University of Nebraska - Lincoln
DigitalCommons@University of Nebraska - Lincoln

Wildlife Damage Management Conferences -- Proceedings | Wildlife Damage Management, Internet Center for

10-5-2000

Coding spreadsheets for intervention decisions in wildlife damage management

Ray T. Sterner
USDA, APHIS, National Wildlife Research Center, Fort Collins, CO

H. Nicole Lorimer
USDA, APHIS, National Wildlife Research Center, Fort Collins, CO

Follow this and additional works at: http://digitalcommons.unl.edu/icwdm_wdmconfproc

Part of the Environmental Sciences Commons

Sterner, Ray T. and Lorimer, H. Nicole, "Coding spreadsheets for intervention decisions in wildlife damage management" (2000). *Wildlife Damage Management Conferences -- Proceedings.* Paper 22.
http://digitalcommons.unl.edu/icwdm_wdmconfproc/22

This Article is brought to you for free and open access by the Wildlife Damage Management, Internet Center for at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Wildlife Damage Management Conferences -- Proceedings by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Technical Session

Origins, Innovations, And Futures Of Wildlife Damage Management

For more information please visit http://wildlifedamage.unl.edu

The Ninth Wildlife Damage Management Conference Proceedings. Edited by Margaret C. Brittingham, Jonathan Kays and Rebecka McPeake. Oct 5-8, 2000 State College, PA USA

Coding spreadsheets for intervention decisions in wildlife damage management

Ray T. Sterner, U.S. Department of Agriculture, Animal and Plant Health Inspection Service, National Wildlife Research Center, 4101 LaPorte Avenue, Fort Collins, Colorado 80521-2154, USA

H. Nicole Lorimer, U.S. Department of Agriculture, Animal and Plant Health Inspection Service, National Wildlife Research Center, 4101 LaPorte Avenue, Fort Collins, Colorado 80521-2154, USA

Abstract: Sterner (In press) described the use of *a priori*, theoretical analyses of crop/resource savings and benefit:cost ratios as a way of making intervention decisions in wildlife damage management. Iterative (1-variable-changed-at-a-time) calculations of these economic indices were computed for the use of zinc phosphide baits to control vole *{Microtus spp.)* populations in alfalfa *(Medicago sativa).* Results showed that indices displayed transitive effects — greater net savings and benefit:cost ratios were related to larger field-size, crop-damage and bait-effectiveness variables, but smaller bait-application fees. Ratios varied between 0.40 and 6.45, with -5-10% vole-caused damage required to produce returns on investments equal to the costs of control (benefit:cost ratio = 1.0). This paper presents the detailed Lotus® 1-2-3®, 9.5 code used to derive the results of Sterner (In press). Adaptation of the code to the study of other wildlife damage management problems is straightforward.

Key words: alfalfa, computers, economics, rodenticide, spreadsheets, wildlife damage, voles

Computer spreadsheet software (e.g., Lotus® 1-2-3®, Microsoft Excel®) makes iterative calculations of potential net crop savings and benefit:cost ratios relatively easy. This software is widely available to most farmers, ranchers and wildlife professionals. Plots of the response surfaces for indices involving varied crop-damage, management-effectiveness and application-cost variables, with 1 variable changed per calculation, afford useful decision-making aids for wildlife professionals — the charts indicate combinations of these variables related to recovery/non-recovery of the monetary outlays associated with wildlife damage management activities (Sterner In press).

This paper provides the spreadsheet code used by Sterner (In press) to derive potential net savings and benefit:cost ratios associated with the use of the acute rodenticide zinc phosphide (Zn_3P_2, CAS # 1314-84-7) to control vole *{Microtus spp.)* populations and damage in alfalfa *{Medicago sativa).* The code will prove useful to wildlife professionals interested in the economic bases of intervention decisions in wildlife damage management, as well as to beginning coders of spreadsheets.

