      vacc2=0
      vacc=3
      vacc3=beta_pert (popp (55) .lowv, popp (55) .modev, popp (55) .highv) -day
      if vacc3<0 then
        vacc3=0
        vacc=0
      end if
    end if
  end if
end if
case 4
  vacc1=beta_pert (popp (53) .lowv, popp (53) .modev, popp (53) .highv) -day
  vacc=1
  if vacc1<0 then
    vacc1=0
    vacc=2
    vacc2=beta_pert (popp (54) .lowv, popp (54) .modev, popp (54) .highv) -day
    if vacc2<0 then
      vacc2=0
      vacc=3
      vacc3=beta_pert (popp (55) .lowv, popp (55) .modev, popp (55) .highv) -day
      if vacc3<0 then
        vacc3=0
        vacc=0
      end if
    end if
  end if
end if
if random()<=popp (34) .other then
  spk=1
  spike=beta_pert (popp (33) .lowv, popp (33) .modev, popp (33) .highv) -day
  if spike<0 then
    spike=0
  end if
end if

```

```

        end if
    end if
end case
end if

lc=0
'flags for litter collection, cleaning and litter delivery to be activated
cl=0
ld=0
litterc=0
clean=0
litterd=0
litterd=round((5/6*turnaround),1)
clean=round((1/2*turnaround),1)
litterc=round((1/6*turnaround),1)

if pop=0 then
    if turnaround-start<=litterd and turnaround-start>clean then
        if dataset.ldel_id1<>0 then
            ld=1
            litterd=litterd-turnaround+start
        else
            litterd=0
        end if
        clean=0
        litterc=0
    else
        clean=0
        litterd=0
        litterc=0
    end if
    if turnaround-start<=clean and turnaround-start>litterc then
        if dataset.ldel_id1<>0 then
            ld=1
            litterd=litterd-turnaround+start
        else
            litterd=0
        end if
        if dataset.swd_id1<>0 then

```

```

        cl=1
        clean=clean-turnaround+start
    else
        clean=0
    end if
    litterc=0
end if
if turnaround-start<=litterc then
    if dataset.ldel_id1<>0 then
        ld=1
        litterd=litterd-turnaround+start
    else
        litterd=0
    end if
    if dataset.swd_id1<>0 then
        cl=1
        clean=clean-turnaround+start
    else
        clean=0
    end if
    if dataset.lrem_id1<>0 then
        lc=1
        litterc=litterc-turnaround+start
    else
        litterc=0
    end if
end if
end if

```

```

'flag for feed deliveries occur
elseif dataset.multiaged=1 then

```

```

    feed=0

```

```

'flag for feed deliveries occurring

```

```

    feedday=0

```

```

    db=0

```

```

    dbday=0

```

```

    lc=0

```

```

'flags for litter collection, cleaning and litter delivery to be activated

```

```

'flag for dead bird collection being active

```



```

c1=0
ld=0
vacc=0
vacc1=0
vacc2=0
vacc3=0
spk=0
spike=0
pop=1
turnaround=beta_pert (popp (76) .lowv, popp (76) .modev, popp (76) .highv)
litterd=round ((5/6*turnaround),1)
clean=round ((1/2*turnaround),1)
litterc=round ((1/6*turnaround),1)

do case dataset.typeofbirds
  case 1
    batchyr=popp (56) .other
    inlay=1 'multiaged layer farms always in lay
  case 2
    batchyr=popp (56) .other
    inlay=1 'multiaged layer farms always in lay
  case 3
    batchyr=popp (56) .other
  case 4
    batchyr=popp (56) .other
end case

cyclelength=365\batchyr
batchlength=cyclelength-turnaround

day=round (random () *cyclelength+0.5,1)

if day<=batchlength then
'set whether farm is populated at present
  bdue=0
  endday=(batchlength-day)
'time when this batch will be depopulated
  start=0
  currentcapacity=dataset.capacity

```

```

elseif day>batchlength then
'if farm is currently not populated, set time to next cycle begins
  bdue=1
  endday=0
  start=(cyclelength-day)
  currentcapacity=int(dataset.capacity*(1-1/batchyr))
'days til next cycle starts
  end if

  if dataset.feed_source1<>0 then
    feed=1
    feedday=int(random()*popp(29).other)

  end if
  if dataset.dbc_id<>0 then
    db=1
    if dataset.dbc_id=4 then
      dbday=int(random()*popp(78).other)
    else
      dbday=int(random()*popp(30).other)
    end if
    if endday-dbday<0 then
      db=0
      dbday=0
    end if
  end if
  if bdue=1 then
    if turnaround-start<=litterd and turnaround-start>clean then
      if dataset.ldel_id1<>0 then
        ld=1
        litterd=litterd-turnaround+start
      else
        litterd=0
      end if
      clean=0
      litterc=0
    else
      clean=0
      litterd=0
    end if
  end if
end if

```

```

    litterc=0
end if
if turnaround-start<=clean and turnaround-start>litterc then
    if dataset.ldel_id1<>0 then
        ld=1
        litterd=litterd-turnaround+start
    else
        litterd=0
    end if
    if dataset.swd_id1<>0 then
        cl=1
        clean=clean-turnaround+start
    else
        clean=0
    end if
    litterc=0
end if
if turnaround-start<=litterc then
    if dataset.ldel_id1<>0 then
        ld=1
        litterd=litterd-turnaround+start
    else
        litterd=0
    end if
    if dataset.swd_id1<>0 then
        cl=1
        clean=clean-turnaround+start
    else
        clean=0
    end if
    if dataset.lrem_id1<>0 then
        lc=1
        litterc=litterc-turnaround+start
    else
        litterc=0
    end if
end if
elseif bdue=0 then
    do case dataset.typeofbirds

```

case 1

case 2

```
vaccl=beta_pert (popp (77) .lowv, popp (77) .modev, popp (77) .highv) -day
vacc=1
if vaccl>cyclelength then
    vaccl=vaccl mod cyclelength      'when prev batch due for vaccination
end if
if vaccl<0 then
    vaccl=0
    vacc=0
end if
```

case 3

```
vaccl=beta_pert (popp (53) .lowv, popp (53) .modev, popp (53) .highv) -day
vacc=1
if vaccl>cyclelength then
    vaccl=vaccl mod cyclelength      'when prev batch due for vaccination
end if
if vaccl<0 then
    vaccl=0
    vacc=2
    vacc2=beta_pert (popp (54) .lowv, popp (54) .modev, popp (54) .highv) -day
    if vacc2>cyclelength then
        vacc2=vacc2 mod cyclelength      'when prev batch due for vaccination
    end if
    if vacc2<0 then
        vacc2=0
        vacc=3
        vacc3=beta_pert (popp (55) .lowv, popp (55) .modev, popp (55) .highv) -day
        if vacc3>cyclelength then
            vacc3=vacc3 mod cyclelength      'when prev batch due for vaccination
        end if
        if vacc3<0 then
            vacc3=0
            vacc=0
        end if
    end if
end if
```

```

case 4
  vaccl=beta_pert (popp (53) .lowv, popp (53) .modev, popp (53) .highv) -day
  vacc=1
  if vaccl>cyclelength then
    vaccl=vaccl mod cyclelength
  end if
  if vaccl<0 then
    vaccl=0
    vacc=2
    vacc2=beta_pert (popp (54) .lowv, popp (54) .modev, popp (54) .highv) -day
    if vacc2>cyclelength then
      vacc2=vacc2 mod cyclelength          'when prev batch due for vaccination
    end if
    if vacc2<0 then
      vacc2=0
      vacc=3
      vacc3=beta_pert (popp (55) .lowv, popp (55) .modev, popp (55) .highv) -day
      if vacc3>cyclelength then
        vacc3=vacc3 mod cyclelength          'when prev batch due for vaccination
      end if
      if vacc3<0 then
        vacc3=0
        vacc=0
      end if
    end if
  end if
end if
if random()<=popp(34).other then

  spk=1
  spike=beta_pert (popp (33) .lowv, popp (33) .modev, popp (33) .highv) -day
  if spike>cyclelength then
    spike=spike mod cyclelength          'when prev batch due for spiking
  end if
  if spike<0 then
    spk=0
    spike=0
  end if

```

```

        end if
    end case
end if
end if

update dataset
'write these values to the file
  set cycleday=day,
  endofthisbatch=endday,
  feed_del=feed,
  daystofeeddelivery=feedday,
  daystocycle=start,
  populated=pop,
  batchdue=bdue,
  daystodbc=dbday,
  vacc_day1=vacc1,
  vacc_day2=vacc2,
  vacc_day3=vacc3,
  litterremoval=litterc,
  swd=clean,
  litterdelivery=litterd,
  turn_time=turnaround,
  dead_bird=db,
  litter_c=lc,
  san=cl,
  litter_d=ld,
  in_lay=inlay,
  daytosetegg=setegg_d,
  spikingday=spike,
  spiking=spk,
  currentcap=currentcapacity
where RowID=ctrl

end sub

sub dupopulate

dim day, endday, batchlength, cyclelength, turnaround, pop, start, feed, feedday, dbday,
daysdb, litterc, clean, litterd, db, th, lc, cl, ld, n, nfarms, batchyr, bdue as smallint

```

```

dim currentcapacity as integer

if dataset.multiaged=0 then
  do case dataset.typeofbirds
  case 1
    batchlength=beta_pert (popp (57) .lowv, popp (57) .modev, popp (57) .highv)
    turnaround=beta_pert (popp (60) .lowv, popp (60) .modev, popp (60) .highv)
  case 2
    batchlength=beta_pert (popp (58) .lowv, popp (58) .modev, popp (58) .highv)
    turnaround=beta_pert (popp (61) .lowv, popp (61) .modev, popp (61) .highv)
  case 3
    batchlength=beta_pert (popp (59) .lowv, popp (59) .modev, popp (59) .highv)
    turnaround=beta_pert (popp (62) .lowv, popp (62) .modev, popp (62) .highv)
  end case

  cyclelength=batchlength+turnaround
  day=round(random()*cyclelength+0.5,1)

  if day<=batchlength then
'set whether farm is populated at present
    pop=1
    endday=(batchlength-day)
'time when this batch will be depopulated
    start=0
    currentcapacity=dataset.capacity
  elseif day>batchlength then
'if farm is currently not populated, set time to next cycle begins
    pop=0
    endday=0
    start=(cyclelength-day)
'days til next cycle starts

    if dataset.status=0 or dataset.status=1 then
'nb only equipped to start with state 0 case 1 5 and 6 farms
      update dataset set status=5 where rowid=ctrl
    elseif dataset.status=2 then
      update dataset set
        status=6,

```

```

        daysleftcont=beta_pert (disp(19).lowv,disp(19).modev,disp(19).highv),
daystillreport=0
        where rowid=ctrl
    end if
end if

    feed=0
'flag for feed deliveries occurring
    feedday=0
    db=0
'flag for dead bird collection being active
    dbday=0
    th=0
'flag for thinning visits to be active

if pop=1 then
    if dataset.feed_source1<>0 then
        feed=1
        feedday=int(random()*popp(29).other)
        if endday-feedday<0 then
'if timing is after depopulation, won't occur
            feed=0
            feedday=0
        end if
    end if
    if dataset.dbc_id<>0 then
        db=1
        if dataset.dbc_id=4 then
            dbday=int(random()*popp(78).other)
        else
            dbday=int(random()*popp(30).other)
        end if
        if endday-dbdays<0 then
            db=0
            dbday=0
        end if
    end if
end if

```



```

end if

lc=0
'flags for litter collection, cleaning and litter delivery to be activated
cl=0
ld=0
litterc=0
clean=0
litterd=0
litterd=round((5/6*turnaround),1)
clean=round((1/2*turnaround),1)
litterc=round((1/6*turnaround),1)

if pop=1 then
  if turnaround-start<=litterd and turnaround-start>clean then
    if dataset.ldel_id1<>0 then
      ld=1
      litterd=litterd-turnaround+start
    else
      litterd=0
    end if
    clean=0
    litterc=0
  else
    clean=0
    litterd=0
    litterc=0
  end if
  if turnaround-start<=clean and turnaround-start>litterc then
    if dataset.ldel_id1<>0 then
      ld=1
      litterd=litterd-turnaround+start
    else
      litterd=0
    end if
    if dataset.swd_id1<>0 then
      cl=1
      clean=clean-turnaround+start
    end if
  end if
end if

```

```

else

    clean=0
end if
litterc=0
end if
if turnaround-start<=litterc then
    if dataset.ldel_id1<>0 then
        ld=1
        litterd=litterd-turnaround+start
    else
        litterd=0
    end if
    if dataset.swd_id1<>0 then
        cl=1
        clean=clean-turnaround+start
    else
        clean=0
    end if
    if dataset.lrem_id1<>0 then
        lc=1
        litterc=litterc-turnaround+start
    else
        litterc=0
    end if
end if
end if
elseif dataset.multiaged=1 then

    feed=0
'flag for feed deliveries occurring
    feedday=0
    db=0                                     'flag for dead bird collection being active
    dbday=0
    lc=0
'flags for litter collection, cleaning and litter delivery to be activated
    cl=0
    ld=0

```

```

pop=1
turnaround=beta_pert (popp (64) .lowv, popp (64) .modev, popp (64) .highv)
litterd=round ((5/6*turnaround),1)
clean=round ((1/2*turnaround),1)
litterc=round ((1/6*turnaround),1)

batchyr=popp (65) .other

cyclelength=365\batchyr
batchlength=cyclelength-turnaround

day=round (random () *cyclelength+0.5,1)

if day<=batchlength then
'set whether farm is populated at present
  bdue=0
  endday=(batchlength-day)
'time when this batch will be depopulated
  start=0
  currentcapacity=dataset.capacity
elseif day>batchlength then
'if farm is currently not populated, set time to next cycle begins
  bdue=1
  endday=0
  start=(cyclelength-day)
  currentcapacity=int (dataset.capacity*(1-1/batchyr))
'days til next cycle starts
end if

if dataset.feed_source1<>0 then
  feed=1
  feedday=int (random () *popp (29) .other)
end if
if dataset.dbc_id<>0 then
  db=1
  if dataset.dbc_id=4 then
    dbday=int (random () *popp (78) .other)
  else
    dbday=int (random () *popp (30) .other)

```

```

end if
if endday-dbday<0 then
  db=0
  dbday=0
end if
end if
if bdue=1 then
  if turnaround-start<=litterd and turnaround-start>clean then
    if dataset.ldel_id1<>0 then
      ld=1
      litterd=litterd-turnaround+start
    else
      litterd=0
    end if
    clean=0
    litterc=0
  else
    clean=0
    litterd=0
    litterc=0
  end if
  if turnaround-start<=clean and turnaround-start>litterc then
    if dataset.ldel_id1<>0 then
      ld=1
      litterd=litterd-turnaround+start
    else
      litterd=0
    end if
    if dataset.swd_id1<>0 then
      cl=1
      clean=clean-turnaround+start
    else
      clean=0
    end if
    litterc=0
  end if
  if turnaround-start<=litterc then
    if dataset.ldel_id1<>0 then
      ld=1

```

```

        litterd=litterd-turnaround+start
    else
        litterd=0
    end if
    if dataset.swd_id1<>0 then
        cl=1
        clean=clean-turnaround+start
    else
        clean=0
    end if
    if dataset.lrem_id1<>0 then
        lc=1
        litterc=litterc-turnaround+start
    else
        litterc=0
    end if
end if
end if
end if

```

```

update dataset
'write these values to the file
  set cycleday=day,
  endofthisbatch=endday,
  feed_del=feed,
  daystofeeddelivery=feedday,
  daystocycle=start,
  populated=pop,
  batchdue=bdue,
  daystodbc=dbday,
  litterremoval=litterc,

  swd=clean,
  litterdelivery=litterd,
  turn time=turnaround,
  dead_bird=db,
  litter_c=lc,
  san=cl,
  litter_d=ld,

```

```

        currentcap=currentcapacity
    where RowID=ctrl

end sub

sub tupopulate

dim day, endday, batchlength, cyclelength, turnaround, pop, start, feed, feedday, dbday,
daysdb, litterc, clean, litterd, thin1, thin2, db, th, lc, cl, ld, n, nfarms, batchyr, bdue as smallint

dim currentcapacity as integer

if dataset.multiaged=0 then
    do case dataset.typeofbirds
        case 1
            batchlength=beta_pert(popp(66).lowv, popp(66).modev, popp(66).highv)
            turnaround=beta_pert(popp(69).lowv, popp(69).modev, popp(69).highv)
            case 2
                batchlength=beta_pert(popp(67).lowv, popp(67).modev, popp(67).highv)
                turnaround=beta_pert(popp(70).lowv, popp(70).modev, popp(70).highv)
            case 3
                batchlength=beta_pert(popp(68).lowv, popp(68).modev, popp(68).highv)
                turnaround=beta_pert(popp(71).lowv, popp(71).modev, popp(71).highv)
        end case

        cyclelength=batchlength+turnaround
        day=round(random()*cyclelength+0.5,1)

        if day<=batchlength then
            'set whether farm is populated at present
            pop=1
            endday=(batchlength-day)
            'time when this batch will be depopulated
            start=0
            currentcapacity=dataset.capacity
        elseif day>batchlength then
            'if farm is currently not populated, set time to next cycle begins
            pop=0
            endday=0
        end if
    end do
end sub

```

```

        start=(cyclelength-day)
'days til next cycle starts

        if dataset.status=0 or dataset.status=1 then
'nb only equiped to start with state 0 case 1 5 and 6 farms
            update dataset set status=5 where rowid=ctrl
        elseif dataset.status=2 then
            update dataset set
status=6,daysleftcont=beta_pert(dispatch(19).lowv,dispatch(19).modev,dispatch(19).highv),daystillreport=0 where rowid=ctrl
        end if
    end if

    feed=0
'flag for feed deliveries occurring
    feedday=0
    db=0
'flag for dead bird collection being active
    dbday=0
    th=0
'flag for thinning visits to be active
    thinl=0
'days til next feed delivery

    if pop=1 then
        if dataset.feed_source1<>0 then
            feed=1
            feedday=int(random()*popp(29).other)
            if endday-feedday<0 then
'if timing is after depopulation, won't occur
                feed=0
                feedday=0
            end if
        end if
        if dataset.dbc_id<>0 then
            db=1
            if dataset.dbc_id=4 then
                dbday=int(random()*popp(78).other)
            else
                dbday=int(random()*popp(30).other)
            end if
        end if
    end if
end if

```

```

        end if
        if endday-dbday<0 then
            db=0
            dbday=0
        end if
    end if
    if dataset.typeofbirds=1 then
        thin1=beta_pert(popp(72).lowv,popp(72).modev,popp(72).highv)
        if day<=thin1 then
'set time to next thinning
            thin1=thin1-day
            th=1
        else
            th=0
            thin2=endday
            currentcapacity=int(dataset.capacity/2)
        end if
    end if

end if

lc=0
'flags for litter collection, cleaning and litter delivery to be activated
cl=0
ld=0
litterc=0
clean=0
litterd=0
litterd=round((5/6*turnaround),1)
clean=round((1/2*turnaround),1)
litterc=round((1/6*turnaround),1)

if pop=0 then
    if turnaround-start<=litterd and turnaround-start>clean then
        if dataset.ldel_id1<>0 then
            ld=1
            litterd=litterd-turnaround+start
        else
            litterd=0
        end if
    end if
end if

```



```

    end if
    clean=0
    litterc=0
else
    clean=0
    litterd=0
    litterc=0
end if
if turnaround-start<=clean and turnaround-start>litterc then
    if dataset.ldel_id1<>0 then

        ld=1
        litterd=litterd-turnaround+start
    else
        litterd=0
    end if
    if dataset.swd_id1<>0 then
        cl=1
        clean=clean-turnaround+start
    else
        clean=0
    end if
    litterc=0
end if
if turnaround-start<=litterc then
    if dataset.ldel_id1<>0 then
        ld=1
        litterd=litterd-turnaround+start
    else
        litterd=0
    end if
    if dataset.swd_id1<>0 then
        cl=1
        clean=clean-turnaround+start
    else
        clean=0
    end if
    if dataset.lrem_id1<>0 then
        lc=1

```

```

        litterc=litterc-turnaround+start
    else
        litterc=0
    end if
end if
end if
elseif dataset.multiaged=1 then
    feed=0
'flag for feed deliveries occurring
    feedday=0
    db=0                                     'flag for dead bird collection being active
    dbday=0
    lc=0
'flags for litter collection, cleaning and litter delivery to be activated
    cl=0
    ld=0
    pop=1
    turnaround=beta_pert (popp (74) .lowv, popp (74) .modev, popp (74) .highv)
    litterd=round((5/6*turnaround),1)
    clean=round((1/2*turnaround),1)
    litterc=round((1/6*turnaround),1)

    batchyr=popp(75).other

    cyclelength=365\batchyr
    batchlength=cyclelength-turnaround

    day=round(random()*cyclelength+0.5,1)

    if day<=batchlength then
'set whether farm is populated at present
        bdue=0
        endday=(batchlength-day)
'time when this batch will be depopulated
        start=0
        currentcapacity=dataset.capacity

    elseif day>batchlength then
'if farm is currently not populated, set time to next cycle begins

```

```

    bdue=1
    endday=0
    start=(cyclelength-day)
    currentcapacity=int(dataset.capacity*(1-1/batchyr))

end if

if dataset.feed_source1<>0 then
    feed=1
    feedday=int(random()*popp(29).other)
end if
if dataset.dbc_id<>0 then
    db=1
    if dataset.dbc_id=4 then
        dbday=int(random()*popp(78).other)
    else
        dbday=int(random()*popp(30).other)
    end if
    if endday-dbday<0 then
        db=0
        dbday=0
    end if
end if
if bdue=1 then
    if turnaround-start<=litterd and turnaround-start>clean then
        if dataset.ldel_id1<>0 then
            ld=1
            litterd=litterd-turnaround+start
        else
            litterd=0
        end if
        clean=0
        litterc=0
    else
        clean=0
        litterd=0
        litterc=0
    end if
    if turnaround-start<=clean and turnaround-start>litterc then

```

```
if dataset.ldel_id1<>0 then
  ld=1

  litterd=litterd-turnaround+start
else
  litterd=0
end if
if dataset.swd_id1<>0 then
  cl=1
  clean=clean-turnaround+start
else
  clean=0
end if
litterc=0
end if
if turnaround-start<=litterc then
  if dataset.ldel_id1<>0 then
    ld=1
    litterd=litterd-turnaround+start
  else
    litterd=0
  end if
  if dataset.swd_id1<>0 then
    cl=1
    clean=clean-turnaround+start
  else
    clean=0
  end if
  if dataset.lrem_id1<>0 then
    lc=1
    litterc=litterc-turnaround+start
  else
    litterc=0
  end if
end if
end if
end if
```

```

update dataset
'write these values to the file
  set cycleday=day,
  endofthisbatch=endday,
  feed_del=feed,
  daystofeeddelivery=feedday,
  daystocycle=start,
  populated=pop,
  batchdue=bdue,
  daystodbc=dbday,
  thinning1=thin1,
  thinning2=thin2,
  litterremoval=litterc,
  swd=clean,
  litterdelivery=litterd,
  turn_time=turnaround,
  dead_bird=db,
  thin=th,
  litter_c=lc,
  san=cl,
  litter_d=ld,
  currentcap=currentcapacity
where RowID=ctrl

end sub

```

AI_model_spread_31October09.mb

```

Include "mapbasic.def"
Include "ai_model.def"

sub disease_update
dim contact, randno as float
for ctrl=1 to nfarms
  infectivity=1
  fetch rec ctrl from locs
  idnol=dyn_data(ctrl).id
  if dyn_data(ctrl).spiking=1 and dyn_data(ctrl).spikingday=0 and dyn_data(ctrl).status=0 then
    if spk_inc=1 and surv_data(ctrl).surv_status<=1 and surv_data(ctrl).VA=0 then

```



```

        end if
    end if
end if
elseif (dyn_data(ctrl).species=1 and (dyn_data(ctrl).typeofbirds=4 or dyn_data(ctrl).typeofbirds=7)) or
(dyn_data(ctrl).species=2 and dyn_data(ctrl).typeofbirds=3) then
    if live_inc=1 and surv_data(ctrl).surv_status<=1 and surv_data(ctrl).VA=0 then
        if (surv_data(ctrl).ca=0 and surv_data(ctrl).ra=0) or (surv_data(ctrl).ra=1 and ramove=1) or
(surv_data(ctrl).ca=1 and camove=1) then
            if dyn_data(ctrl).endofthisbatch=0 and ((dyn_data(ctrl).multiaged=0 and dyn_data(ctrl).populated=1)
or
            (dyn_data(ctrl).multiaged=1 and dyn_data(ctrl).batchdue=0)) then
                call live_spread
            end if
        end if
    end if
else
    if slau_inc=1 and surv_data(ctrl).surv_status<=1 then
        if (surv_data(ctrl).ca=0 and surv_data(ctrl).ra=0) or
(surv_data(ctrl).ra=1 and raslau=1 and dyn_data(ctrl).species<>3 or dyn_data(ctrl).typeofbirds<>1) or
(surv_data(ctrl).ra=1 and rapickup=1 and dyn_data(ctrl).species=3 and dyn_data(ctrl).typeofbirds=1) or
(surv_data(ctrl).ca=1 and caslau=1 and dyn_data(ctrl).species<>3 or dyn_data(ctrl).typeofbirds<>1) or
(surv_data(ctrl).ca=1 and capickup=1 and dyn_data(ctrl).species=3 and dyn_data(ctrl).typeofbirds=1)
then
            if dyn_data(ctrl).endofthisbatch=0 and dyn_data(ctrl).slaid1>0 then
                if (dyn_data(ctrl).multiaged=0 and dyn_data(ctrl).populated=1) or (dyn_data(ctrl).multiaged=1
and dyn_data(ctrl).batchdue=0) then
                    if random()<=infectivity*biocont then
                        slaid=dyn_data(ctrl).slaid1
                        if dyn_data(ctrl).slaid2>0 then
                            if random()<=0.5 then
                                slaid=dyn_data(ctrl).slaid2
                            end if
                        end if
                        call slau spread
                        fetch rec ctrl from locs
                        slaid=0
                    end if
                end if
            end if

```



```

        end if
    end if
end if
if egg_inc=1 and surv_data(ctrl1).surv_status<=1 then
    if (surv_data(ctrl1).ca=0 and surv_data(ctrl1).ra=0) or (surv_data(ctrl1).ra=1 and raeggs=1) or
(surv_data(ctrl1).ca=1 and caeggs=1) then
        if dyn_data(ctrl1).in_lay=1 and dyn_data(ctrl1).species=2 and dyn_data(ctrl1).eggid1>0 then
            if random()<=infectivity*biocont then
                eggid=dyn_data(ctrl1).eggid1
                if dyn_data(ctrl1).eggid2>0 then
                    if random()<=0.5 then
                        eggid=dyn_data(ctrl1).eggid2
                    end if
                end if
                call egg_spread
                fetch rec ctrl1 from locs
                eggid=0
            end if
        end if
    end if
end if
if vacc_inc=1 and dyn_data(ctrl1).vaccid1>0 and surv_data(ctrl1).surv_status<=1 then
    if (surv_data(ctrl1).ca=0 and surv_data(ctrl1).ra=0) or (surv_data(ctrl1).ra=1 and ravacc=1) or
(surv_data(ctrl1).ca=1 and cavacc=1) then
        if ((dyn_data(ctrl1).vaccinate=1 and dyn_data(ctrl1).vacc_day1=0) or (dyn_data(ctrl1).vaccinate=2 and
dyn_data(ctrl1).vacc_day2=0) or
(dyn_data(ctrl1).vaccinate=3 and dyn_data(ctrl1).vacc_day3=0)) then
            if random()<=infectivity*biocont then
                vaccid=dyn_data(ctrl1).vaccid1
                call vacc_spread
                fetch rec ctrl1 from locs
                vaccid=0
            end if
        end if
    end if
end if
if dyn_data(ctrl1).multiaged=1 and dyn_data(ctrl1).batchdue=1 then
    if lrem_inc=1 and surv_data(ctrl1).surv_status<=1 then

```

```

        if (surv_data(ctrl).ca=0 and surv_data(ctrl).ra=0) or (surv_data(ctrl).ra=1 and ralrem=1) or
(surv_data(ctrl).ca=1 and calrem=1) then
            if dyn_data(ctrl).litter_c=1 and dyn_data(ctrl).litterremoval=0 and dyn_data(ctrl).lrem_id1>0 then
                if random()<=infectivity*biocont then
                    lremid=dyn_data(ctrl).lrem_id1
                    if dyn_data(ctrl).lrem_id2>0 then
                        if random()<=0.5 then
                            lremid=dyn_data(ctrl).lrem_id2
                        end if
                    end if
                    call lrem_spread
                    fetch rec ctrl from locs
                    lremid=0
                end if
            end if
        end if
    end if
    if san_inc=1 and dyn_data(ctrl).swd_id1>0 and surv_data(ctrl).surv_status<=1 then
        if (surv_data(ctrl).ca=0 and surv_data(ctrl).ra=0) or (surv_data(ctrl).ra=1 and rasan=1) or
(surv_data(ctrl).ca=1 and casan=1) then
            if dyn_data(ctrl).san=1 and dyn_data(ctrl).swd=0 then
                if random()<=infectivity*biocont then
                    sanid=dyn_data(ctrl).swd_id1
                    if dyn_data(ctrl).swd_id2>0 then
                        if random()<=0.5 then
                            sanid=dyn_data(ctrl).swd_id2
                        end if
                    end if
                    call san_spread
                    fetch rec ctrl from locs
                    sanid=0
                end if
            end if
        end if
    end if
    if ldel_inc=1 and surv_data(ctrl).surv_status<=1 then
        if (surv_data(ctrl).ca=0 and surv_data(ctrl).ra=0) or (surv_data(ctrl).ra=1 and raldel=1) or
(surv_data(ctrl).ca=1 and caldel=1) then
            if dyn_data(ctrl).litter_d=1 and dyn_data(ctrl).litterdelivery=0 and dyn_data(ctrl).ldel_id1>0 then

```

```

if random()<=infectivity*biocont then
  ldelid=dyn_data(ctrl1).ldel_id1
  if dyn_data(ctrl1).ldel_id3>0 then
    randno=random()
    if randno<=1/3 then
      ldelid=dyn_data(ctrl1).ldel_id2
    elseif randno<=2/3 then
      ldelid=dyn_data(ctrl1).ldel_id3
    end if
  elseif dyn_data(ctrl1).ldel_id2>0 then
    if random()<=0.5 then
      ldelid=dyn_data(ctrl1).ldel_id2
    end if
  end if
  call Ldel_spread
  fetch rec ctrl1 from locs
  ldelid=0
end if
end if
end if
if doc_inc=1 and surv_data(ctrl1).surv_status<=1 and surv_data(ctrl1).VA=0 then
  if (surv_data(ctrl1).ca=0 and surv_data(ctrl1).ra=0) or (surv_data(ctrl1).ra=1 and radoc=1) or
(surv_data(ctrl1).ca=1 and cadoc=1) then
    if dyn_data(ctrl1).docid1>0 and dyn_data(ctrl1).daystocycle=0 then
      if random()<=infectivity*biocont then
        docid=dyn_data(ctrl1).docid1
        if dyn_data(ctrl1).docid2>0 then
          if random()<=0.5 then
            docid=dyn_data(ctrl1).docid2
          end if
        end if
        call doc_spread
        fetch rec ctrl1 from locs
        docid=0
      end if
    end if
  end if
end if
end if

```

```

    end if
elseif dyn_data(ctrl).status=6 then
    x1=dyn_data(ctrl).xx
    y1=dyn_data(ctrl).yy
    call biocon
    infectivity=1
    IP=dyn_data(ctrl).loc
    if lrem_inc=1 and surv_data(ctrl).surv_status<=1 then
        if (surv_data(ctrl).ca=0 and surv_data(ctrl).ra=0) or (surv_data(ctrl).ra=1 and ralrem=1) or
(surv_data(ctrl).ca=1 and calrem=1) then
            if dyn_data(ctrl).litter_c=1 and dyn_data(ctrl).litterremoval=0 and dyn_data(ctrl).lrem_id1>0 then
                if random()<=infectivity*biocont then
                    lremid=dyn_data(ctrl).lrem_id1
                    if dyn_data(ctrl).lrem_id2>0 then
                        if random()<=0.5 then
                            lremid=dyn_data(ctrl).lrem_id2
                        end if
                    end if
                end if
                call lrem_spread
                fetch rec ctrl from locs
                lremid=0
            end if
        end if
    end if
    end if
    end if
    if san_inc=1 and surv_data(ctrl).surv_status<=1 then
        if (surv_data(ctrl).ca=0 and surv_data(ctrl).ra=0) or (surv_data(ctrl).ra=1 and rasan=1) or
(surv_data(ctrl).ca=1 and casan=1) then
            if dyn_data(ctrl).swd=0 and dyn_data(ctrl).san=1 then
                if random()<=infectivity*biocont then
                    sanid=dyn_data(ctrl).swd_id1
                    if dyn_data(ctrl).swd_id2>0 then
                        if random()<=0.5 then
                            sanid=dyn_data(ctrl).swd_id2
                        end if
                    end if
                end if
                call san_spread
                fetch rec ctrl from locs
                sanid=0
            end if
        end if
    end if
end if

```

```

        end if
        if random()<disp(17).other then
            dyn_data(ctrl1).status=5
            dyn_data(ctrl1).when_inf=0
            dyn_data(ctrl1).inf_day=dayctr
            if dyn_data(ctrl1).become_lat=0 then
                dyn_data(ctrl1).how_inf=""
                dyn_data(ctrl1).exp_by=0
            end if
            newrem3=newrem3+1
        end if
    end if
end if
end if
end if
if ldel_inc=1 and surv_data(ctrl1).surv_status<=1 then
    if (surv_data(ctrl1).ca=0 and surv_data(ctrl1).ra=0) or (surv_data(ctrl1).ra=1 and raldel=1) or
(surv_data(ctrl1).ca=1 and caldel=1) then
        if dyn_data(ctrl1).litter_d=1 and dyn_data(ctrl1).litterdelivery=0 and dyn_data(ctrl1).ldel_id1>0 then
            if random()<=infectivity*biocont then
                ldelid=dyn_data(ctrl1).ldel_id1
                if dyn_data(ctrl1).ldel_id3>0 then
                    randno=random()
                    if randno<=1/3 then
                        ldelid=dyn_data(ctrl1).ldel_id2
                    elseif randno<=2/3 then
                        ldelid=dyn_data(ctrl1).ldel_id3
                    end if
                elseif dyn_data(ctrl1).ldel_id2>0 then
                    if random()<=0.5 then
                        ldelid=dyn_data(ctrl1).ldel_id2
                    end if
                end if
            end if
            call ldel_spread
            fetch rec ctrl1 from locs
            ldelid=0
        end if
    end if
end if
end if
end if

```

```

        if doc_inc=1 and surv_data(ctrl1).surv_status<=1 and surv_data(ctrl1).VA=0 then
            if (surv_data(ctrl1).ca=0 and surv_data(ctrl1).ra=0) or (surv_data(ctrl1).ra=1 and radoc=1) or
(surv_data(ctrl1).ca=1 and cadoc=1) then
                if dyn_data(ctrl1).daystocycle=0 and dyn_data(ctrl1).docid1>0 then
                    if random()<=infectivity*biocont then
                        docid=dyn_data(ctrl1).docid1
                        if dyn_data(ctrl1).docid2>0 then
                            if random()<=0.5 then
                                docid=dyn_data(ctrl1).docid2
                            end if
                        end if
                    end if
                    call doc_spread
                    fetch rec ctrl1 from locs
                    docid=0
                end if
            end if
        end if
    end if
    infectivity=1
next
end sub

```

```

sub spike_spread

```

```

dim n, exitloop, spreadfrom, age as smallint
if dyn_data(ctrl1).species=1 then
    if dyn_data(ctrl1).typeofbirds=2 or dyn_data(ctrl1).typeofbirds=3 then
        select * from locs where locs.id<>ctrl1 and locs.species=1 and locs.state=dyn_data(ctrl1).state and
        locs.integrator=dyn_data(ctrl1).integrator and locs.typeofbirds=3 or locs.typeofbirds=4 into temp1
    elseif dyn_data(ctrl1).typeofbirds=5 or dyn_data(ctrl1).typeofbirds=6 then
        select * from locs where locs.id<>ctrl1 and locs.species=1 and locs.state=dyn_data(ctrl1).state and
        locs.integrator=dyn_data(ctrl1).integrator and locs.typeofbirds=6 or locs.typeofbirds=7 into temp1
    end if
elseif dyn_data(ctrl1).species=2 then
    if dyn_data(ctrl1).typeofbirds=4 then
        select * from locs where locs.id<>ctrl1 and locs.species=2 and locs.integrator=dyn_data(ctrl1).integrator and
        locs.state=dyn_data(ctrl1).state and locs.typeofbirds=4 into temp1
    end if

```