Methods

Sterner (In press) computed iterative

For more information please visit http://wildlifedamage.unl.edu

potential net crop savings and benefit:cost ratios associated with broadcasting Zn_3P_2 oat groat baits to control voles in alfalfa. Calculations were derived for all combinations of 3 field-size (64.8, 129.6 and 259.2 ha), 6 crop-loss (5, 10,…30%), 7 bait-effectiveness (0.70, 0.75,...1.00) and 10 application-fee variables (US $1, $2,...$10/ha). Average 1998 alfalfa yield and price data (7.77 Mton/ha and US $100.33/Mton; U.S. Department of Agriculture 1999) were used to value crop savings and benefit:cost ratios; whereas, commercial placebo and rodenticide bait costs ($0.42/kg and $2.73/kg) applied at 11.2 kg/ha were used to determine product costs (B. L. Hosman, Personal Communication, 1997). The computed indices were plotted as 3-dimensional graphical displays to show the respective response surfaces.

Formulas

Five formulas were involved in the calculations of Sterner (2000):

(1) Maximum Crop Value (US$) = [Yield (Unit/ha) • Price (US$/unit) • Area (ha)].

(2) Maximum Potential Crop Saving (US$) = [Maximum Alfalfa Value (US$) • Vole-caused Damage (%)].

(3) Application Cost (US$) = {[Area (ha) • Personnel Rate (US$/ha)] + [Area (ha) • Materials (US$/kg/ha)]}.

(4) Potential Net Saving (US$) = {[Maximum Potential Alfalfa Saving (US$) • Method Effectiveness (decimal)] - [Application Cost(US$)]}.

(5) Benefit:Cost Ratio = {[Potential Alfalfa Saving (US$) ÷ Application Cost (US$)] +1}.

Essentially, maximum potential crop saving was considered that portion of the maximum crop value which was projected to be damaged by voles. Potential net saving was viewed as the difference between this maximum potential crop saving and the cost of applying the damage-management technique adjusted for effectiveness — the damage intervention. Application cost involved both fixed product charges (i.e., rodenticide baits) and labor; each calculation of potential net saving was specific to the product outlays plus a designated labor charge. A typical, registered, broadcast rate for Zn_3P_2 oat groat baits is 11.2 kg/ha (see Sterner 1994; Sterner et al. 1996); application fees were then altered systematically ($l-10/ha) to determine the effects of fee structure upon potential net savings and benefit:cost ratios. Finally, this output was adjusted systematically based on the expected bait effectiveness (i.e., decimal value of the portion of crop projected as saved in the future).

Regarding the economic indices (i.e., potential net saving and benefit:cost ratio), potential net saving is a direct index of monetary valuations to be gained by the wildlife management intervention; however, this index is dependent upon field size. Conversely, the benefit:cost ratio provides a relative index of saving that is unaffected by field size, with a ratio of 1.0 reflecting equivalent expenses and crop savings for the pre- and rodenticide-bait application.

Software

Lotus® 1-2-3®, 9.5 software (Lotus Development, Cambridge, MA) was used to perform the iterative calculations of net savings and benefit:cost ratios.

For more information please visit http://wildlifedamage.unl.edu

Spreadsheet design

The computations involved 2 spreadsheets: Explanations Sheet and Potential Crop Savings Sheet (see Aitken 1997; Catapult, Inc. 1999).

The Explanations Sheet provided detailed variable, formula, value and range name descriptions (see Figure 1). This sheet was used to document the spreadsheet calculations; it was not essential to performing the iterative calculations of the economic indices — the Potential Crop Saving Sheet would suffice for all calculations, assuming that economic formulas were accurately derived using appropriate cell codes. Still, for current purposes, computations were initiated for a specific field size and vole-caused damage value of the Potential Crop Savings Sheet using the "range name" values supplied for FIELDSIZE and VCD (Cells D4 and D6) on the Explanations Sheet.