```

end if
n=tableinfo("templ", TAB_INFO_NROWS)
if n=0 then
    close table templ
    exit sub
end if
do
    age=0
    spreadfrom=int(random()*n+1)
    fetch rec spreadfrom from templ
    idno2=templ.id
    if surv_data(idno2).surv_status<=1 then
        if surv_data(idno2).VA=0 and (surv_data(ctrl1).ca=0 and surv_data(ctrl1).ra=0 and surv_data(idno2).ca=0 and
surv_data(idno2).ra=0) or (surv_data(idno2).ra=1 and ramove=1 and surv_data(ctrl1).ra=1) or (surv_data(idno2).ca=1
and camove=1 and surv_data(ctrl1).ca=1) then
            if dyn_data(idno2).multiaged=0 and dyn_data(idno2).populated=1 then
                if dyn_data(idno2).species=1 and dyn_data(idno2).typeofbirds=2 then
                    age=dyn_data(idno2).cycleday+beta_pert(popp(2).lowv,popp(2).modev,popp(2).highv)
                elseif dyn_data(idno2).species=1 and dyn_data(idno2).typeofbirds=5 then
                    age=dyn_data(idno2).cycleday+beta_pert(popp(5).lowv,popp(5).modev,popp(5).highv)
                else
                    age=dyn_data(idno2).cycleday
                end if
            if age<=popp(33).highv and age>=140 then
                exitloop=10-1
            if dyn_data(idno2).status=2 then
                dyn_data(ctrl1).status=1
                newlat1=newlat1+1
                dyn_data(ctrl1).daysleftlatent=1
                dyn_data(ctrl1).how_inf="spike"
                redim inflist(ubound(inflist)+1)
                inflist(ubound(inflist)).id=ctrl1
                dyn_data(idno2).R=dyn_data(idno2).R+1
                if mit_inc=1 then
                    redim exposures(ubound(exposures)+1)
                    exposures(ubound(exposures)).day=dayctr
                    exposures(ubound(exposures)).id=ctrl1
                    exposures(ubound(exposures)).from=idno2
                    exposures(ubound(exposures)).how="spike"
                end if
            end if
        end if
    end if
end do

```

```

                exposures(ubound(exposures)).effective=1
            end if
        end if
    end if
elseif dyn_data(idno2).multiaged=1 then
    exitloop=10-1
    if dyn_data(idno2).status=2 then
        dyn_data(ctrl1).status=1
        newlat1=newlat1+1
        dyn_data(ctrl1).daysleftlatent=1
        dyn_data(ctrl1).how_inf="spike"
        redim inflist(ubound(inflist)+1)
        inflist(ubound(inflist)).id=ctrl1
        dyn_data(idno2).R=dyn_data(idno2).R+1
        if mit_inc=1 then
            redim exposures(ubound(exposures)+1)
            exposures(ubound(exposures)).day=dayctr
            exposures(ubound(exposures)).id=ctrl1
            exposures(ubound(exposures)).from=idno2
            exposures(ubound(exposures)).how="spike"
            exposures(ubound(exposures)).effective=1
        end if
    end if
end if
end if
end if
    exitloop=exitloop+1
loop until exitloop=10
close table temp1
end sub

```

```
Sub local_spread
```

```

dim neigh_zone1 as object
dim x2, y2, dist, p_neigh as float
dim neig as smallint

```

```
neigh_zone1=buffer(IP,12,loc_par.maxrad,"km")
```



```

for idno2=1 to nfarms
  if dyn_data(idno2).loc within neigh_zone1 then
    if dyn_data(idno2).status=0 then

      x2=dyn_data(idno2).xx
      y2=dyn_data(idno2).yy
      dist=distance(x1,y1,x2,y2,"km")
      if truscott=0 then
        p_neigh=(1-exp(-(loc_par.Ho/(1+(dist/loc_par.Rd)^loc_par.alpha))))
        al 2007
      elseif truscott=1 then
        p_neigh=(1-exp(-(1+(dist/1.2))^-2.6))
        al 2007
      end if
      if surv_data(idno2).vacc_status>=4 then
        p_neigh=p_neigh*vaccsusc(dyn_data(idno2).species, surv_data(idno2).vacc_status)
      end if

      z=random()
      if z<=p_neigh then
        newlat1=newlat1+1
        dyn_data(idno2).status=1
        dyn_data(idno2).how_inf="LOC"
        dyn_data(idno2).exp_by=idno1
        dyn_data(idno2).inf_day=dayctr
        dyn_data(idno2).when_inf=0
        redim inflist(ubound(inflist)+1)
        inflist(ubound(inflist)).id=idno2
        dyn_data(idno1).R=dyn_data(idno1).R+1
        if dyn_data(idno2).species=3 then
          dyn_data(idno2).daysleftlatent=uniform(displ(4).lowv,displ(4).highv)
        else
          dyn_data(idno2).daysleftlatent=uniform(displ(1).lowv,displ(1).highv)
        end if
        if mit inc=1 then
          redim exposures(ubound(exposures)+1)
          exposures(ubound(exposures)).day=dayctr
          exposures(ubound(exposures)).id=idno2
          exposures(ubound(exposures)).from=idno1

```

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```

                exposures(ubound(exposures)).how="LOC"
                exposures(ubound(exposures)).effective=1
            end if
        end if
    end if
end if
next
end sub

sub feed_spread

dim trucks, nfom as smallint
dim randno, x2, y2 as float

trucks=6
for idno2 = 1 to nfarms
    randno=random()
    nfom=1
    call bioexc
    if dyn_data(idno2).feed_source2>0 then
        if random()<=0.5 then
            nfom=2
        end if
    end if

    x2=dyn_data(idno2).xx
    y2=dyn_data(idno2).yy
    if dyn_data(idno2).feed_source1=feedid or dyn_data(idno2).feed_source2=feedid then
        if dyn_data(idno2).daystofeeddelivery<=contdays-1 and dyn_data(idno2).feed_del=1 and dyn_data(idno2).status=0
then
            if (surv_data(idno2).ca=0 and surv_data(idno2).ra=0) or (surv_data(idno2).ra=1 and rafeed=1) or
(surv_data(idno2).ca=1 and cafeed=1) then
                contactday=dyn_data(idno2).daystofeeddelivery
                call decay_fom
                if random()<=bioexcl*p feed1*decay/(nfom*trucks) then
                    if dyn_data(idno2).daystofeeddelivery=0 and distance(x1,y1,x2,y2,"KM")<=disp(26).other then
                        if (surv_data(idno2).vacc_status>=4 and random()<=vaccsusc(dyn_data(idno2).species,
surv_data(idno2).vacc_status)) or surv_data(idno2).vacc_status<4 then
                            dyn_data(idno2).status=1
                        end if
                    end if
                end if
            end if
        end if
    end if
end for
end sub

```

```

newlat1=newlat1+1
dyn_data(idno2).how_inf="FEED"
dyn_data(idno2).exp_by=idno1
dyn_data(idno2).inf_day=dayctr
dyn_data(idno2).when_inf=0
redim inflist(ubound(inflist)+1)
inflist(ubound(inflist)).id=idno2
dyn_data(idno1).R=dyn_data(idno1).R+1
if dyn_data(idno2).species=3 then
    dyn_data(idno2).daysleftlatent=uniform(dispatch(4).lowv,dispatch(4).highv)
else
    dyn_data(idno2).daysleftlatent=uniform(dispatch(1).lowv,dispatch(1).highv)
end if
if mit_inc=1 then
    redim exposures(ubound(exposures)+1)
    exposures(ubound(exposures)).day=dayctr
    exposures(ubound(exposures)).id=idno2
    exposures(ubound(exposures)).from=idno1
    exposures(ubound(exposures)).how="FEED"
    exposures(ubound(exposures)).effective=1
end if
end if
elseif dyn_data(idno2).daystofeeddelivery>0 then
    if dyn_data(idno2).become_lat=0 or (dyn_data(idno2).become_lat=1 and
        dyn_data(idno2).daystilllatent>dyn_data(idno2).daystofeeddelivery) then
        dyn_data(idno2).become_lat=1
        dyn_data(idno2).daystilllatent=dyn_data(idno2).daystofeeddelivery
        dyn_data(idno2).exp_by=idno1
        dyn_data(idno2).how_inf="feed"
    end if
end if
end if
end if
end if
next
end sub

sub dead_spread

```

```

dim trucks as smallint
dim x2, y2 as float

trucks=4

for idno2 = 1 to nfarms
call bioexc
  if dyn_data(idno2).dbc_id=dbcid then
    x2=dyn_data(idno2).xx
    y2=dyn_data(idno2).yy

    if dyn_data(idno2).daystodbc<=contdays-1 and dyn_data(idno2).dead_bird=1 and dyn_data(idno2).status=0 then
      if surv_data(idno2).surv_status<=1 and ((surv_data(idno2).ca=0 and surv_data(idno2).ra=0) or
(surv_data(idno2).ra=1 and radbc=1) or (surv_data(idno2).ca=1 and cadbc=1)) then
        contactday=dyn_data(idno2).daystodbc
        call decay_fom
        if random()<=bioexcl*p_dbc1*decay/trucks then
          if dyn_data(idno2).daystodbc=0 and distance(x1,y1,x2,y2,"KM")<=disp(21).other then
            if (surv_data(idno2).vacc_status>=4 and random()<=vaccsusc(dyn_data(idno2).species,
surv_data(idno2).vacc_status)) or surv_data(idno2).vacc_status<4 then
              dyn_data(idno2).status=1
              newlat1=newlat1+1
              dyn_data(idno2).how_inf="DBC"
              dyn_data(idno2).exp_by=idno1
              dyn_data(idno2).inf_day=dayctr
              dyn_data(idno2).when_inf=0
              redim inflist(ubound(inflist)+1)
              inflist(ubound(inflist)).id=idno2
              dyn_data(idno1).R=dyn_data(idno1).R+1
              if dyn_data(idno2).species=3 then
                dyn_data(idno2).daysleftlatent=uniform(disp(4).lowv,disp(4).highv)
              else
                dyn_data(idno2).daysleftlatent=uniform(disp(1).lowv,disp(1).highv)
              end if
              if mit_inc=1 then
                redim exposures(ubound(exposures)+1)
                exposures(ubound(exposures)).day=dayctr
                exposures(ubound(exposures)).id=idno2
              end if
            end if
          end if
        end if
      end if
    end if
  end if
end for

```



```

end if

if (dyn_data(idno2).endofthisbatch+dyn_data(idno2).litterremoval)<=contdays-1 and (dyn_data(idno2).status=0 or
dyn_data(idno2).status=5) and dyn_data(idno2).litter_c=1 then
  if surv_data(idno2).surv_status<=1 and ((surv_data(idno2).ca=0 and surv_data(idno2).ra=0) or
(surv_data(idno2).ra=1 and ralrem=1) or (surv_data(idno2).ca=1 and calrem=1)) then
    contactday=dyn_data(idno2).litterremoval
    call decay_fom
    if random()<=bioexcl*p_lrem1*decay/(nfom*trucks) then
      if dyn_data(idno2).multiaged=0 and dyn_data(idno2).populated=0 then
        if dyn_data(idno2).litterremoval=0 then
          if (surv_data(idno2).vacc_status>=4 and random()<=vaccsusc(dyn_data(idno2).species,
surv_data(idno2).vacc_status)) or surv_data(idno2).vacc_status<4 then
            dyn_data(idno2).status=6
            dyn_data(idno2).how_inf="LC"
            dyn_data(idno2).exp_by=idno1
            dyn_data(idno2).when_inf=0
            dyn_data(idno2).inf_day=dayctr
            dyn_data(idno2).daysleftcont=beta_pert(dispatch(19).lowv,dispatch(19).modev,dispatch(19).highv)

            newcont4b=newcont4b+1
          end if
        elseif dyn_data(idno2).litterremoval>0 then
          if dyn_data(idno2).become_cont=0 or (dyn_data(idno2).become_cont=1 and
dyn_data(idno2).daystilcont>dyn_data(idno2).litterremoval) then
            dyn_data(idno2).become_cont=1
            dyn_data(idno2).daystilcont=dyn_data(idno2).litterremoval
            dyn_data(idno2).exp_by=idno1
            dyn_data(idno2).how_inf="lc"
          end if
        end if
      elseif dyn_data(idno2).multiaged=1 and dyn_data(idno2).batchdue=1 then
        if dyn_data(idno2).litterremoval=0 then
          if (surv_data(idno2).vacc_status>=4 and random()<=vaccsusc(dyn_data(idno2).species,
surv_data(idno2).vacc_status)) or surv_data(idno2).vacc_status<4 then
            dyn_data(idno2).status=1
            newlat1=newlat1+1
            dyn_data(idno2).how_inf="LC"
            dyn_data(idno2).exp_by=idno1
          end if
        end if
      end if
    end if
  end if
end if

```



```

dim crews, nfom as smallint
dim x2, y2, dist as float

crews=1

for idno2=1 to nfarms

    call bioexc
    if dyn_data(idno2).swd_id1=sanid or dyn_data(idno2).swd_id2=sanid then
        if dyn_data(idno2).swd_id2>0 then
            nfom=2
        else
            nfom=1
        end if
        if (dyn_data(idno2).endofthisbatch+dyn_data(idno2).swd<=contdays-1 and
dyn_data(idno2).endofthisbatch+dyn_data(idno2).swd>0) and (dyn_data(idno2).status=0 or dyn_data(idno2).status=5) and
dyn_data(idno2).san=1 then
            x2=dyn_data(idno2).xx
            y2=dyn_data(idno2).yy
            if surv_data(idno2).surv_status<=1 and ((surv_data(idno2).ca=0 and surv_data(idno2).ra=0) or
(surv_data(idno2).ra=1 and rasan=1) or (surv_data(idno2).ca=1 and casan=1)) then
                contactday=dyn_data(idno2).swd-1
                call decay_fom
                if random()<=bioexcl*p_san1*decay/(nfom*crews) then
                    if dyn_data(idno2).multiaged=0 and dyn_data(idno2).populated=0 then
                        if dyn_data(idno2).become_cont=0 or (dyn_data(idno2).become_cont=1 and
dyn_data(idno2).daystilcont>dyn_data(idno2).swd) then
                            dyn_data(idno2).become_cont=1
                            dyn_data(idno2).daystilcont=dyn_data(idno2).swd
                            dyn_data(idno2).exp_by=idno1
                            dyn_data(idno2).how_inf="san"
                        end if
                    elseif dyn_data(idno2).multiaged=1 and dyn_data(idno2).batchdue=1 then
                        if dyn_data(idno2).become_lat=0 or (dyn_data(idno2).become_lat=1
and dyn_data(idno2).daystillatent>dyn_data(idno2).swd) then
                            dyn_data(idno2).become_lat=1
                            dyn_data(idno2).daystillatent=dyn_data(idno2).swd
                            dyn_data(idno2).exp_by=idno1
                            dyn_data(idno2).how_inf="san"
                        end if
                    end if
                end if
            end if
        end if
    end if
end for

```



```

                end if
            end if
        end if
    end if
end if
end if
next

end sub

sub Ldel_spread

dim crews, nfom as smallint

crews=1

for idno2=1 to nfarms

call bioexc
if dyn_data(idno2).ldel_id1=ldelid or dyn_data(idno2).ldel_id2=ldelid or dyn_data(idno2).ldel_id3=ldelid then
    if dyn_data(idno2).ldel_id3>0 then
        nfom=3
    elseif dyn_data(idno2).ldel_id2>0 then
        nfom=2
    else
        nfom=1
    end if

    if (dyn_data(idno2).endofthisbatch+dyn_data(idno2).litterdelivery)<=contdays-1 and (dyn_data(idno2).status=0 or
    dyn_data(idno2).status=5) and dyn_data(idno2).litter_d=1 then
        if surv_data(idno2).surv_status<=1 and ((surv_data(idno2).ca=0 and surv_data(idno2).ra=0) or
(surv_data(idno2).ra=1 and raldel=1) or (surv_data(idno2).ca=1 and caldel=1)) then
            contactday=dyn_data(idno2).litterdelivery
            call decay_fom
            if random()<=bioexcl*p ldel1*decay/(nfom*crews) then
                if dyn_data(idno2).multiaged=0 and dyn_data(idno2).populated=0 then
                    if dyn_data(idno2).litterdelivery=0 then
                        if (surv_data(idno2).vacc_status>=4 and random()<=vaccsusc(dyn_data(idno2).species,
surv_data(idno2).vacc_status)) or surv_data(idno2).vacc_status<4 then

```

```

newcont4d=newcont4d+1
dyn_data(idno2).status=6
dyn_data(idno2).how_inf="LD"
dyn_data(idno2).exp_by=idno1
dyn_data(idno2).when_inf=0
dyn_data(idno2).inf_day=dayctr
dyn_data(idno2).daysleftcont=beta_pert (disp(19).lowv,disp(19).modev,disp(19).highv)
if mit_inc=1 then
    redim exposures (ubound(exposures)+1)
    exposures (ubound(exposures)).day=dayctr
    exposures (ubound(exposures)).id=idno2
    exposures (ubound(exposures)).from=idno1
    exposures (ubound(exposures)).how="LD"
    exposures (ubound(exposures)).effective=1
end if
end if
elseif dyn_data(idno2).litterdelivery>0 then
    if dyn_data(idno2).become_cont=0 or (dyn_data(idno2).become_cont=1 and
    dyn_data(idno2).daystilcont>dyn_data(idno2).litterdelivery) then
        dyn_data(idno2).become_cont=1
        dyn_data(idno2).daystilcont=dyn_data(idno2).litterdelivery
        dyn_data(idno2).exp_by=idno1
        dyn_data(idno2).how_inf="ld"
    end if
end if
elseif dyn_data(idno2).multiaged=1 and dyn_data(idno2).batchdue=1 then
    if dyn_data(idno2).litterdelivery=0 then
        if (surv_data(idno2).vacc_status>=4 and random()<=vaccsusc(dyn_data(idno2).species,
surv_data(idno2).vacc_status)) or surv_data(idno2).vacc_status<4 then
            dyn_data(idno2).status=1
            newlat1=newlat1+1
            dyn_data(idno2).how_inf="LD"
            dyn_data(idno2).exp_by=idno1
            dyn_data(idno2).inf_day=dayctr
            dyn_data(idno2).when_inf=0
            redim inflist(ubound(inflist)+1)
            inflist(ubound(inflist)).id=idno2
            dyn_data(idno1).R=dyn_data(idno1).R+1