The Potential Crop Savings Sheet provided actual calculations for a specific field size and vole-caused-damage variable (see Fig. 2). Separate runs of the spreadsheet were required for each field size (i.e., 64.8, 129.2 and 292.6 ha) and selected vole-caused potential crop saving, application cost, potential net saving and benefit:cost ratio provided for 10 specific application fee (i.e., pre- and Zn_3P_2-baits plus personnel rates of $1, $2, $3, $4, $5, $6, $7, $8, $9 and $10/) beneath 7 separate bait-effectiveness conditions (i.e., 1.00, 0.95, 0.90, 0.85, 0.80, 0.75 and 0.70).

Code - explanations sheet

Figure 1 presents the detailed 13 row x 4 column composition of the Explanations Sheet. Rows 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13 document Potential Crop Value (PCV), Field Size (FIELDSIZE), Potential Crop Loss (PCL), Vole-caused Damage (VCD), 1998 Yield (7.77), 1998 Price ($100.33), Application Cost (AC), Net Crop Saving (NCS), Benefit:Cost Ratio (BCR), Broadcast Labor (Labor), Bait Effectiveness (BE) and Cost of Bait (COB) information, respectively; whereas, Row 1 designates the Column A (Variable), B (Formula), C (Value), and D (Range Name) header for each row category, respectively (e.g., Cells A2, B2, C2 and D2 present Variable, Formula, Value, and Range data for PCV). Important Lotus® 1-2-3® code for the economic analysis is contained in the cells of Column C — the computed values and computational codes for the Range Name variables (Column D) are displayed in respective cells of this column.

It should be noted that these values and cell contents provide output for a 64.8 ha field having 5% vole-caused loss with a bait effectiveness of 1.00 and a $1.00/ha labor cost; iterative calculations of the remaining bait effectiveness (i.e., 0.95, 0.90...0.70) and broadcast labor fees (i.e., $2, $3,...$10/ha) require use of the Potential Crop Savings Sheet. Separate "runs" of the spreadsheet are then required to obtain net savings and benefit:cost estimates for altered field sizes (ha) or altered vole-caused damages (%).

For more information please visit http://wildlifedamage.unl.edu

Figure 1. Actual printout of Lotus® 1-2-3 explanation spreadsheet.

Variable	Formula	Value	Range Name	
Potential Crop Value (US$)	[1998 Yield (7.77 Mton per ha) x 1998 Price ($100.33 per Mton) x Field Size (ha)]	$50,515.75	PCV	
Field Size		64.8	FieldSize	*
Potential Crop Loss (US$)	[Potential Crop Value x Vole-caused Damage]	$2,525.79	PCL	
Vole-caused Damage (%)		5.00%	VCD	*
1998 Yield		7.77	1998Yield	*
1998 Price		$100.33	1998Price	*
Application Cost (100% & $l/ha)	{[Field Size (ha) x Broadcast Labor (US$/ha)] + [(Field Size (ha) x $.42 Placebo Bait (kg) x 11.2 (kg/ha] + [Field Size (ha) x $2.73 Zn3P2 Bait (kg) x 11.2 kg/ha]}	$2,350.94	AC	
Net Crop Saving (100% & $1/ha)	[Potential Crop Loss (US$) x Bait Effectiveness (dec)] - [Application Cost (US$)]	$174.84	NCS	
Benefit:cost Ratio (100% & $l/ha)	[Net Crop Saving/Application Cost]+1	1.0744	BCR	**
Broadcast Labor ($/ha)		$1	Labor	**
Bait Effectiveness (decimal)		1.00	BE	**
Cost of Bait (Placebo & Zn3P2)	[(Field Size (ha) x $.42 (kg) Placebo Bait x 11.2 kg/ha] + [Field Size (ha) x $2.73 (kg) Zn3P2 Bait x 11.2 kg/ha]	$2,286.14	COB	

* Entries used in basic calculations.
**These entries represent single, default calculations for $1/ha Broadcast fee and 1.0 bait Effectiveness.

The following is the code for the respective "values" contained in these cells:

PCV ($50,515.75): +FIELDSIZE*$1998 PRICE* 1998 YIELD
FIELDSIZE (64.8): 64.8
PCL ($2,525.79): +$PCV*$VCD
VCD (5%): 1998 5
Yield (7.77): 1998 7.77
Price ($100.33): 100.33
AC ($2,350.94): +FIELDSIZE*l+(FIELDSIZE*0.42*11.2)+(FIELDSIZE*2.73*l 1.2)
NCS ($174.84): (PCL-AC)
BCR (1.0744): (NCS/AQ+1
Labor ($1): 1
BE (1.00): 1.00
COB ($2,286.14): ($FIELDSIZE*0.42* 11.2)+($FIELDSIZE* 2.73*11.2)

For more information please visit http://wildlifedamage.unl.edu

Code - potential crop saving sheet

The Potential Crop Savings Sheet is configured as 81 rows x 6 columns (Columns B through G); a printout of this sheet for 1 "run" of the calculations involving a specified FIELDSIZE (64.8 ha) and VCD (5%) variable is presented in Figure 2. As shown, this spreadsheet consists of 7 iterative sets of Maximum Saving, Application Costs, Net Savings, and BemCost (i.e., benefit:cost) computations, with Effectiveness (i.e., bait effectiveness of 1.00,0.95,0.90...0.70) altered sequentially (top to bottom of page) and broadcast labor fees (i.e., $1, $2, $3,...$10/ha) inserted in sequential sets of 10 rows each beneath the respective Effectiveness value in Column C.

More specifically, Row 1 contains the title (i.e., Potential Crop Savings; cells 2B-C), Row 3 lists the FIELDSIZE variable (Cells 3B-C), and Row 4 lists the VCD variable (Cells 5B-C). Each bait effectiveness projection (Effectiveness:) is hard coded into Cells C5, C16, C27, C38, C49, C60, andC71, respectively. Broadcast-labor-fee variables ($1, $2,...$10/ha) for calculations involving each bait effectiveness (1.0, 0.95,...0.70) variable are then listed vertically in Cells C6-C15, C17-C26, C28-C37, C39-C48, C50-C59, C61-C70 and C72-C81, respectively. The resultant Maximum Saving, Application Costs, Net Savings, and Ben:Cost (benefit: cost) indices derived from the calculations using each variable are output in the corresponding cells of Columns D, E, F, and G, respectively, with the exception that Maximum Saving is listed only once and used repeatedly for each Net Savings and Ben:Cost index. Not surprisingly, Application Costs associated with respective broadcast labor fees are the same, but subsequent sets of net savings, and benefit:cost indices (Ben:Cost) decrease because the Maximum Saving is decreased as bait effectiveness is decreased.

Regarding spreadsheet function, left-clicking the mouse button on specific cells of Column C allows the actual code for the computation formula to be viewed and edited during spreadsheet use; selecting PRINT PREVIEW & PAGE SETUP - INCLUDE - FORMULAS causes the entire code for the spreadsheet to be printed (see Appendix A). Consider the code for the 1.00 bait-effectiveness projection (64.8 ha field and 5% vole-caused damage). Maximum saving (Cell D6) is computed as ((PCV)*(VCD)*C5) or (($50,515.75*0.05)* 1.0) or $2,525.79; this is equivalent to stating that the future yield for this hypothetical *5%* loss of alfalfa is assumed to be saved (Effectiveness = 1.00, Cell C5) - the completely effective baiting program will prevent 25.17 Mton of damaged alfalfa. The initial Application Cost value (Cell E6) is simply the AC value computed on the Explanation Sheet (see Figure 1; AC = $2,350.94).

That is, for the case involving a $ 1.00/ha broadcast fee for the baiting program (i.e., this includes both pre- and Zn_3P_2-bait broadcasts), this AC is the Cost of Bait (i.e., COB = $2,286.14) plus the $64.80 required to broadcast both pre- and Zn_3P_2-bait at the $1.00/ha broadcast-fee rate. Subsequent AC values then increment at a constant $64.80 as $ 1.00/ha increases are added to the broadcast fee structure (i.e., Cells E7 = $2,415.74, E8 = $2,480.54, etc.). As shown, these application costs are fixed and redundant for each of $1-10$/ha broadcast-fee charges in each of the iterative sets of calculations. Entries for Net Savings reflect simply the respective differences between Maximum Saving and

For more information please visit http://wildlifedamage.unl.edu

Figure 2. Actual print out of the Lotus® 1-2-3® Potential Crop Savings spreadsheet (i.e., Field Size = 64.8 ha; Damage = 5%; Effectiveness = 1.00, 0.95...0.70).