```



```

for idno2 = 1 to nfarms

    call bioexc
    if dyn_data(idno2).vaccid1=vaccid then
        if ((dyn_data(idno2).vaccinate=1 and dyn_data(idno2).vacc_day1<=contdays-1 and dyn_data(idno2).vacc_day1>0)
or
        (dyn_data(idno2).vaccinate=2 and dyn_data(idno2).vacc_day2<=contdays-1 and dyn_data(idno2).vacc_day2>0)
or
        (dyn_data(idno2).vaccinate=3 and dyn_data(idno2).vacc_day3<=contdays-1 and dyn_data(idno2).vacc_day3>0))
        and dyn_data(idno2).status=0 and dyn_data(idno2).vaccid1=dyn_data(ctrl1).vaccid1 then
            if surv_data(idno2).surv_status<=1 and ((surv_data(idno2).ca=0 and surv_data(idno2).ra=0) or
(surv_data(idno2).ra=1 and ravacc=1) or (surv_data(idno2).ca=1 and cavacc=1)) then
                if dyn_data(idno2).vaccinate=1 then
                    vaccdays=dyn_data(idno2).vacc_day1
                elseif dyn_data(idno2).vaccinate=2 then
                    vaccdays=dyn_data(idno2).vacc_day2
                elseif dyn_data(idno2).vaccinate=3 then
                    vaccdays=dyn_data(idno2).vacc_day3
                end if
                contactday=vaccdays-1
                call decay_fom
                if random()<=bioexcl*p_vaccl*decay/crews then
                    if dyn_data(idno2).become_lat=0 or (dyn_data(idno2).become_lat=1 and
dyn_data(idno2).daystillatent>vaccdays) then
                        dyn_data(idno2).become_lat=1
                        dyn_data(idno2).daystillatent=vaccdays
                        dyn_data(idno2).exp_by=idno1
                        dyn_data(idno2).how_inf="vac"
                    end if
                end if
            end if
        end if
    end if
next
end sub

sub pickup_spread

dim trucks as smallint

```

```

trucks=1

for idno2=1 to nfarms

if pickupid=dyn_data(idno2).pickup_id1 then
  if dyn_data(idno2).status=0 then
    if surv_data(idno2).surv_status<=1 then
      if (surv_data(idno2).ca=0 and surv_data(idno2).ra=0) or
        (surv_data(idno2).ra=1 and rapickup=1 and (dyn_data(idno2).species=1 or dyn_data(idno2).species=4)) or
        (surv_data(idno2).ca=1 and capickup=1 and (dyn_data(idno2).species=1 or dyn_data(idno2).species=4))
      then
        if dyn_data(idno2).thin=1 and dyn_data(idno2).thinning1<=contdays-1 then
          contactday=dyn_data(idno2).thinning1
          call decay_fom
          if random()<=p_pul*decay/trucks then
            if dyn_data(idno2).thinning1=0 and dyn_data(idno2).cycleday>=dyn_data(ctr1).cycleday then
              if (surv_data(idno2).vacc_status>=4 and random()<=vaccsusc(dyn_data(idno2).species,
surv_data(idno2).vacc_status)) or surv_data(idno2).vacc_status<4 then
                newlat1=newlat1+1
                dyn_data(idno2).status=1
                dyn_data(idno2).how_inf="THIN"
                dyn_data(idno2).exp_by=idno1
                dyn_data(idno2).when_inf=0
                dyn_data(idno2).inf_day=dayctr
                redim inflist(ubound(inflist)+1)
                inflist(ubound(inflist)).id=idno2
                dyn_data(idno1).R=dyn_data(idno1).R+1
                if dyn_data(idno2).species=3 then
                  dyn_data(idno2).daysleftlatent=uniform(dispatch(4).lowv,dispatch(4).highv)
                else
                  dyn_data(idno2).daysleftlatent=uniform(dispatch(1).lowv,dispatch(1).highv)
                end if
            if mit_inc=1 then
              redim exposures(ubound(exposures)+1)
              exposures(ubound(exposures)).day=dayctr
              exposures(ubound(exposures)).id=idno2
              exposures(ubound(exposures)).from=idno1
              exposures(ubound(exposures)).how="THIN"
            end if
          end if
        end if
      end if
    end if
  end if
end if

```

```

        exposures(ubound(exposures)).effective=1
    end if
end if
elseif dyn_data(idno2).thinning1>0 then
    if dyn_data(idno2).become_lat=0 or (dyn_data(idno2).become_lat=1 and
dyn_data(idno2).daystillatent>dyn_data(idno2).thinning1) then
        dyn_data(idno2).become_lat=1
        dyn_data(idno2).daystillatent=dyn_data(idno2).thinning1
        dyn_data(idno2).exp_by=idno1
        dyn_data(idno2).how_inf="thin"
    end if
end if
end if
end if
if dyn_data(idno2).thin<=2 and dyn_data(idno2).thinning2<=contdays-1 and dyn_data(idno2).status=0 then
    contactday=dyn_data(idno2).thinning2
    call decay_fom
    if random()<=p_pul*decay/trucks then
        if dyn_data(idno2).thinning2=0 and dyn_data(idno2).cycleday>=dyn_data(ctrl1).cycleday then
            if (surv_data(idno2).vacc_status>=4 and random()<=vaccsusc(dyn_data(idno2).species,
surv_data(idno2).vacc_status)) or surv_data(idno2).vacc_status<4 then
                newlat1=newlat1+1
                dyn_data(idno2).status=1
                dyn_data(idno2).how_inf="THIN"
                dyn_data(idno2).exp_by=idno1
                dyn_data(idno2).when_inf=0
                dyn_data(idno2).inf_day=dayctr
                redim inflist(ubound(inflist)+1)
                inflist(ubound(inflist)).id=idno2
                dyn_data(idno1).R=dyn_data(idno1).R+1
                if dyn_data(idno2).species=3 then
                    dyn_data(idno2).daysleftlatent=uniform(dis(4).lowv,dis(4).highv)
                else
                    dyn_data(idno2).daysleftlatent=uniform(dis(1).lowv,dis(1).highv)
                end if
            if mit_inc=1 then
                redim exposures(ubound(exposures)+1)
                exposures(ubound(exposures)).day=dayctr
                exposures(ubound(exposures)).id=idno2
            end if
        end if
    end if
end if

```

```

        exposures(ubound(exposures)).from=idno1
        exposures(ubound(exposures)).how="THIN"
        exposures(ubound(exposures)).effective=1
    end if
end if
end if
if dyn_data(idno2).thinning2>0 then
    if dyn_data(idno2).become_lat=0 or (dyn_data(idno2).become_lat=1 and
dyn_data(idno2).daystillatent>dyn_data(idno2).thinning2) then
        dyn_data(idno2).become_lat=1
        dyn_data(idno2).daystillatent=dyn_data(idno2).thinning2
        dyn_data(idno2).exp_by=idno1
        dyn_data(idno2).how_inf="thin"
    end if
end if
end if
elseif dyn_data(idno2).thin<=3 and dyn_data(idno2).thinning3<=contdays-1 and dyn_data(idno2).status=0
then
    contactday=dyn_data(idno2).thinning3
    call decay_fom
    if random()<=p_pul*decay/trucks then
        if dyn_data(idno2).thinning3=0 and dyn_data(idno2).cycleday>=dyn_data(ctrl1).cycleday then
            if (surv_data(idno2).vacc_status>=4 and random()<=vaccsusc(dyn_data(idno2).species,
surv_data(idno2).vacc_status)) or surv_data(idno2).vacc_status<4 then
                newlat1=newlat1+1
                dyn_data(idno2).status=1
                dyn_data(idno2).how_inf="THIN"
                dyn_data(idno2).exp_by=idno1
                dyn_data(idno2).when_inf=0
                dyn_data(idno2).inf_day=dayctr
                redim inflist(ubound(inflist)+1)
                inflist(ubound(inflist)).id=idno2
                dyn_data(idno1).R=dyn_data(idno1).R+1
                if dyn_data(idno2).species=3 then
                    dyn_data(idno2).daysleftlatent=uniform(dispatch(4).lowv,dispatch(4).highv)
                else
                    dyn_data(idno2).daysleftlatent=uniform(dispatch(1).lowv,dispatch(1).highv)
                end if
                if mit_inc=1 then

```



```

for idno2=1 to nfarms
  if dyn_data(idno2).species=2 and idno2<>ctrl1 then
    if dyn_data(idno2).eggid1=eggid or dyn_data(idno2).eggid2=eggid then
      if dyn_data(idno2).eggid2=0 or (dyn_data(idno2).eggid2>0 and random()<=0.5) then
        if dyn_data(idno2).in_lay=1 then
          if surv_data(idno2).surv_status<=1 and ((surv_data(idno2).ca=0 and surv_data(idno2).ra=0) or
(surv_data(idno2).ra=1 and raeggs=1) or (surv_data(idno2).ca=1 and caeggs=1)) then
            redim templist(ubound(templist)+1)
            tempctr=ubound(templist)
            templist(tempctr)=dyn_data(idno2).id
          end if
        end if
      end if
    end if
  end if
end if
next

if ubound(templist)>0 then
  for ctr2=1 to ubound(templist)
    idno2=templist(ctr2)
    if dyn_data(ctr2).status=0 then
      if random()<=0.2 then
        if random()<=1/2 then
          if random()<=1/(ubound(templist)+1) then
            if random()<=p_eggl then
              if (surv_data(idno2).vacc_status>=4 and random()<=vaccsusc(dyn_data(idno2).species,
surv_data(idno2).vacc_status)) or surv_data(idno2).vacc_status<4 then
                dyn_data(idno2).become_lat=1
                dyn_data(idno2).daystillatent=1
                dyn_data(idno2).exp_by=idno1
                dyn_data(idno2).how_inf="EGG"
              end if
            end if
          end if
        end if
      end if
    end if
  end if
next
end if

```

```

end sub

sub doc_spread

dim crews, nfom, x2, y2 as smallint

crews=2

for idno2=1 to nfarms
call bioexc
if dyn_data(idno2).docid1=docid or dyn_data(idno2).docid2=docid then
  if dyn_data(ctr1).docid2>0 then
    nfom=2
  else
    nfom=1
  end if
  x2=dyn_data(idno2).xx
  y2=dyn_data(idno2).yy
  if dyn_data(idno2).daystocycle=0 and (dyn_data(idno2).status=0 or dyn_data(idno2).status=5) and
distance(x1,y1,x2,y2,"KM")<=disp(25).other then
  if surv_data(idno2).surv_status<=1 and surv_data(idno2).VA=0 and ((surv_data(idno2).ca=0 and
surv_data(idno2).ra=0) or (surv_data(idno2).ra=1 and radoc=1) or (surv_data(idno2).ca=1 and cadoc=1)) then
    contactday=dyn_data(idno2).daystocycle
    call decay_fom
    if random()<=bioexcl*p_doc1*decay/(crews*nfom) then
      if dyn_data(idno2).multiaged=0 and dyn_data(idno2).populated=0 then
        if (surv_data(idno2).vacc_status>=4 and random()<=vaccsusc(dyn_data(idno2).species,
surv_data(idno2).vacc_status)) or surv_data(idno2).vacc_status<4 then
          newcont4d=newcont4d+1
          dyn_data(idno2).status=6
          dyn_data(idno2).how_inf="DOC"
          dyn_data(idno2).exp_by=idno1
          dyn_data(idno2).when_inf=0
          dyn_data(idno2).inf_day=dayctr
          dyn_data(idno2).daysleftcont=beta_pert(disp(19).lowv,disp(19).modev,disp(19).highv)
          if mit_inc=1 then
            redim exposures(ubound(exposures)+1)
            exposures(ubound(exposures)).day=dayctr
          end if
        end if
      end if
    end if
  end if
end if
end for

```



```

sub live_spread
dim n, exitloop, spreadto as smallint

if dyn_data(ctrl1).species=1 then
  if dyn_data(ctrl1).typeofbirds=4 then
    select * from locs where locs.id<>ctrl1 and locs.species=1 and locs.state=dyn_data(ctrl1).state and
      locs.integrator=dyn_data(ctrl1).integrator and locs.typeofbirds=2 into temp1

  elseif dyn_data(ctrl1).typeofbirds=7 then
    select * from locs where locs.id<>ctrl1 and locs.species=1 and locs.state=dyn_data(ctrl1).state and
      locs.integrator=dyn_data(ctrl1).integrator and locs.typeofbirds=5 into temp1
  end if
elseif dyn_data(ctrl1).species=2 then
  if dyn_data(ctrl1).typeofbirds=3 then
    if dyn_data(ctrl1).state="NSW" or dyn_data(ctrl1).state="ACT" then
      select * from locs where locs.id<>ctrl1 and locs.species=2 and (locs.state="NSW" or locs.state="VIC" or
locs.state="QLD") and
        (locs.typeofbirds=2 or locs.typeofbirds=1) and locs.integrator=dyn_data(ctrl1).integrator into temp1
    elseif dyn_data(ctrl1).state="QLD" then
      select * from locs where locs.id<>ctrl1 and locs.species=2 and (locs.state="NSW" or locs.state="QLD") and
        (locs.typeofbirds=2 or locs.typeofbirds=1) and locs.integrator=dyn_data(ctrl1).integrator into temp1
    elseif dyn_data(ctrl1).state="VIC" then
      select * from locs where locs.id<>ctrl1 and locs.species=2 and (locs.state="NSW" or locs.state="VIC" or
locs.state="SA") and
        (locs.typeofbirds=2 or locs.typeofbirds=1) and locs.integrator=dyn_data(ctrl1).integrator into temp1
    else
      select * from locs where locs.id<>ctrl1 and locs.species=2 and locs.state=dyn_data(ctrl1).state and
        (locs.typeofbirds=2 or locs.typeofbirds=1) and locs.integrator=dyn_data(ctrl1).integrator into temp1
    end if
  end if
end if

n=tableinfo("temp1", TAB_INFO_NROWS)

if n=0 then
  close table temp1
  exit sub
end if

```

```

do
spreadto=int(random()*n+1)
fetch rec spreadto from temp1
idno2=temp1.id

if surv_data(idno2).surv_status<=1 then
  if surv_data(idno2).VA=0 and (surv_data(idno2).ca=0 and surv_data(idno2).ra=0 and surv_data(ctrl1).ca=0 and
surv_data(ctrl1).ra=0)
  or (surv_data(idno2).ra=1 and ramove=1 and surv_data(ctrl1).ra=1) or (surv_data(idno2).ca=1 and camove=1 and
surv_data(ctrl1).ca=1) then
    if dyn_data(idno2).status=0 then
      if dyn_data(idno2).multiaged=0 then
        dyn_data(idno2).daystocycle=0
        dyn_data(idno2).status=1
        newlat1=newlat1+1
        dyn_data(idno2).daysleftlatent=1
        dyn_data(idno2).how_inf="live"
        redim inflist(ubound(inflist)+1)
        inflist(ubound(inflist)).id=idno2
        dyn_data(idno1).R=dyn_data(idno1).R+1
        exitloop =n-1
        if mit_inc=1 then
          redim exposures(ubound(exposures)+1)
          exposures(ubound(exposures)).day=dayctr
          exposures(ubound(exposures)).id=idno2
          exposures(ubound(exposures)).from=idno1
          exposures(ubound(exposures)).how="live"
          exposures(ubound(exposures)).effective=1
        end if
      elseif dyn_data(idno2).multiaged=1 then
        if dyn_data(idno2).batchdue=0 then
          dyn_data(idno2).status=1
          newlat1=newlat1+1
          dyn_data(idno2).daysleftlatent=1
          dyn_data(idno2).how_inf="live"
          redim inflist(ubound(inflist)+1)
          inflist(ubound(inflist)).id=idno2
          dyn_data(idno1).R=dyn_data(idno1).R+1

```

```

        exitloop =n-1
    if mit_inc=1 then
        redim exposures(ubound(exposures)+1)
        exposures(ubound(exposures)).day=dayctr
        exposures(ubound(exposures)).id=idno2
        exposures(ubound(exposures)).from=idno1
        exposures(ubound(exposures)).how="live"
        exposures(ubound(exposures)).effective=1
    end if
elseif dyn_data(idno2).batchdue=1 then
    dyn_data(idno2).daystocycle=0
    dyn_data(idno2).litterremoval=0
    dyn_data(idno2).litterdelivery=0
    dyn_data(idno2).swd=0
    dyn_data(idno2).status=1
    newlat1=newlat1+1
    dyn_data(idno2).daysleftlatent=1
    redim inflist(ubound(inflist)+1)
    inflist(ubound(inflist)).id=idno2
    dyn_data(idno1).R=dyn_data(idno1).R+1
    exitloop =n-1
    if mit_inc=1 then
        redim exposures(ubound(exposures)+1)
        exposures(ubound(exposures)).day=dayctr
        exposures(ubound(exposures)).id=idno2
        exposures(ubound(exposures)).from=idno1
        exposures(ubound(exposures)).how="live"
        exposures(ubound(exposures)).effective=1
    end if
end if
end if
elseif dyn_data(idno2).status=5 then
    dyn_data(idno2).populated=1
    dyn_data(idno2).daystocycle=0
    dyn_data(idno2).litterremoval=0
    dyn_data(idno2).litterdelivery=0
    dyn_data(idno2).swd=0
    dyn_data(idno2).status=1

```

```

dyn_data(idno2).daysleftlatent=1
redim inflist(ubound(inflist)+1)
inflist(ubound(inflist)).id=idno2
dyn_data(idno1).R=dyn_data(idno1).R+1
exitloop =n-1
if mit_inc=1 then
    redim exposures(ubound(exposures)+1)
    exposures(ubound(exposures)).day=dayctr
    exposures(ubound(exposures)).id=idno2
    exposures(ubound(exposures)).from=idno1
    exposures(ubound(exposures)).how="live"
    exposures(ubound(exposures)).effective=1
end if
newlat3=newlat3+1
elseif dyn_data(idno2).status<>3 then
    exitloop =n-1
'if contaminated then will become latent, if latent/infectious then would still be so and if dead will not occur
end if
end if
end if
exitloop=exitloop+1
loop until exitloop=n
close table temp1
end sub

sub biocon
do case dyn_data(ctrl1).species
case 1
do case dyn_data(ctrl1).typeofbirds
case 1
if dyn_data(ctrl1).integrator>0 then
    biocont=biocont11
else
    biocont=biocont1i
end if
case 2
    biocont=biocont12
case 3
    biocont=biocont13