POTENTIAL CROP SAVINGS

Field Size: 64.8

Projected Damage: 5%

Effectiveness: 1.00

Labor Fee	Maximum Saving	Application Costs	Net Savings	Ben:Cost
$1.00	$2,525.79	$2,350.94	$174.84	1.0743717
$2.00		$2,415.74	$110.04	1.0455527
$3.00		$2,480.54	$45.24	1.0182394
$4.00		$2,545.34	($19.56)	0.9923168
$5.00		$2,610.14	($84.36)	0.9676814
$6.00		$2,674.94	($149.16)	0.9442395
$7.00		$2,739.74	($213.96)	0.9219065
$8.00		$2,804.54	($278.76)	0.9006055
$9.00		$2,869.34	($343.56)	0.8802666
$10.00		$2,934.14	($408.36)	0.8608261

Effectiveness: 0.95

Labor Fee:	Maximum Saving	Application Costs	Net Savings	Ben:Cost
$1.00	$2,399.50	$2,350.94	$48.55	1.0206531
$2.00		$2,415.74	($16.25)	0.9932751
$3.00		$2,480.54	($81.05)	0.9673274
$4.00		$2,545.34	($145.85)	0.942701
$5.00		$2,610.14	($210.65)	0.9192973
$6.00		$2,674.94	($275.45)	0.8970275
$7.00		$2,739.74	($340.25)	0.8758111
$8.00		$2,804.54	($405.05)	0.8555752
$9.00		$2,869.34	($469.85)	0.8362533
$10.00		$2,934.14	($534.65)	0.8177848

Effectiveness: 0.90

Labor Fee:	Maximum Saving	Application Costs	Net Savings	Ben:Cost
$1.00	$2,273.21	$2,350.94	($77.74)	0.9669345
$2.00		$2,415.74	($142.54)	0.9409974
$3.00		$2,480.54	($207.34)	0.9164155
$4.00		$2,545.34	($272.14)	0.8930851
$5.00		$2,610.14	($336.94)	0.8709132
$6.00		$2,674.94	($401.74)	0.8498155
$7.00		$2,739.74	($466.54)	0.8297158
$8.00		$2,804.54	($531.34)	0.8105449
$9.00		$2,869.34	($596.14)	0.7922399
$10.00		$2,934.14	($660.94)	0.7747435

Effectiveness: 0.85

Labor Fee:	Maximum Saving	Application Costs	Net Savings	Ben:Cost
$1.00	$2,146.92	$2,350.94	($204.02)	0.9132159
$2.00		$2,415.74	($268.82)	0.8887198
$3.00		$2,480.54	($333.62)	0.8655035
$4.00		$2,545.34	($398.42)	0.8434693
$5.00		$2,610.14	($463.22)	0.8225292
$6.00		$2,674.94	($528.02)	0.8026035

$7.00		$2,739.74	($592.82)	0.7836205
$8.00		$2,804.54	($657.62)	0.7655147
$9.00		$2,869.34	($722.42)	0.7482266
$10.00		$2,934.14	($787.22)	0.7317022

Effectiveness: 0.80

Labor Fee:	Maximum Saving	Application Costs	Net Savings	Ben:Cost
$1.00	$2,020.63	$2,350.94	($330.31)	0.8594974
$2.00		$2,415.74	($395.11)	0.8364422
$3.00		$2,480.54	($459.91)	0.8145915
$4.00		$2,545.34	($524.71)	0.7938535
$5.00		$2,610.14	($589.51)	0.7741451
$6.00		$2,674.94	($654.31)	0.7553916
$7.00		$2,739.74	($719.11)	0.7375252
$8.00		$2,804.54	($783.91)	0.7204844
$9.00		$2,869.34	($848.71)	0.7042133
$10.00		$2,934.14	($913.51)	0.6886609