```



```
case 4
  biocont=biocont14
case 5
  biocont=biocont15
case 6
  biocont=biocont16
case 7
  biocont=biocont17
case 8
  biocont=biocont18
end case
case 2
do case dyn_data(ctrl1).typeofbirds
case 1
  biocont=biocont21
case 2
  biocont=biocont22
case 3
  biocont=biocont23
case 4
  biocont=biocont24
end case
case 3
do case dyn_data(ctrl1).typeofbirds
case 1
  if dyn_data(ctrl1).integrator>0 then
    biocont=biocont31
  else
    biocont=biocont3i
  end if
case 2
  biocont=biocont32
case 3
  biocont=biocont33
end case
case 4
do case dyn_data(ctrl1).typeofbirds
case 1
  if dyn_data(ctrl1).integrator>0 then
```

```

        biocont=biocont41
    else
        biocont=biocont4i
    end if
case 2
    biocont=biocont42
case 3
    biocont=biocont43
end case
end case
end sub

sub bioexc
do case dyn_data(idno2).species
case 1
do case dyn_data(idno2).typeofbirds
case 1
    if dyn_data(idno2).integrator>0 then
        bioexcl=bioexcl11
    else
        bioexcl=bioexcl1i
    end if
case 2
    bioexcl=bioexcl12
case 3
    bioexcl=bioexcl13
case 4
    bioexcl=bioexcl14
case 5
    bioexcl=bioexcl15
case 6
    bioexcl=bioexcl16
case 7
    bioexcl=bioexcl17
case 8
    bioexcl=bioexcl18
end case
case 2
do case dyn_data(idno2).typeofbirds

```

```
case 1
  bioexcl=bioexcl21
case 2
  bioexcl=bioexcl22
case 3
  bioexcl=bioexcl23
case 4
  bioexcl=bioexcl24
end case
case 3
do case dyn_data(idno2).typeofbirds
  case 1
    if dyn_data(idno2).integrator>0 then
      bioexcl=bioexcl31
    else
      bioexcl=bioexcl3i
    end if
  case 2
    bioexcl=bioexcl32
  case 3
    bioexcl=bioexcl33
  end case
case 4
do case dyn_data(idno2).typeofbirds
  case 1
    if dyn_data(idno2).integrator>0 then
      bioexcl=bioexcl41
    else
      bioexcl=bioexcl4i
    end if
  case 2
    bioexcl=bioexcl42
  case 3
    bioexcl=bioexcl43
  end case
end case
end case
end sub
```

```
sub decay_fom

do case contactday
case 0
  decay=1
case 1
  decay=0.71
case 2
  decay=0.71
case 3
  decay=0.079
case 4
  decay=0.0044
case else
  decay=0
end case

end sub
```

AI_model_timing_5September09.mb

```
Include "Mapbasic.def"
Include "AI_Model.def"
```

```
Sub newcycle
for ctrl=1 to nfarms
  do case dyn_data(ctrl).species
  case 1
    call cmtiming
  case 2
    call cltiming
  case 3
    call dutiming
  case 4
    call tutiming
  end case
next
end sub

sub cmtiming
```

```

'procedure for depopulating and starting new batches

dim idno,agetrans,endage,batchyr as smallint
idno=dyn_data(ctrl).id
if dyn_data(ctrl).multiaged=0 then
    if dyn_data(ctrl).populated=1 and dyn_data(ctrl).endofthisbatch=0 and dyn_data(ctrl).status<>3 then
        if surv_data(ctrl).surv_status>1 then
            if dyn_data(ctrl).overdue=0 then
                dyn_data(ctrl).overdue=1
                costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap

                end if
            elseif (surv_data(ctrl).ra=1 and RAslau=0 and (dyn_data(ctrl).typeofbirds=2 or dyn_data(ctrl).typeofbirds=3
or
dyn_data(ctrl).typeofbirds=5 or dyn_data(ctrl).typeofbirds=6 or dyn_data(ctrl).typeofbirds=8)) then
                if dyn_data(ctrl).overdue=0 then
                    dyn_data(ctrl).overdue=1
                    costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap

                    end if
                elseif (surv_data(ctrl).ra=1 and dyn_data(ctrl).typeofbirds=1 and RApickup=0) then
                    dyn_data(ctrl).overdue=1
                elseif (surv_data(ctrl).ra=1 and RAmove=0 and (dyn_data(ctrl).typeofbirds=4 or dyn_data(ctrl).typeofbirds=7))
then
                    if dyn_data(ctrl).overdue=0 then
                        dyn_data(ctrl).overdue=1
                        costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap

                        end if
                    elseif (surv_data(ctrl).ca=1 and CAslau=0 and (dyn_data(ctrl).typeofbirds=2 or dyn_data(ctrl).typeofbirds=3
or
dyn_data(ctrl).typeofbirds=5 or dyn_data(ctrl).typeofbirds=6 or dyn_data(ctrl).typeofbirds=8)) then
                        if dyn_data(ctrl).overdue=0 then
                            dyn_data(ctrl).overdue=1
                            costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap

                            end if
                        elseif (surv_data(ctrl).ca=1 and CAPickup=0 and dyn_data(ctrl).typeofbirds=1) then
                            dyn_data(ctrl).overdue=1

```

```

elseif (surv_data(ctrl).ca=1 and CAmove=0 and (dyn_data(ctrl).typeofbirds=4 or dyn_data(ctrl).typeofbirds=7))
then
    if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap
    end if
else
    dyn_data(ctrl).overdue=0
    dyn_data(ctrl).daysoverdue=0
    dyn_data(ctrl).populated=0
    dyn_data(ctrl).feed_del=0
    dyn_data(ctrl).dead_bird=0
    dyn_data(ctrl).thin=0
    dyn_data(ctrl).spiking=0
    dyn_data(ctrl).vaccinate=0
    dyn_data(ctrl).in_lay=0
    dyn_data(ctrl).daystocycle=dyn_data(ctrl).turn_time
    dyn_data(ctrl).currentcap=0
    dyn_data(ctrl).report=0
    dyn_data(ctrl).daystillreport=0
    dyn_data(ctrl).become_lat=0
    if mit_inc=1 then
        surv_data(ctrl).vdays=0
        surv_data(ctrl).dcp=0
        surv_data(ctrl).sp=0
        surv_data(ctrl).surv_status=0
        surv_data(ctrl).vacc_status=0
        surv_data(ctrl).why_vacc=0
        surv_data(ctrl).vdue_day=0
        surv_data(ctrl).daystovaccimm=0
    end if
    if dyn_data(ctrl).ldel_id1<>0 then
        dyn_data(ctrl).litter_d=1
    end if
    dyn_data(ctrl).san=1
    if dyn_data(ctrl).lrem_id1<>0 then
        dyn_data(ctrl).litter_c=1
    end if

```

```

if dyn_data(ctrl1).status=0 then
  dyn_data(ctrl1).status=5
  newrem1=newrem1+1
elseif dyn_data(ctrl1).status=1 then
  dyn_data(ctrl1).status=5
  dyn_data(ctrl1).fate=0
  dyn_data(ctrl1).daysleftlatent=0
  dyn_data(ctrl1).daystildead=0
  dyn_data(ctrl1).daystilimmune=0
  dyn_data(ctrl1).daysleftimmune=0
  newrem4=newrem4+1
elseif dyn_data(ctrl1).status=2 then
  dyn_data(ctrl1).status=6
  dyn_data(ctrl1).fate=0
  dyn_data(ctrl1).daysleftlatent=0
  dyn_data(ctrl1).daystildead=0
  dyn_data(ctrl1).daystilimmune=0
  dyn_data(ctrl1).daysleftimmune=0
  dyn_data(ctrl1).daysleftcont=beta_pert (disp(19) .lowv, disp(19) .modev, disp(19) .highv)
  disoutputs(ctrl1).endinf=dayctr
  disoutputs(ctrl1).endstat=6
  disoutputs(ctrl1).howend="RDep"
'RDep = routine depopulation
  newcont2=newcont2+1
  elseif dyn_data(ctrl1).status=4 then
    dyn_data(ctrl1).status=5
    dyn_data(ctrl1).fate=0
    dyn_data(ctrl1).daysleftlatent=0
    dyn_data(ctrl1).daystildead=0
    dyn_data(ctrl1).daystilimmune=0
    dyn_data(ctrl1).daysleftimmune=0
    newrem2=newrem2+1
  end if
end if
end if
if dyn_data(ctrl1).daystocycle=0 and dyn_data(ctrl1).populated=0 then
  if surv_data(ctrl1).surv_status<=1 and surv_data(ctrl1).VA=0 then
    if (surv_data(ctrl1).ra=0 and surv_data(ctrl1).ca=0)

```

```

    or (surv_data(ctrl1).ra=1 and RAdoc=1 and (dyn_data(ctrl1).typeofbirds<>2 or
dyn_data(ctrl1).typeofbirds<>5))
    or (surv_data(ctrl1).ra=1 and RAmove=1 and (dyn_data(ctrl1).typeofbirds=2 or dyn_data(ctrl1).typeofbirds=5))
    or (surv_data(ctrl1).ca=1 and CAdoc=1 and (dyn_data(ctrl1).typeofbirds<>2 or
dyn_data(ctrl1).typeofbirds<>5))
    or (surv_data(ctrl1).ca=1 and CAmove=1 and (dyn_data(ctrl1).typeofbirds=2 or dyn_data(ctrl1).typeofbirds=5))
then

do case dyn_data(ctrl1).typeofbirds
case 1
    dyn_data(ctrl1).endofthisbatch=beta_pert(popp(1).lowv, popp(1).modev, popp(1).highv)
'these default values could eventually be read in from a file
    dyn_data(ctrl1).turn_time=beta_pert(popp(21).lowv, popp(21).modev, popp(21).highv)
    dyn_data(ctrl1).thin=1
    dyn_data(ctrl1).thinning1=beta_pert(popp(31).lowv, popp(31).modev, popp(31).highv)
    dyn_data(ctrl1).thinning2=beta_pert(popp(32).lowv, popp(32).modev, popp(32).highv)
    dyn_data(ctrl1).thinning3=dyn_data(ctrl1).endofthisbatch
case 2
    agetrans=beta_pert(popp(2).lowv, popp(2).modev, popp(2).highv)
    endage=beta_pert(popp(3).lowv, popp(3).modev, popp(3).highv)
    dyn_data(ctrl1).endofthisbatch=endage-agetrans
    dyn_data(ctrl1).turn_time=beta_pert(popp(23).lowv, popp(23).modev, popp(23).highv)
    if random()<=popp(34).other then
        dyn_data(ctrl1).spiking=1
        dyn_data(ctrl1).spikingday=beta_pert(popp(33).lowv, popp(33).modev, popp(33).highv)-agetrans
    end if
case 3
    dyn_data(ctrl1).endofthisbatch=beta_pert(popp(4).lowv, popp(4).modev, popp(4).highv)
    dyn_data(ctrl1).turn_time=beta_pert(popp(24).lowv, popp(24).modev, popp(24).highv)
    if random()<=popp(34).other then
        dyn_data(ctrl1).spiking=1
        dyn_data(ctrl1).spikingday=beta_pert(popp(33).lowv, popp(33).modev, popp(33).highv)
    end if
    dyn_data(ctrl1).vaccinate=1
    dyn_data(ctrl1).vacc_day1=beta_pert(popp(12).lowv, popp(12).modev, popp(12).highv)
case 4
    dyn_data(ctrl1).endofthisbatch=beta_pert(popp(2).lowv, popp(2).modev, popp(2).highv)
    dyn_data(ctrl1).turn_time=beta_pert(popp(22).lowv, popp(22).modev, popp(22).highv)
    dyn_data(ctrl1).vacc_day1=beta_pert(popp(9).lowv, popp(9).modev, popp(9).highv)

```



```

    dyn_data(ctrl1).vaccinate=1
case 5
    agetrans=beta_pert (popp (5) .lowv, popp (5) .modev, popp (5) .highv)
    endage=beta_pert (popp (6) .lowv, popp (6) .modev, popp (6) .highv)
    dyn_data(ctrl1).endofthisbatch=endage-agetrans
    dyn_data(ctrl1).turn_time=beta_pert (popp (26) .lowv, popp (26) .modev, popp (26) .highv)
    if random()<=popp (34) .other then
        dyn_data(ctrl1).spiking=1
        dyn_data(ctrl1).spikingday=beta_pert (popp (33) .lowv, popp (33) .modev, popp (33) .highv) -agetrans
    end if
case 6
    dyn_data(ctrl1).endofthisbatch=beta_pert (popp (7) .lowv, popp (7) .modev, popp (7) .highv)
    dyn_data(ctrl1).turn_time=beta_pert (popp (27) .lowv, popp (27) .modev, popp (27) .highv)
    dyn_data(ctrl1).vaccinate=1
    dyn_data(ctrl1).vacc_day1=beta_pert (popp (18) .lowv, popp (18) .modev, popp (18) .highv)
    if random()<=popp (34) .other then
        dyn_data(ctrl1).spiking=1
        dyn_data(ctrl1).spikingday=beta_pert (popp (33) .lowv, popp (33) .modev, popp (33) .highv)
    end if
case 7
    dyn_data(ctrl1).endofthisbatch=beta_pert (popp (5) .lowv, popp (5) .modev, popp (5) .highv)
    dyn_data(ctrl1).turn_time=beta_pert (popp (25) .lowv, popp (25) .modev, popp (25) .highv)
    dyn_data(ctrl1).vaccinate=1
    dyn_data(ctrl1).vacc_day1=beta_pert (popp (15) .lowv, popp (15) .modev, popp (15) .highv)
case 8
    agetrans=popp (40) .other
    endage=beta_pert (popp (8) .lowv, popp (8) .modev, popp (8) .highv)
    dyn_data(ctrl1).endofthisbatch=endage-agetrans
    dyn_data(ctrl1).turn_time=beta_pert (popp (28) .lowv, popp (28) .modev, popp (28) .highv)
end case

dyn_data(ctrl1).populated=1
dyn_data(ctrl1).cycleday=0
dyn_data(ctrl1).dayssincedead=0
dyn_data(ctrl1).currentcap=dyn_data(ctrl1).capacity
if mit_inc=1 and dyn_data(ctrl1).currentcap>vcrewscap then
    if dyn_data(ctrl1).currentcap mod vcrewscap=0 then
        surv_data(ctrl1).vdays=dyn_data(ctrl1).currentcap/vcrewscap
    else

```

```

        surv_data(ctrl).vdays=dyn_data(ctrl).currentcap\vcrewscap+1
    end if
else
    surv_data(ctrl).vdays=1
end if
if dyn_data(ctrl).feed_source1<>0 then
    dyn_data(ctrl).feed_del=1
end if

dyn_data(ctrl).daystofeeddelivery=int(random()*popp(29).other+1)

if dyn_data(ctrl).lrem_id1<>0 then
    dyn_data(ctrl).litterremoval=round(1/6*(dyn_data(ctrl).turn_time),1)
end if
if dyn_data(ctrl).swd_id1<>0 then
    dyn_data(ctrl).swd=round(1/2*(dyn_data(ctrl).turn_time),1)
end if
if dyn_data(ctrl).ldel_id1<>0 then
    dyn_data(ctrl).litterdelivery=round(5/6*(dyn_data(ctrl).turn_time),1)
end if

dyn_data(ctrl).litter_c=0
dyn_data(ctrl).san=0
dyn_data(ctrl).litter_d=0

if dyn_data(ctrl).dbc_id<>0 then
    if dyn_data(ctrl).dbc_id=4 then
        if dyn_data(ctrl).endofthisbatch>popp(78).other then
            dyn_data(ctrl).dead_bird=1
            dyn_data(ctrl).daystodbc=popp(78).other+1
        end if
    else
        if dyn_data(ctrl).endofthisbatch>popp(30).other then
            dyn_data(ctrl).dead_bird=1
            dyn_data(ctrl).daystodbc=popp(30).other+1
        end if
    end if
end if
end if

```

```

        if dyn_data(ctrl).status=5 then
            dyn_data(ctrl).status=0
            newsus1=newsus1+1
        elseif dyn_data(ctrl).status=6 then
            dyn_data(ctrl).status=1
            dyn_data(ctrl).inf_day=dayctr
            dyn_data(ctrl).when_inf=0
            redim inflist(ubound(inflist)+1)
            inflist(ubound(inflist)).id=ctrl
            if dyn_data(ctrl).exp_by<>0 then
                dyn_data(dyn_data(ctrl).exp_by).R=dyn_data(dyn_data(ctrl).exp_by).R+1
            end if
            if dyn_data(ctrl).species=3 then
                dyn_data(ctrl).daysleftlatent=uniform(disp(4).lowv,disp(4).highv)
            else
                dyn_data(ctrl).daysleftlatent=uniform(disp(1).lowv,disp(1).highv)
            end if

            newlat2=newlat2+1
        end if
    end if
end if
end if
elseif dyn_data(ctrl).multiaged=1 then
    if dyn_data(ctrl).batchdue=0 and dyn_data(ctrl).endofthisbatch=0 then
        if surv_data(ctrl).surv_status>1 then
            if dyn_data(ctrl).overdue=0 then
                dyn_data(ctrl).overdue=1
                costoverdue=costoverdue+compo(ctrl)*int(dyn_data(ctrl).capacity*(1/popp(42).other))
            end if
        elseif (surv_data(ctrl).ra=1 and RAslau=0 and (dyn_data(ctrl).typeofbirds=2 or dyn_data(ctrl).typeofbirds=3
or
            dyn_data(ctrl).typeofbirds=5 or dyn_data(ctrl).typeofbirds=6 or dyn_data(ctrl).typeofbirds=8)) then
            if dyn_data(ctrl).overdue=0 then
                dyn_data(ctrl).overdue=1
                costoverdue=costoverdue+compo(ctrl)*int(dyn_data(ctrl).capacity*(1/popp(42).other))
            end if
        elseif (surv_data(ctrl).ra=1 and RAPickup=0 and dyn_data(ctrl).typeofbirds=1) then
            if dyn_data(ctrl).overdue=0 then

```

```

        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*int(dyn_data(ctrl).capacity*(1/popp(42).other))
    end if
elseif (surv_data(ctrl).ra=1 and RAmove=0 and (dyn_data(ctrl).typeofbirds=4 or dyn_data(ctrl).typeofbirds=7))
then
    if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*int(dyn_data(ctrl).capacity*(1/popp(42).other))
    end if
elseif (surv_data(ctrl).ca=1 and CAslau=0 and (dyn_data(ctrl).typeofbirds=2 or dyn_data(ctrl).typeofbirds=3
or
    dyn_data(ctrl).typeofbirds=5 or dyn_data(ctrl).typeofbirds=6 or dyn_data(ctrl).typeofbirds=8)) then
    if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*int(dyn_data(ctrl).capacity*(1/popp(42).other))
    end if
elseif (surv_data(ctrl).ca=1 and CAPickup=0 and dyn_data(ctrl).typeofbirds=1) then
    if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*int(dyn_data(ctrl).capacity*(1/popp(42).other))
    end if
elseif (surv_data(ctrl).ca=1 and CAmove=0 and (dyn_data(ctrl).typeofbirds=4 or dyn_data(ctrl).typeofbirds=7))
then
    if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*int(dyn_data(ctrl).capacity*(1/popp(42).other))
    end if
else
    dyn_data(ctrl).overdue=0
    dyn_data(ctrl).daysoverdue=0
    if dyn_data(ctrl).typeofbirds>1 then
    end if
    dyn_data(ctrl).currentcap=int(dyn_data(ctrl).capacity*(1-1/popp(42).other))
    if mit_inc=1 and dyn_data(ctrl).currentcap>vcrewscap then
        if dyn_data(ctrl).currentcap mod vcrewscap=0 then
            surv_data(ctrl).vdays=dyn_data(ctrl).currentcap/vcrewscap
        else
            surv_data(ctrl).vdays=dyn_data(ctrl).currentcap\vcrewscap+1
        end if
    end if
end if

```

```

        else
            surv_data(ctrl1).vdays=1
        end if
    dyn_data(ctrl1).batchdue=1
    dyn_data(ctrl1).daystocycle=dyn_data(ctrl1).turn_time

    if dyn_data(ctrl1).ldel_id1<>0 then
        dyn_data(ctrl1).litter_d=1
    end if
    if dyn_data(ctrl1).swd_id1<>0 then
        dyn_data(ctrl1).san=1
    end if
    if dyn_data(ctrl1).lrem_id1<>0 then
        dyn_data(ctrl1).litter_c=1
    end if
end if
end if
if dyn_data(ctrl1).daystocycle=0 and dyn_data(ctrl1).batchdue=1 then
    if surv_data(ctrl1).surv_status<=1 and surv_data(ctrl1).VA=0 then
        if (surv_data(ctrl1).ra=0 and surv_data(ctrl1).ca=0)
            or (surv_data(ctrl1).ra=1 and RAdoc=1 and (dyn_data(ctrl1).typeofbirds<>2 or
dyn_data(ctrl1).typeofbirds<>5))
            or (surv_data(ctrl1).ra=1 and RAmove=1 and (dyn_data(ctrl1).typeofbirds=2 or dyn_data(ctrl1).typeofbirds=5))
            or (surv_data(ctrl1).ca=1 and CAdoc=1 and (dyn_data(ctrl1).typeofbirds<>2 or
dyn_data(ctrl1).typeofbirds<>5))
            or (surv_data(ctrl1).ca=1 and CAmove=1 and (dyn_data(ctrl1).typeofbirds=2 or dyn_data(ctrl1).typeofbirds=5))
        then

            batchyr=popp(42).other

            dyn_data(ctrl1).turn_time=beta_pert(popp(41).lowv,popp(41).modev,popp(41).highv)
            dyn_data(ctrl1).endofthisbatch=365\batchyr-dyn_data(ctrl1).turn_time
            dyn_data(ctrl1).batchdue=0
            dyn_data(ctrl1).cycleday=0
            dyn_data(ctrl1).currentcap=dyn_data(ctrl1).capacity
            dyn_data(ctrl1).daystofeeddelivery=int(random()*popp(29).other+1)
            if mit_inc=1 and dyn_data(ctrl1).currentcap>vcrewsap then
                if dyn_data(ctrl1).currentcap mod vcrewsap=0 then
                    surv_data(ctrl1).vdays=dyn_data(ctrl1).currentcap/vcrewsap
                end if
            end if
        end if
    end if
end if

```

```

        else
            surv_data(ctrl1).vdays=dyn_data(ctrl1).currentcap\vcrewscap+1
        end if
    else
        surv_data(ctrl1).vdays=1
    end if
    if dyn_data(ctrl1).lrem_id1<>0 then
        dyn_data(ctrl1).litterremoval=round(1/6*(dyn_data(ctrl1).turn_time),1)
    end if
    if dyn_data(ctrl1).swd_id1<>0 then
        dyn_data(ctrl1).swd=round(1/2*(dyn_data(ctrl1).turn_time),1)
    end if
    if dyn_data(ctrl1).ldel_id1<>0 then
        dyn_data(ctrl1).litterdelivery=round(5/6*(dyn_data(ctrl1).turn_time),1)
    end if

    dyn_data(ctrl1).litter_c=0
    dyn_data(ctrl1).san=0
    dyn_data(ctrl1).litter_d=0

    if dyn_data(ctrl1).dbc_id<>0 then
        if dyn_data(ctrl1).dbc_id=4 then
            if dyn_data(ctrl1).endofthisbatch>popp(78).other then
                dyn_data(ctrl1).dead_bird=1
                dyn_data(ctrl1).daystodbc=popp(78).other+1
            end if
        else
            if dyn_data(ctrl1).endofthisbatch>popp(30).other then
                dyn_data(ctrl1).dead_bird=1
                dyn_data(ctrl1).daystodbc=popp(30).other+1
            end if
        end if
    end if
    do case dyn_data(ctrl1).typeofbirds
    case 2
        agetrans=beta_pert(popp(2).lowv,popp(2).modev,popp(2).highv)
        if random()<=popp(34).other then
            dyn_data(ctrl1).spiking=1
        end if
    end case
end do

```

```

        dyn_data(ctrl1).spikingday=beta_pert(popp(33).lowv,popp(33).modev,popp(33).highv)-agetrans
        if dyn_data(ctrl1).spikingday>365\popp(42).other then
            dyn_data(ctrl1).spikingday=dyn_data(ctrl1).spikingday mod 365\popp(42).other
        end if
    end if
case 3
    dyn_data(ctrl1).vacc_day1=beta_pert(popp(12).lowv,popp(12).modev,popp(12).highv)
    dyn_data(ctrl1).vaccinate=1
    if dyn_data(ctrl1).vacc_day1>365\popp(42).other then
        dyn_data(ctrl1).vacc_day1=dyn_data(ctrl1).vacc_day1 mod 365\popp(42).other
    end if
    if random()<=popp(34).other then
        dyn_data(ctrl1).spiking=1
        dyn_data(ctrl1).spikingday=beta_pert(popp(33).lowv,popp(33).modev,popp(33).highv)
        if dyn_data(ctrl1).spikingday>365\popp(42).other then
            dyn_data(ctrl1).spikingday=dyn_data(ctrl1).spikingday mod 365\popp(42).other
        end if
    end if
case 4
    dyn_data(ctrl1).vacc_day1=beta_pert(popp(9).lowv,popp(9).modev,popp(9).highv)
    dyn_data(ctrl1).vaccinate=1
    if dyn_data(ctrl1).vacc_day1>365\popp(42).other then
        dyn_data(ctrl1).vacc_day1=dyn_data(ctrl1).vacc_day1 mod 365\popp(42).other
    end if
case 5
    agetrans=beta_pert(popp(5).lowv,popp(5).modev,popp(5).highv)
    if random()<=popp(34).other then
        dyn_data(ctrl1).spiking=1
        dyn_data(ctrl1).spikingday=beta_pert(popp(33).lowv,popp(33).modev,popp(33).highv)-agetrans
        if dyn_data(ctrl1).spikingday>365\popp(42).other then
            dyn_data(ctrl1).spikingday=dyn_data(ctrl1).spikingday mod 365\popp(42).other
        end if
    end if
case 6
    dyn_data(ctrl1).vacc_day1=beta_pert(popp(18).lowv,popp(18).modev,popp(18).highv)
    dyn_data(ctrl1).vaccinate=1
    if dyn_data(ctrl1).vacc_day1>365\popp(42).other then
        dyn_data(ctrl1).vacc_day1=dyn_data(ctrl1).vacc_day1 mod 365\popp(42).other
    end if

```

```

        if random() <= popp(34).other then
            dyn_data(ctrl).spiking=1
            dyn_data(ctrl).spikingday=beta_pert(popp(33).lowv, popp(33).modev, popp(33).highv)
            if dyn_data(ctrl).spikingday > 365 \ popp(42).other then
                dyn_data(ctrl).spikingday = dyn_data(ctrl).spikingday mod 365 \ popp(42).other
            end if
        end if
    case 7
        dyn_data(ctrl).vacc_day1 = beta_pert(popp(15).lowv, popp(15).modev, popp(15).highv)
        dyn_data(ctrl).vaccinate=1
        if dyn_data(ctrl).vacc_day1 > 365 \ popp(42).other then
            dyn_data(ctrl).vacc_day1 = dyn_data(ctrl).vacc_day1 mod 365 \ popp(42).other
        end if
    end case
end if
end if
end if
end sub

sub cltiming

dim idno, agetrans, batchyr as smallint

idno = dyn_data(ctrl).id
if dyn_data(ctrl).multiaged = 0 then
    if dyn_data(ctrl).populated = 1 and dyn_data(ctrl).endofthisbatch = 0 and dyn_data(ctrl).status <> 3 then
        if surv_data(ctrl).surv_status > 1 then
            if dyn_data(ctrl).overdue = 0 then
                dyn_data(ctrl).overdue = 1
                costoverdue = costoverdue + compo(ctrl) * dyn_data(ctrl).currentcap
            end if
        elseif (surv_data(ctrl).ra = 1 and RAslau = 0 and dyn_data(ctrl).typeofbirds <> 3) then
            if dyn_data(ctrl).overdue = 0 then
                dyn_data(ctrl).overdue = 1
                costoverdue = costoverdue + compo(ctrl) * dyn_data(ctrl).currentcap
            end if
        elseif (surv_data(ctrl).ra = 1 and RAmove = 0 and dyn_data(ctrl).typeofbirds = 3) then
            if dyn_data(ctrl).overdue = 0 then

```



```

        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap
    end if
elseif (surv_data(ctrl).ca=1 and CAslau=0 and dyn_data(ctrl).typeofbirds<>3) then
    if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap
    end if
elseif (surv_data(ctrl).ca=1 and CAmove=0 and dyn_data(ctrl).typeofbirds=3) then
    if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap
    end if
else
    dyn_data(ctrl).overdue=0
    dyn_data(ctrl).daysoverdue=0
    dyn_data(ctrl).populated=0
    dyn_data(ctrl).report=0
    dyn_data(ctrl).daystillreport=0
    dyn_data(ctrl).currentcap=0
    dyn_data(ctrl).become_lat=0
    dyn_data(ctrl).feed_del=0
    dyn_data(ctrl).dead_bird=0
    dyn_data(ctrl).in_lay=0
    dyn_data(ctrl).daystocycle=dyn_data(ctrl).turn_time
    if dyn_data(ctrl).ldel_id1<>0 then
        dyn_data(ctrl).litter_d=1
    end if
    dyn_data(ctrl).san=1
    if dyn_data(ctrl).lrem_id1<>0 then
        dyn_data(ctrl).litter_c=1
    end if
    if mit_inc=1 then
        surv_data(ctrl).vdays=0
        surv_data(ctrl).dcp=0
        surv_data(ctrl).sp=0
        surv_data(ctrl).surv_status=0
        surv_data(ctrl).vacc_status=0
        surv_data(ctrl).why_vacc=0
    end if
end if

```

```

        surv_data(ctrl).vdue_day=0
        surv_data(ctrl).daystovaccimm=0
    end if

    if dyn_data(ctrl).status=0 then
        dyn_data(ctrl).status=5
        newrem1=newrem1+1

    elseif dyn_data(ctrl).status=1 then
        dyn_data(ctrl).status=5
        dyn_data(ctrl).fate=0
        dyn_data(ctrl).daysleftlatent=0
        dyn_data(ctrl).daystildead=0
        dyn_data(ctrl).daystilimmune=0
        dyn_data(ctrl).daysleftimmune=0
        newrem4=newrem4+1

    elseif dyn_data(ctrl).status=2 then
        dyn_data(ctrl).status=6
        dyn_data(ctrl).fate=0
        dyn_data(ctrl).daysleftlatent=0
        dyn_data(ctrl).daystildead=0
        dyn_data(ctrl).daystilimmune=0
        dyn_data(ctrl).daysleftimmune=0
        dyn_data(ctrl).daysleftcont=beta_pert (disp(19).lowv,disp(19).modev,disp(19).highv)

        disoutputs(ctrl).endinf=dayctr
        disoutputs(ctrl).endstat=6
        disoutputs(ctrl).howend="RDep"
        newcont2=newcont2+1

    elseif dyn_data(ctrl).status=4 then
        dyn_data(ctrl).status=5
        dyn_data(ctrl).fate=0
        dyn_data(ctrl).daysleftlatent=0
        dyn_data(ctrl).daystildead=0
        dyn_data(ctrl).daystilimmune=0
        dyn_data(ctrl).daysleftimmune=0
        newrem2=newrem2+1

```

```

        end if
    end if
end if
if dyn_data(ctrl1).populated=0 and dyn_data(ctrl1).daystocycle=0 then
    if surv_data(ctrl1).surv_status<=1 and surv_data(ctrl1).VA=0 then
        if (surv_data(ctrl1).ra=0 and surv_data(ctrl1).ca=0)
        or (surv_data(ctrl1).ra=1 and RAdoc=1 and dyn_data(ctrl1).typeofbirds<>2)
        or (surv_data(ctrl1).ra=1 and RAmove=1 and dyn_data(ctrl1).typeofbirds=2)
        or (surv_data(ctrl1).ca=1 and CAdoc=1 and dyn_data(ctrl1).typeofbirds<>2)
        or (surv_data(ctrl1).ca=1 and CAmove=1 and dyn_data(ctrl1).typeofbirds=2) then
            if mit_inc=1 then
                end if
            do case dyn_data(ctrl1).typeofbirds
            case 1
                agetrans=beta_pert (popp(44).lowv, popp(44).modev, popp(44).highv)
                dyn_data(ctrl1).endofthisbatch=beta_pert (popp(45).lowv, popp(45).modev, popp(45).highv) - agetrans
                dyn_data(ctrl1).turn_time=beta_pert (popp(49).lowv, popp(49).modev, popp(49).highv)
                dyn_data(ctrl1).daytosetegg=beta_pert (popp(52).lowv, popp(52).modev, popp(52).highv)
            case 2
                'L/Pu
                dyn_data(ctrl1).endofthisbatch=beta_pert (popp(43).lowv, popp(43).modev, popp(43).highv)
'these default values could eventually be read in from a file
                dyn_data(ctrl1).turn_time=beta_pert (popp(47).lowv, popp(47).modev, popp(47).highv)

                dyn_data(ctrl1).daytosetegg=beta_pert (popp(52).lowv, popp(52).modev, popp(52).highv)
                dyn_data(ctrl1).vacc_day1=beta_pert (popp(77).lowv, popp(77).modev, popp(77).highv)

                dyn_data(ctrl1).vaccinate=1
            case 3
                'Pu
                dyn_data(ctrl1).endofthisbatch=beta_pert (popp(44).lowv, popp(44).modev, popp(44).highv)
                dyn_data(ctrl1).turn_time=beta_pert (popp(48).lowv, popp(48).modev, popp(48).highv)
                dyn_data(ctrl1).vacc_day1=beta_pert (popp(53).lowv, popp(53).modev, popp(53).highv)
                dyn_data(ctrl1).vaccinate=1
            case 4
                'Breeder/elite
                dyn_data(ctrl1).endofthisbatch=beta_pert (popp(46).lowv, popp(46).modev, popp(46).highv)
                dyn_data(ctrl1).turn_time=beta_pert (popp(50).lowv, popp(50).modev, popp(50).highv)
                dyn_data(ctrl1).vacc_day1=beta_pert (popp(53).lowv, popp(53).modev, popp(53).highv)
                dyn_data(ctrl1).vaccinate=1
                if random()<=popp(34).other then
'tset spiking time

```

```

        dyn_data(ctrl).spiking=1
        dyn_data(ctrl).spikingday=beta_pert(popp(33).lowv,popp(33).modev,popp(33).highv)
    end if
end case

dyn_data(ctrl).populated=1
dyn_data(ctrl).cycleday=0
dyn_data(ctrl).currentcap=dyn_data(ctrl).capacity

if mit_inc=1 and dyn_data(ctrl).currentcap>vcrewscap then
    if dyn_data(ctrl).currentcap mod vcrewscap=0 then
        surv_data(ctrl).vdays=dyn_data(ctrl).currentcap/vcrewscap
    else
        surv_data(ctrl).vdays=dyn_data(ctrl).currentcap\vcrewscap+1
    end if
else
    surv_data(ctrl).vdays=1
end if
if dyn_data(ctrl).feed_source1<>0 then
    dyn_data(ctrl).feed_del=1
end if
    dyn_data(ctrl).daystofeeddelivery=int(random()*popp(29).other+1)
if dyn_data(ctrl).lrem_id1<>0 then
    dyn_data(ctrl).litterremoval=round(1/6*(dyn_data(ctrl).turn_time),1)
end if
if dyn_data(ctrl).swd_id1<>0 then
    dyn_data(ctrl).swd=round(1/2*(dyn_data(ctrl).turn_time),1)
end if
if dyn_data(ctrl).ldel_id1<>0 then
    dyn_data(ctrl).litterdelivery=round(5/6*(dyn_data(ctrl).turn_time),1)
end if
dyn_data(ctrl).litter_c=0
dyn_data(ctrl).san=0
dyn_data(ctrl).litter_d=0

if dyn_data(ctrl).dbc_id<>0 then
    if dyn_data(ctrl).dbc_id=4 then
        if dyn_data(ctrl).endofthisbatch>popp(78).other then
            dyn_data(ctrl).dead_bird=1
        end if
    end if
end if