Effectiveness: 0.75

Labor Fee:	Maximum Saving	Application Costs	Net Savings	Ben:Cost
$1.00	$1,894.34	$2,350.94	($456.60)	0.8057788
$2.00		$2,415.74	($521.40)	0.7841645
$3.00		$2,480.54	($586.20)	0.7636796
$4.00		$2,545.34	($651.00)	0.7442376
$5.00		$2,610.14	($715.80)	0.725761
$6.00		$2,674.94	($780.60)	0.7081796
$7.00		$2,739.74	($845.40)	0.6914298
$8.00		$2,804.54	($910.20)	0.6754541
$9.00		$2,869.34	($975.00)	0.6601999
$10.00		$2,934.14	($1,039.80)	0.6456196

Effectiveness: 0.70

Labor Fee:	Maximum Saving	Application Costs	Net Savings	Ben:Cost
$1.00	$1,768.05	$2,350.94	($582.89)	0.7520602
$2.00		$2,415.74	($647.69)	0.7318869
$3.00		$2,480.54	($712.49)	0.7127676
$4.00		$2,545.34	($777.29)	0.6946218
$5.00		$2,610.14	($842.09)	0.6773769
$6.00		$2,674.94	($906.89)	0.6609676
$7.00		$2,739.74	($971.69)	0.6453345
$8.00		$2,804.54	($1,036.49)	0.6304238
$9.00		$2,869.34	($1,101.29)	0.6161866
$10.00		$2,934.14	($1,166.09)	0.6025783

$l-10/ha adjusted Application Costs [i.e., Cell F6 = (D6)-(E6) or ($2,525.79)-($2,350.94) or $174.84, Cell F7 = ($D$6)-(E7) or ($2,525.79)-($2,415.74) or $110.84, etc.]. Note that the use of D6 for a specific cell calculation fixes the use of that precise number in all specified calculations. The Ben:Cost entries reflect the quotients of respective Net Savings divided by respective Application Costs, with a 1 added to generate a ratio having the property of 1.0 when Net Saving equals Application Cost [i.e., Cell G6 = ((F6/E6)+l) or (($174.84/$2,350.94)+l) or 1.0744, Cell G7 = ((F7/E7)+l) or

(($110.84/$2,415.74)+l) or 1.0455, etc.].

Subsequent development of the spreadsheet is straightforward; this can be accomplished by copying the cells for the "1.00 Effectiveness" block in appropriate columns down the sheet, but altering the specific cells needed to derive appropriate calculations for "0.95 Effectiveness", "0.90 Effectiveness", etc. That is, iterative sets of calculations entail alterations of the maximum saving values (Cells D17, D28, D39, D50, D61 and D72) based on the substitution of 0.95, 0.90, 0.85, 0.80, 0.75, and 0.70 effectiveness variables [i.e., (PCV)*(VCD)*C16, (PCV)*(VCD)*C27, etc.] as the starting value. The AC values in Column E remain the same, but the Net Savings and Ben:Cost values in Columns F and G must be changed to reflect the appropriate cell by cell subtractions and divisions, respectively.

Conclusions

Output of the Net Savings and Ben:Cost columns can be readily copied and pasted into graphical software packages for ease of illustration (e.g., Freelance) or statistical analysis (e.g., Statistical Analysis System). This approach is being adapted for use in assessing other wildlife damage management tools/situations (e.g., methylanthranilate for goose avoidance of parks/fairways, capsaicin for rodent repellence of cables, overhead monofilament wires for deterrence of bird visitations to aquaculture ponds); statistical techniques involving response-surface analysis will be used to determine critical inflections of benefit:cost ratios.

Acknowledgments. We thank B. L. Hosman for certain price data associated with Zn_3P_2 baiting. Paige Groninger and Kathleen Fagerstone reviewed drafts of the manuscript.