```

```

        dyn_data(ctrl1).daystodbc=popp(78).other+1
    end if
else
    if dyn_data(ctrl1).endofthisbatch>popp(30).other then
        dyn_data(ctrl1).dead_bird=1
        dyn_data(ctrl1).daystodbc=popp(30).other+1
    end if
end if
end if

if dyn_data(ctrl1).status=5 then
    dyn_data(ctrl1).status=0
    newsus1=newsus1+1

elseif dyn_data(ctrl1).status=6 then
    dyn_data(ctrl1).status=1
    dyn_data(ctrl1).inf_day=dayctr
    dyn_data(ctrl1).when_inf=0
    redim inflist(ubound(inflist)+1)
    inflist(ubound(inflist)).id=ctrl1
    if dyn_data(ctrl1).exp_by<>0 then
        dyn_data(dyn_data(ctrl1).exp_by).R=dyn_data(dyn_data(ctrl1).exp_by).R+1
    end if
    if dyn_data(ctrl1).species=3 then
        dyn_data(ctrl1).daysleftlatent=uniform(dispatch(4).lowv,dispatch(4).highv)
    else
        dyn_data(ctrl1).daysleftlatent=uniform(dispatch(1).lowv,dispatch(1).highv)
    end if

    newlat2=newlat2+1
end if
end if
end if
elseif dyn_data(ctrl1).multiaged=1 then

if dyn_data(ctrl1).batchdue=0 and dyn_data(ctrl1).endofthisbatch=0 then
    if surv_data(ctrl1).surv_status>1 then

```

```

    if dyn_data(ctrl1).overdue=0 then
        dyn_data(ctrl1).overdue=1
        costoverdue=costoverdue+compo(ctrl1)*int(dyn_data(ctrl1).capacity*(1/popp(56).other))
    end if
elseif (surv_data(ctrl1).ra=1 and RAslau=0 and dyn_data(ctrl1).typeofbirds<>3) then
    if dyn_data(ctrl1).overdue=0 then
        dyn_data(ctrl1).overdue=1
        costoverdue=costoverdue+compo(ctrl1)*int(dyn_data(ctrl1).capacity*(1/popp(56).other))
    end if
elseif (surv_data(ctrl1).ra=1 and RAmove=0 and dyn_data(ctrl1).typeofbirds=3) then
    if dyn_data(ctrl1).overdue=0 then
        dyn_data(ctrl1).overdue=1
        costoverdue=costoverdue+compo(ctrl1)*int(dyn_data(ctrl1).capacity*(1/popp(56).other))
    end if
elseif (surv_data(ctrl1).ca=1 and CAslau=0 and dyn_data(ctrl1).typeofbirds<>3) then
    if dyn_data(ctrl1).overdue=0 then
        dyn_data(ctrl1).overdue=1
        costoverdue=costoverdue+compo(ctrl1)*int(dyn_data(ctrl1).capacity*(1/popp(56).other))
    end if
elseif (surv_data(ctrl1).ca=1 and CAmove=0 and dyn_data(ctrl1).typeofbirds=3) then
    if dyn_data(ctrl1).overdue=0 then
        dyn_data(ctrl1).overdue=1
        costoverdue=costoverdue+compo(ctrl1)*int(dyn_data(ctrl1).capacity*(1/popp(56).other))
    end if
else
    dyn_data(ctrl1).overdue=0
    dyn_data(ctrl1).daysoverdue=0
    dyn_data(ctrl1).batchdue=1
    dyn_data(ctrl1).currentcap=int(dyn_data(ctrl1).capacity*(1-1/popp(56).other))
    if mit_inc=1 and dyn_data(ctrl1).currentcap>vcrewscap then
        if dyn_data(ctrl1).currentcap mod vcrewscap=0 then
            surv_data(ctrl1).vdays=dyn_data(ctrl1).currentcap/vcrewscap
        else
            surv_data(ctrl1).vdays=dyn_data(ctrl1).currentcap\vcrewscap+1
        end if
    else
        surv_data(ctrl1).vdays=1
    end if
    dyn_data(ctrl1).daystocycle=dyn_data(ctrl1).turn_time

```

```

    if dyn_data(ctrl1).ldel_id1<>0 then
        dyn_data(ctrl1).litter_d=1
    end if
    if dyn_data(ctrl1).swd_id1<>0 then
        dyn_data(ctrl1).san=1
    end if
    if dyn_data(ctrl1).lrem_id1<>0 then
        dyn_data(ctrl1).litter_c=1
    end if
end if
end if
if dyn_data(ctrl1).daystocycle=0 and dyn_data(ctrl1).batchdue=1 then
    if surv_data(ctrl1).surv_status<=1 and surv_data(ctrl1).VA=0 then
        if (surv_data(ctrl1).ra=0 and surv_data(ctrl1).ca=0)
        or (surv_data(ctrl1).ra=1 and RAdoc=1 and dyn_data(ctrl1).typeofbirds<>2)
        or (surv_data(ctrl1).ra=1 and RAmove=1 and dyn_data(ctrl1).typeofbirds=2)
        or (surv_data(ctrl1).ca=1 and CAdoc=1 and dyn_data(ctrl1).typeofbirds<>2)
        or (surv_data(ctrl1).ca=1 and CAmove=1 and dyn_data(ctrl1).typeofbirds=2) then
            batchyr=popp(56).other
            dyn_data(ctrl1).turn_time=beta_pert(popp(76).lowv,popp(76).modev,popp(76).highv)

            dyn_data(ctrl1).endofthisbatch=365\batchyr-dyn_data(ctrl1).turn_time

            dyn_data(ctrl1).batchdue=0
            dyn_data(ctrl1).currentcap=dyn_data(ctrl1).capacity
            if mit_inc=1 and dyn_data(ctrl1).currentcap>vcrewschap then
                if dyn_data(ctrl1).currentcap mod vcrewschap=0 then
                    surv_data(ctrl1).vdays=dyn_data(ctrl1).currentcap/vcrewschap
                else
                    surv_data(ctrl1).vdays=dyn_data(ctrl1).currentcap\vcrewschap+1
                end if
            else
                surv_data(ctrl1).vdays=1
            end if
            dyn_data(ctrl1).cycleday=0
            dyn_data(ctrl1).daystofeeddelivery=int(random()*popp(29).other+1)
            if dyn_data(ctrl1).lrem_id1<>0 then
                dyn_data(ctrl1).litterremoval=round(1/6*(dyn_data(ctrl1).turn_time),1)
            end if
        end if
    end if
end if

```

```

end if
if dyn_data(ctrl).swd_id1<>0 then
    dyn_data(ctrl).swd=round(1/2*(dyn_data(ctrl).turn_time),1)
end if

if dyn_data(ctrl).ldel_id1<>0 then
    dyn_data(ctrl).litterdelivery=round(5/6*(dyn_data(ctrl).turn_time),1)
end if

dyn_data(ctrl).litter_c=0
dyn_data(ctrl).san=0
dyn_data(ctrl).litter_d=0

if dyn_data(ctrl).dbc_id<>0 then
'remember record still current in id table
    if dyn_data(ctrl).dbc_id=4 then
        if dyn_data(ctrl).endofthisbatch>popp(78).other then
            dyn_data(ctrl).dead_bird=1
            dyn_data(ctrl).daystodbc=popp(78).other+1
        end if
    else
        if dyn_data(ctrl).endofthisbatch>popp(30).other then
            dyn_data(ctrl).dead_bird=1
            dyn_data(ctrl).daystodbc=popp(30).other+1
        end if
    end if
end if

do case dyn_data(ctrl).typeofbirds
case 1

case 2
    dyn_data(ctrl).vacc_day1=beta_pert(popp(77).lowv,popp(77).modev,popp(77).highv)
    dyn_data(ctrl).vaccinate=1
    if dyn_data(ctrl).vacc_day1>365\popp(56).other then
        dyn_data(ctrl).vacc_day1=dyn_data(ctrl).vacc_day1 mod 365\popp(56).other
    end if
case 3

```



```

    dyn_data(ctrl1).vacc_day1=beta_pert(popp(53).lowv,popp(53).modev,popp(53).highv)
    dyn_data(ctrl1).vaccinate=1
    if dyn_data(ctrl1).vacc_day1>365\popp(56).other then
        dyn_data(ctrl1).vacc_day1=dyn_data(ctrl1).vacc_day1 mod 365\popp(56).other
    end if
case 4
    dyn_data(ctrl1).vacc_day1=beta_pert(popp(53).lowv,popp(53).modev,popp(53).highv)

    dyn_data(ctrl1).vaccinate=1
    if dyn_data(ctrl1).vacc_day1>365\popp(56).other then
        dyn_data(ctrl1).vacc_day1=dyn_data(ctrl1).vacc_day1 mod 365\popp(56).other
    end if
    if random()<=popp(34).other then
        dyn_data(ctrl1).spiking=1
        dyn_data(ctrl1).spikingday=beta_pert(popp(33).lowv,popp(33).modev,popp(33).highv)
        if dyn_data(ctrl1).spikingday>365\popp(42).other then
            dyn_data(ctrl1).spikingday=dyn_data(ctrl1).spikingday mod 365\popp(42).other
        end if
    end if
end case
end if
end if
end if
end if

end sub

sub dutiming

'procedure for depopulating and starting new batches

dim idno,endage,batchyr as smallint

idno=dyn_data(ctrl1).id
if dyn_data(ctrl1).multiaged=0 then
    if dyn_data(ctrl1).populated=1 and dyn_data(ctrl1).endofthisbatch=0 and dyn_data(ctrl1).status<>3 then

        if surv_data(ctrl1).surv_status>1 then
            if dyn_data(ctrl1).overdue=0 then

```

```

        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap
    end if
elseif dyn_data(ctrl).typeofbirds=1 and surv_data(ctrl).ra=1 and RApickup=0 then
    if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap
    end if
elseif dyn_data(ctrl).typeofbirds>1 and surv_data(ctrl).ra=1 and RAslau=0 then
    if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap
    end if
elseif dyn_data(ctrl).typeofbirds=1 and surv_data(ctrl).ca=1 and CApickup=0 then
    if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap
    end if
elseif dyn_data(ctrl).typeofbirds>1 and surv_data(ctrl).ca=1 and CAslau=0 then
    if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap
    end if
else
    dyn_data(ctrl).overdue=0
    dyn_data(ctrl).daysoverdue=0
    dyn_data(ctrl).feed_del=0
    dyn_data(ctrl).dead_bird=0
    dyn_data(ctrl).thin=0
    dyn_data(ctrl).in_lay=0
    dyn_data(ctrl).daystocycle=dyn_data(ctrl).turn_time
    dyn_data(ctrl).populated=0
    dyn_data(ctrl).currentcap=0
    dyn_data(ctrl).report=0
    dyn_data(ctrl).daystillreport=0
    dyn_data(ctrl).become_lat=0
    if dyn_data(ctrl).ldel_id1<>0 then
        dyn_data(ctrl).litter_d=1
    end if
end if

```

```

dyn_data(ctrl).san=1
if dyn_data(ctrl).lrem_id1<>0 then
  dyn_data(ctrl).litter_c=1
end if
if mit_inc=1 then
  surv_data(ctrl).vdays=0
  surv_data(ctrl).dcp=0
  surv_data(ctrl).sp=0
  surv_data(ctrl).surv_status=0
  surv_data(ctrl).vacc_status=0
  surv_data(ctrl).why_vacc=0
  surv_data(ctrl).vdue_day=0
  surv_data(ctrl).daystovaccimm=0
end if
if dyn_data(ctrl).status=0 then
  dyn_data(ctrl).status=5
  newrem1=newrem1+1

elseif dyn_data(ctrl).status=1 then
  dyn_data(ctrl).status=5
  dyn_data(ctrl).fate=0
  dyn_data(ctrl).daysleftlatent=0
  dyn_data(ctrl).daystildead=0
  dyn_data(ctrl).daystilimmune=0
  dyn_data(ctrl).daysleftimmune=0
  newrem4=newrem4+1
elseif dyn_data(ctrl).status=2 then
  dyn_data(ctrl).status=6
  dyn_data(ctrl).fate=0
  dyn_data(ctrl).daysleftlatent=0
  dyn_data(ctrl).daystildead=0
  dyn_data(ctrl).daystilimmune=0
  dyn_data(ctrl).daysleftimmune=0
  dyn_data(ctrl).daysleftcont=beta_pert (disp (19) .lowv, disp (19) .modev, disp (19) .highv)
  disoutputs(ctrl).endinf=dayctr
  disoutputs(ctrl).endstat=6
  disoutputs(ctrl).howend="RDep"
'RDep = routine depopulation
  newcont2=newcont2+1

```

```

elseif dyn_data(ctrl1).status=4 then
  dyn_data(ctrl1).status=5
  dyn_data(ctrl1).fate=0
  dyn_data(ctrl1).daysleftlatent=0
  dyn_data(ctrl1).daystildead=0
  dyn_data(ctrl1).daystilimmune=0
  dyn_data(ctrl1).daysleftimmune=0
  newrem2=newrem2+1
end if
end if
end if
if dyn_data(ctrl1).populated=0 and dyn_data(ctrl1).daystocycle=0 then
  if surv_data(ctrl1).surv_status<=1 and surv_data(ctrl1).VA=0 then
    if (surv_data(ctrl1).ra=0 and surv_data(ctrl1).ca=0)
    or (surv_data(ctrl1).ra=1 and RAdoc=1)
    or (surv_data(ctrl1).ca=1 and CAdoc=1) then

      if dyn_data(ctrl1).typeofbirds=1 then
        dyn_data(ctrl1).endofthisbatch=beta_pert(popp(57).lowv,popp(57).modev,popp(57).highv)
'these default values could eventually be read in from a file
        dyn_data(ctrl1).turn_time=beta_pert(popp(60).lowv,popp(60).modev,popp(60).highv)

      elseif dyn_data(ctrl1).typeofbirds=2 then
        dyn_data(ctrl1).endofthisbatch=beta_pert(popp(58).lowv,popp(58).modev,popp(58).highv)
        dyn_data(ctrl1).turn_time=beta_pert(popp(61).lowv,popp(61).modev,popp(61).highv)

      elseif dyn_data(ctrl1).typeofbirds=3 then
        dyn_data(ctrl1).endofthisbatch=beta_pert(popp(59).lowv,popp(59).modev,popp(59).highv)
        dyn_data(ctrl1).turn_time=beta_pert(popp(62).lowv,popp(62).modev,popp(62).highv)
      end if

      dyn_data(ctrl1).populated=1
      dyn_data(ctrl1).currentcap=dyn_data(ctrl1).capacity
      dyn_data(ctrl1).cycleday=0
      if dyn_data(ctrl1).capacity>vcrewscap then
        if dyn_data(ctrl1).capacity mod vcrewscap=0 then
          surv_data(ctrl1).vdays=dyn_data(ctrl1).capacity/vcrewscap
        else

```

```

        surv_data(ctrl1).vdays=dyn_data(ctrl1).capacity\vcrewscap+1
    end if
else
    surv_data(ctrl1).vdays=1
end if
if dyn_data(ctrl1).feed_source1<>0 then
    dyn_data(ctrl1).feed_del=1
end if
dyn_data(ctrl1).daystofeeddelivery=int(random()*popp(29).other+1)
if dyn_data(ctrl1).lrem_id1<>0 then
    dyn_data(ctrl1).litterremoval=round(1/6*(dyn_data(ctrl1).turn_time),1)
end if
if dyn_data(ctrl1).swd_id1<>0 then
    dyn_data(ctrl1).swd=round(1/2*(dyn_data(ctrl1).turn_time),1)
end if
if dyn_data(ctrl1).ldel_id1<>0 then
    dyn_data(ctrl1).litterdelivery=round(5/6*(dyn_data(ctrl1).turn_time),1)
end if
dyn_data(ctrl1).litter_c=0
dyn_data(ctrl1).san=0
dyn_data(ctrl1).litter_d=0
if dyn_data(ctrl1).dbc_id<>0 then
    if dyn_data(ctrl1).dbc_id=4 then
        if dyn_data(ctrl1).endofthisbatch>popp(78).other then
            dyn_data(ctrl1).dead_bird=1
            dyn_data(ctrl1).daystodbc=popp(78).other+1
        end if
    else
        if dyn_data(ctrl1).endofthisbatch>popp(30).other then
            dyn_data(ctrl1).dead_bird=1
            dyn_data(ctrl1).daystodbc=popp(30).other+1
        end if
    end if
end if
end if

if dyn_data(ctrl1).status=5 then
    dyn_data(ctrl1).status=0
    newsus1=newsus1+1
end if

```

```

elseif dyn_data(ctrl).status=6 then
  dyn_data(ctrl).status=1
  dyn_data(ctrl).inf_day=dayctr
  dyn_data(ctrl).when_inf=0
  redim inflist(ubound(inflist)+1)
  inflist(ubound(inflist)).id=ctrl
  if dyn_data(ctrl).exp_by<>0 then
    dyn_data(dyn_data(ctrl).exp_by).R=dyn_data(dyn_data(ctrl).exp_by).R+1
  end if
  if dyn_data(ctrl).species=3 then
    dyn_data(ctrl).daysleftlatent=uniform(disp(4).lowv,disp(4).highv)
  else
    dyn_data(ctrl).daysleftlatent=uniform(disp(1).lowv,disp(1).highv)
  end if
  newlat2=newlat2+1
end if
end if
end if
end if
elseif dyn_data(ctrl).multiaged=1 then
  if dyn_data(ctrl).batchdue=0 and dyn_data(ctrl).endofthisbatch=0 then
    if surv_data(ctrl).surv_status>1 then
      if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*int(dyn_data(ctrl).capacity*(1/popp(65).other))
      end if
    elseif dyn_data(ctrl).typeofbirds=1 and surv_data(ctrl).ra=1 and RApickup=0 then
      if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*int(dyn_data(ctrl).capacity*(1/popp(65).other))
      end if
    elseif dyn_data(ctrl).typeofbirds>1 and surv_data(ctrl).ra=1 and RAslau=0 then
      if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*int(dyn_data(ctrl).capacity*(1/popp(65).other))
      end if
    elseif dyn_data(ctrl).typeofbirds=1 and surv_data(ctrl).ca=1 and CAPickup=0 then
      if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1