Literature cited

Aitken, P. 1997. 10 Minute Guide to 1-2-3® 97 for Windows. Que Corporation, Indianapolis, Indiana, USA.

Catapult, Inc. 1999. PBT Course Guide: Lotus® 1-2-3® 9.5 Intermediate. PBT — An IBM Company, Bothell, Washington, USA.

Sterner, R. T. 1994. Zinc phosphide: Implications of optimal foraging theory and particle-dose analyses to efficacy, acceptance, baitshyness, and nontarget hazards. Proceedings of the Vertebrate Pest Conference 16: 152-159.

Sterner, R. T. Spreadsheets, response surfaces and intervention decisions in wildlife damage management. Pages xx-xx *in* L. Clark, editor, Human conflicts with wildlife: economic considerations. Proceedings of the Third Special Symposium. 1-3 August 2000, National Wildlife Research Center, Fort Collins, Colorado, USA. (In Press).

Sterner, R. T., C. A. Ramey, W. D. Edge, T. E. Manning, J. O. Wolff, and K. A. Fagerstone 1996. Efficacy of zinc phosphide to reduce vole populations in alfalfa — an enclosure study. Crop Protection 15:727-734.

United States Department of Agriculture. 1999. Crop Production 1998 Summary. National Agricultural Statistical Service [Cr Pr 2-1(99)], Washington, District of Columbia, USA.

For more information please visit http://wildlifedamage.unl.edu

Appendix A. Lotus® 1-2-3®, 9.5 Code for the Potential Crop Savings spreadsheet; sequential lines of code are printed sequentially in columns. [Note.-- The words "Crop Savings:" should be eliminated from all respective lines of code upon entry; these words are included here only to show the code print as it appears when using the "PRINT PREVIEW & PAGE SETUP - INCLUDE - FORMULAS" options within Lotus 1-2-3.]