```

```

        costoverdue=costoverdue+compo(ctrl)*int(dyn_data(ctrl).capacity*(1/popp(65).other))
    end if
elseif dyn_data(ctrl).typeofbirds>1 and surv_data(ctrl).ca=1 and CAslau=0 then
    if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*int(dyn_data(ctrl).capacity*(1/popp(65).other))
    end if
else
    dyn_data(ctrl).overdue=0
    dyn_data(ctrl).daysoverdue=0
    dyn_data(ctrl).batchdue=1
    dyn_data(ctrl).currentcap=int(dyn_data(ctrl).capacity*(1-1/popp(65).other))
    if mit_inc=1 and dyn_data(ctrl).currentcap>vcrewscap then
        if dyn_data(ctrl).currentcap mod vcrewscap=0 then
            surv_data(ctrl).vdays=dyn_data(ctrl).currentcap/vcrewscap
        else
            surv_data(ctrl).vdays=dyn_data(ctrl).currentcap\vcrewscap+1
        end if
    else
        surv_data(ctrl).vdays=1
    end if
    dyn_data(ctrl).daystocycle=dyn_data(ctrl).turn_time

    if dyn_data(ctrl).ldel_id1<>0 then
        dyn_data(ctrl).litter_d=1
    end if
    if dyn_data(ctrl).swd_id1<>0 then
        dyn_data(ctrl).san=1
    end if
    if dyn_data(ctrl).lrem_id1<>0 then
        dyn_data(ctrl).litter_c=1
    end if
end if
end if
if dyn_data(ctrl).daystocycle=0 and dyn_data(ctrl).batchdue=1 then
    if surv_data(ctrl).surv_status<=1 and surv_data(ctrl).VA=0 then
        if (surv_data(ctrl).ra=0 and surv_data(ctrl).ca=0)
        or (surv_data(ctrl).ra=1 and RAdoc=1)
        or (surv_data(ctrl).ca=1 and CAdoc=1) then

```

```

batchyr=popp(65).other

dyn_data(ctrl).turn_time=beta_pert(popp(64).lowv,popp(64).modev,popp(64).highv)

dyn_data(ctrl).endofthisbatch=365\batchyr-dyn_data(ctrl).turn_time

dyn_data(ctrl).batchdue=0
dyn_data(ctrl).currentcap=dyn_data(ctrl).capacity
if mit_inc=1 and dyn_data(ctrl).currentcap>vcrewschap then
  if dyn_data(ctrl).currentcap mod vcrewschap=0 then
    surv_data(ctrl).vdays=dyn_data(ctrl).currentcap/vcrewschap
  else
    surv_data(ctrl).vdays=dyn_data(ctrl).currentcap\vcrewschap+1
  end if
else
  surv_data(ctrl).vdays=1
end if
dyn_data(ctrl).cycleday=0
dyn_data(ctrl).daystofeeddelivery=int(random()*popp(29).other+1)

if dyn_data(ctrl).lrem_id1<>0 then
  dyn_data(ctrl).litterremoval=round(1/6*(dyn_data(ctrl).turn_time),1)
end if
if dyn_data(ctrl).swd_id1<>0 then
  dyn_data(ctrl).swd=round(1/2*(dyn_data(ctrl).turn_time),1)
end if
if dyn_data(ctrl).ldel_id1<>0 then
  dyn_data(ctrl).litterdelivery=round(5/6*(dyn_data(ctrl).turn_time),1)
end if

dyn_data(ctrl).litter_c=0
dyn_data(ctrl).san=0
dyn_data(ctrl).litter_d=0

if dyn_data(ctrl).dbc_id<>0 then
'remember record still current in id table
  if dyn_data(ctrl).dbc_id=4 then

```



```

        if dyn_data(ctrl1).endofthisbatch>popp(78).other then
            dyn_data(ctrl1).dead_bird=1
            dyn_data(ctrl1).daystodbc=popp(78).other+1
        end if
    else
        if dyn_data(ctrl1).endofthisbatch>popp(30).other then
            dyn_data(ctrl1).dead_bird=1
            dyn_data(ctrl1).daystodbc=popp(30).other+1
        end if
    end if
end if
end if
end if
end if
end sub

```

```

sub tutiming
'procedure for depopulating and starting new batches

dim idno, batchyr as smallint

idno=dyn_data(ctrl1).id
if dyn_data(ctrl1).multiaged=0 then
    if dyn_data(ctrl1).populated=1 and dyn_data(ctrl1).endofthisbatch=0 and dyn_data(ctrl1).status<>3 then
        if surv_data(ctrl1).surv_status>1 then
            if dyn_data(ctrl1).overdue=0 then
                dyn_data(ctrl1).overdue=1
                costoverdue=costoverdue+compo(ctrl1)*dyn_data(ctrl1).currentcap
            end if
        elseif (surv_data(ctrl1).ra=1 and RAslau=0 and dyn_data(ctrl1).typeofbirds>1) then
            if dyn_data(ctrl1).overdue=0 then
                dyn_data(ctrl1).overdue=1
                costoverdue=costoverdue+compo(ctrl1)*dyn_data(ctrl1).currentcap
            end if
        elseif (surv_data(ctrl1).ra=1 and RAPickup=0 and dyn_data(ctrl1).typeofbirds=1) then
            if dyn_data(ctrl1).overdue=0 then
                dyn_data(ctrl1).overdue=1
            end if
        end if
    end if
end sub

```

```

        costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap
    end if
elseif (surv_data(ctrl).ca=1 and CAslau=0 and dyn_data(ctrl).typeofbirds>1) then
    if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap
    end if
elseif (surv_data(ctrl).ca=1 and CAPickup=0 and dyn_data(ctrl).typeofbirds=1) then
    if dyn_data(ctrl).overdue=0 then
        dyn_data(ctrl).overdue=1
        costoverdue=costoverdue+compo(ctrl)*dyn_data(ctrl).currentcap
    end if
else
    dyn_data(ctrl).overdue=0
    dyn_data(ctrl).daysoverdue=0
    dyn_data(ctrl).populated=0
    dyn_data(ctrl).currentcap=0
    dyn_data(ctrl).report=0
    dyn_data(ctrl).daystillreport=0
    dyn_data(ctrl).become_lat=0
    dyn_data(ctrl).feed_del=0
    dyn_data(ctrl).dead_bird=0
    dyn_data(ctrl).thin=0
    dyn_data(ctrl).in_lay=0
    dyn_data(ctrl).daystocycle=dyn_data(ctrl).turn_time
    if dyn_data(ctrl).ldel_id1<>0 then
        dyn_data(ctrl).litter_d=1
    end if
    dyn_data(ctrl).san=1
    if dyn_data(ctrl).lrem_id1<>0 then
        dyn_data(ctrl).litter_c=1
    end if
    if mit_inc=1 then
        surv_data(ctrl).vdays=0
        surv_data(ctrl).dcp=0
        surv_data(ctrl).sp=0
        surv_data(ctrl).surv_status=0
        surv_data(ctrl).vacc_status=0
        surv_data(ctrl).why_vacc=0
    end if
end if

```

```

        surv_data(ctrl).vdue_day=0
        surv_data(ctrl).daystovaccimm=0
    end if

    if dyn_data(ctrl).status=0 then
        dyn_data(ctrl).status=5
        newrem1=newrem1+1
    elseif dyn_data(ctrl).status=1 then
        dyn_data(ctrl).status=5
        dyn_data(ctrl).fate=0
        dyn_data(ctrl).daysleftlatent=0
        dyn_data(ctrl).daystildead=0
        dyn_data(ctrl).daystilimmune=0
        dyn_data(ctrl).daysleftimmune=0
        newrem4=newrem4+1
    elseif dyn_data(ctrl).status=2 then
        dyn_data(ctrl).status=6
        dyn_data(ctrl).fate=0
        dyn_data(ctrl).daysleftlatent=0
        dyn_data(ctrl).daystildead=0
        dyn_data(ctrl).daystilimmune=0
        dyn_data(ctrl).daysleftimmune=0
        dyn_data(ctrl).daysleftcont=beta_pert (disp(19).lowv, disp(19).modev, disp(19).highv)

        disoutputs(ctrl).endinf=dayctr
        disoutputs(ctrl).endstat=6
        disoutputs(ctrl).howend="RDep"
'RDep = routine depopulation

        newcont2=newcont2+1

    elseif dyn_data(ctrl).status=4 then
        dyn_data(ctrl).status=5
        dyn_data(ctrl).fate=0
        dyn_data(ctrl).daysleftlatent=0
        dyn_data(ctrl).daystildead=0
        dyn_data(ctrl).daystilimmune=0
        dyn_data(ctrl).daysleftimmune=0
        newrem2=newrem2+1

```

```

        end if
    end if
end if
if dyn_data(ctrl1).populated=0 and dyn_data(ctrl1).daystocycle=0 then
    if surv_data(ctrl1).surv_status<=1 and surv_data(ctrl1).VA=0 then
        if (surv_data(ctrl1).ra=0 and surv_data(ctrl1).ca=0)
        or (surv_data(ctrl1).ra=1 and RAdoc=1)
        or (surv_data(ctrl1).ca=1 and CAdoc=1) then
            if dyn_data(ctrl1).typeofbirds=1 then
                dyn_data(ctrl1).endofthisbatch=beta_pert(popp(66).lowv,popp(66).modev,popp(66).highv)
                'these default values could eventually be read in from a file
                dyn_data(ctrl1).turn_time=beta_pert(popp(69).lowv,popp(69).modev,popp(69).highv)
                dyn_data(ctrl1).thin=1
                dyn_data(ctrl1).thinning1=beta_pert(popp(72).lowv,popp(72).modev,popp(72).highv)
                dyn_data(ctrl1).thinning2=dyn_data(ctrl1).endofthisbatch
            elseif dyn_data(ctrl1).typeofbirds=2 then
                dyn_data(ctrl1).endofthisbatch=beta_pert(popp(67).lowv,popp(67).modev,popp(67).highv)
                dyn_data(ctrl1).turn_time=beta_pert(popp(70).lowv,popp(70).modev,popp(70).highv)

                elseif dyn_data(ctrl1).typeofbirds=3 then
                    dyn_data(ctrl1).endofthisbatch=beta_pert(popp(68).lowv,popp(68).modev,popp(68).highv)
                    dyn_data(ctrl1).turn_time=beta_pert(popp(71).lowv,popp(71).modev,popp(71).highv)
                end if

                dyn_data(ctrl1).populated=1
                dyn_data(ctrl1).currentcap=dyn_data(ctrl1).capacity
                dyn_data(ctrl1).cycleday=0
                if mit_inc=1 and dyn_data(ctrl1).currentcap>vcrewscap then
                    if dyn_data(ctrl1).currentcap mod vcrewscap=0 then
                        surv_data(ctrl1).vdays=dyn_data(ctrl1).currentcap/vcrewscap
                    else
                        surv_data(ctrl1).vdays=dyn_data(ctrl1).currentcap\vcrewscap+1
                    end if
                else
                    surv_data(ctrl1).vdays=1
                end if
                if dyn_data(ctrl1).feed_source1<>0 then
                    dyn_data(ctrl1).feed_del=1
                end if
            end if

```

```

dyn_data(ctrl1).daystofeeddelivery=int(random()*popp(29).other+1)

if dyn_data(ctrl1).lrem_id1<>0 then
    dyn_data(ctrl1).litterremoval=round(1/6*(dyn_data(ctrl1).turn_time),1)
end if
if dyn_data(ctrl1).swd_id1<>0 then
    dyn_data(ctrl1).swd=round(1/2*(dyn_data(ctrl1).turn_time),1)
end if
if dyn_data(ctrl1).ldel_id1<>0 then
    dyn_data(ctrl1).litterdelivery=round(5/6*(dyn_data(ctrl1).turn_time),1)
end if

if dyn_data(ctrl1).dbc_id<>0 then
    if dyn_data(ctrl1).dbc_id=4 then
        if dyn_data(ctrl1).endofthisbatch>popp(78).other then
            dyn_data(ctrl1).dead_bird=1
            dyn_data(ctrl1).daystodbc=popp(78).other+1
        end if
    else
        if dyn_data(ctrl1).endofthisbatch>popp(30).other then
            dyn_data(ctrl1).dead_bird=1
            dyn_data(ctrl1).daystodbc=popp(30).other+1
        end if
    end if
end if

if dyn_data(ctrl1).status=5 then
    dyn_data(ctrl1).status=0
    newsus1=newsus1+1

elseif dyn_data(ctrl1).status=6 then
    dyn_data(ctrl1).status=1
    dyn_data(ctrl1).inf_day=dayctr
    dyn_data(ctrl1).when inf=0
    redim inflist(ubound(inflist)+1)
    inflist(ubound(inflist)).id=ctrl1
    if dyn_data(ctrl1).exp_by<>0 then 'if not initially contaminated
        dyn_data(dyn_data(ctrl1).exp_by).R=dyn_data(dyn_data(ctrl1).exp_by).R+1
    end if
end if

```

```

        end if
        if dyn_data(ctrl1).species=3 then
            dyn_data(ctrl1).daysleftlatent=uniform(dispatch(4).lowv,dispatch(4).highv)
        else
            dyn_data(ctrl1).daysleftlatent=uniform(dispatch(1).lowv,dispatch(1).highv)
        end if
        newlat2=newlat2+1
    end if
end if
end if
end if
elseif dyn_data(ctrl1).multiaged=1 then
    if dyn_data(ctrl1).batchdue=0 and dyn_data(ctrl1).endofthisbatch=0 then
        if surv_data(ctrl1).surv_status>1 then
            elseif (surv_data(ctrl1).ra=1 and RAslau=0 and dyn_data(ctrl1).typeofbirds>1) then
                if dyn_data(ctrl1).overdue=0 then
                    dyn_data(ctrl1).overdue=1
                    costoverdue=costoverdue+compo(ctrl1)*int(dyn_data(ctrl1).capacity*(1/popp(75).other))
                end if
            elseif (surv_data(ctrl1).ra=1 and RApickup=0 and dyn_data(ctrl1).typeofbirds=1) then
                if dyn_data(ctrl1).overdue=0 then
                    dyn_data(ctrl1).overdue=1
                    costoverdue=costoverdue+compo(ctrl1)*int(dyn_data(ctrl1).capacity*(1/popp(75).other))
                end if
            elseif (surv_data(ctrl1).ca=1 and CAslau=0 and dyn_data(ctrl1).typeofbirds>1) then
                if dyn_data(ctrl1).overdue=0 then
                    dyn_data(ctrl1).overdue=1
                    costoverdue=costoverdue+compo(ctrl1)*int(dyn_data(ctrl1).capacity*(1/popp(75).other))
                end if
            elseif (surv_data(ctrl1).ca=1 and CAPickup=0 and dyn_data(ctrl1).typeofbirds=1) then
                if dyn_data(ctrl1).overdue=0 then
                    dyn_data(ctrl1).overdue=1
                    costoverdue=costoverdue+compo(ctrl1)*int(dyn_data(ctrl1).capacity*(1/popp(75).other))
                end if
            else
                dyn_data(ctrl1).overdue=0
                dyn_data(ctrl1).daysoverdue=0
                dyn_data(ctrl1).batchdue=1
                dyn_data(ctrl1).currentcap=int(dyn_data(ctrl1).capacity*(1-1/popp(75).other))
            end if
        end if
    end if
end if

```

```

dyn_data(ctrl1).daystocycle=dyn_data(ctrl1).turn_time
  if mit_inc=1 and dyn_data(ctrl1).currentcap>vcrewscap then
    if dyn_data(ctrl1).currentcap mod vcrewscap=0 then
      surv_data(ctrl1).vdays=dyn_data(ctrl1).currentcap/vcrewscap
    else
      surv_data(ctrl1).vdays=dyn_data(ctrl1).currentcap\vcrewscap+1
    end if
  else
    surv_data(ctrl1).vdays=1
  end if
if dyn_data(ctrl1).ldel_id1<>0 then
  dyn_data(ctrl1).litter_d=1
end if
if dyn_data(ctrl1).swd_id1<>0 then
  dyn_data(ctrl1).san=1
end if
if dyn_data(ctrl1).lrem_id1<>0 then
  dyn_data(ctrl1).litter_c=1
end if
end if
if dyn_data(ctrl1).daystocycle=0 and dyn_data(ctrl1).batchdue=1 then
  if surv_data(ctrl1).surv_status<=1 and surv_data(ctrl1).VA=0 then
    if (surv_data(ctrl1).ra=0 and surv_data(ctrl1).ca=0)
    or (surv_data(ctrl1).ra=1 and RAdoc=1)
    or (surv_data(ctrl1).ca=1 and CAdoc=1) then
      batchyr=popp(75).other

      dyn_data(ctrl1).turn_time=beta_pert(popp(74).lowv,popp(74).modev,popp(74).highv)
      dyn_data(ctrl1).endofthisbatch=365\batchyr-dyn_data(ctrl1).turn_time

      dyn_data(ctrl1).batchdue=0
      dyn_data(ctrl1).currentcap=dyn_data(ctrl1).capacity
      if mit_inc=1 and dyn_data(ctrl1).currentcap>vcrewscap then
        if dyn_data(ctrl1).currentcap mod vcrewscap=0 then
          surv_data(ctrl1).vdays=dyn_data(ctrl1).currentcap/vcrewscap
        else
          surv_data(ctrl1).vdays=dyn_data(ctrl1).currentcap\vcrewscap+1
        end if
      end if
    end if
  end if
end if

```

```

else
  surv_data(ctrl1).vdays=1
end if
dyn_data(ctrl1).cycleday=0
dyn_data(ctrl1).daystofeeddelivery=int(random()*popp(29).other+1)

if dyn_data(ctrl1).lrem_id1<>0 then
  dyn_data(ctrl1).litterremoval=round(1/6*(dyn_data(ctrl1).turn_time),1)
end if
if dyn_data(ctrl1).swd_id1<>0 then
  dyn_data(ctrl1).swd=round(1/2*(dyn_data(ctrl1).turn_time),1)
end if
if dyn_data(ctrl1).ldel_id1<>0 then
  dyn_data(ctrl1).litterdelivery=round(5/6*(dyn_data(ctrl1).turn_time),1)
end if

dyn_data(ctrl1).litter_c=0
dyn_data(ctrl1).san=0
dyn_data(ctrl1).litter_d=0

if dyn_data(ctrl1).dbc_id<>0 then
  if dyn_data(ctrl1).dbc_id=4 then
    if dyn_data(ctrl1).endofthisbatch>popp(78).other then
      dyn_data(ctrl1).dead_bird=1
      dyn_data(ctrl1).daystodbc=popp(78).other+1
    end if
  else
    if dyn_data(ctrl1).endofthisbatch>popp(30).other then
      dyn_data(ctrl1).dead_bird=1
      dyn_data(ctrl1).daystodbc=popp(30).other+1
    end if
  end if
end if
end if
end if
end if
end if
end if
end sub

```