FS-INPUT: (FIELDSIZE)
DAMAGE: (VCD) Crop Savings:C7: (C6)+l Crop Savings:C8: (C7)+l Crop Savings:C9: (C8)+l Crop Savings:C10: (C9)+l
CropSavings:Cll:(C10)+l
CropSavings:C12:
CropSavings:C13: Crop Savings:C14: (C13)+l Crop Savings:C15: (C14)+l
CropSavings:C18: (C17)+l
Crop Savings:C19: (C18)+l
Crop Savings:C20: (C19)+l
Crop Savings:C21: (C20)+l
Crop Savings:C22: (C21)+l
Crop Savings:C23: (C22)+l
Crop Savings:C24: (C23)+l
Crop Savings:C25: (C24)+l
Crop Savings:C26: (C25)+l
Crop Savings:C29: (C28)+l
Crop Savings:C30: (C29)+l
Crop Savings:C31: (C30)+l
Crop Savings:C32: (C31)+l
Crop Savings:C33: (C32)+l
Crop Savings:C34: (C33)+l
Crop Savings:C35: (C34)+l
Crop Savings:C36: (C35)+l
Crop Savings:C37: (C36)+l
Crop Savings:C40: (C39)+l
Crop Savings:C41: (C40)+l
Crop Savings:C42: (C41)+l
Crop Savings:C43: (C42)+l
Crop Savings:C44: (C43)+l
Crop Savings:C45: (C44)+l
Crop Savings:C46: (C45)+l
Crop Savings:C47: (C46)+l
Crop Savings:C48: (C47)+l
Crop Savings:C51: (C50)+l
Crop Savings:C52: (C51)+l
Crop Savings:C53: (C52)+l
Crop Savings:C54: (C53)+l
Crop Savings:C55: (C54)+l
Crop Savings:C56: (C55)+l
Crop Savings:C57: (C56)+l
Crop Savings:C58: (C57)+l
Crop Savings:C59: (C58)+l
Crop Savings:C62: (C61)+l
Crop Savings:C63: (C62)+l
Crop Savings:C64: (C63)+l
Crop Savings:C65: (C64)+l
Crop Savings:C66: (C65)+l
Crop Savings:C67: (C66)+l
Crop Savings:C68: (C67)+l
Crop Savings:C69: (C68)+l
Crop Savings:C70: (C69)+l
Crop Savings:C73: (C72)+l
Crop Savings:C74: (C73)+l
Crop Savings:C75: (C74)+l
Crop Savings:C76: (C75)+l
Crop Savings:C77: (C76)+l
Crop Savings:C78: (C77)+l
Crop Savings:C79: (C78)+l
Crop Savings:C80: (C79)+l
Crop Savings:C81: (C80)+l
Crop Savings:D6: (($PCV)*($VCD)*(C5) Crop Savings:D17: (($PCV)*($VCD)*C16)
Crop Savings:D28: (($PCV)*($VCD)*(C27)
Crop Savings:D39: (($PCV)*($VCD)*(C38)
Crop Savings:D50: (($PCV)*($VCD)*(49) Crop Savings:D61: (($PCV)*($VCD)*(C60)
Crop Savings: D72: (($PCV)*($VCD)*(C71)
Crop Savings:E6: (AC)
Crop Savings:E7 (FIELDSIZE)+(E6)
Crop Savings :E8 (FIELDSIZE)+(E7)
Crop Savings:E9 (FIELDSIZE)+(E8)
Crop Savings:E10 (FIELDSIZE)+(E9)
Crop Savings:Ell (FIELDSIZE)+(E10)
Crop Savings:E12 (FIELDSIZE)+(E11)
Crop Savings:E12 (FffiLDSIZE)+(Ell)
Crop Savings:E13 (FIELDSIZE)+(E12)
Crop Savings:E14: (FIELDSIZE)+(E13)
Crop Savings:E15 (FIELDSIZE)+(E14)
CropSavings:E17:(AC)
Crop Savings:E18 (FIELDSIZE)+(E17)
Crop Savings:E19 (FIELDSIZE)+(E18)
Crop Savings:E20: (FIELDSIZE)+(E19)
Crop Savings:E21: (FIELDSIZE)+(E20)
Crop Savings:E22 (FIELDSIZE)+(E21)
Crop Savings:E23 (FIELDSIZE)+(E22)
Crop Savings:E24 (FIELDSIZE)+(E23)
Crop Savings:E25 (FIELDSIZE)+(E24)

Crop Savings:E26: (FIELDSIZE)+(E25)
Crop Savings:E28: (AC)
Crop Savings :E29: (FIELDSIZE)+(E28)
Crop Savings:E30: (FIELDSIZE)+(E29)
Crop Savings.-E31: (FIELDSIZE)+(E30)
Crop Savings:E32: (FIELDSIZE)+(E31)
Crop Savings:E33: (FIELDSIZE)+(E32)
Crop Savings:E34: (FIELDSIZE)+(E33)
Crop Savings:E35: (FIELDSIZE)+(E34)
Crop Savings:E36: (FIELDSIZE)+(E35)
Crop Savings:E37: (FIELDSIZE)+(E36)
Crop Savings:E39: (AC)
Crop Savings :E40 : (FIELDSIZE)+(E39)
Crop Savings :E41: (FIELDSIZE)+(E40)
Crop Savings : E42: (FIELDSIZE)+(E41)
Crop Savings:E43: (FEELDSIZE)+(E42)
Crop Savings :E44: (FIELDSIZE)+(E43)
Crop Savings:E45: (FIELDSIZE)+(E44)
Crop Savings:E46: (FIELDSIZE)+(E45)
Crop Savings: E47: (FIELDSIZE)+(E46)
Crop Savings:E48: (FIELDSIZE)+(E47)
Crop Savings:E50: (AC)
Crop Savings:E51: (FIELDSIZE)+(E50)
Crop Savings:E52: (FIELDSIZE)+(E51)
Crop Savings :E53 (FIELDSIZE)+(E52) Crop Savi ngs:E54 (FIELDSIZE)+(E53) Crop Savi ngs:E55 (FIELDSIZE)+(E54) Crop Savings:E56 (FIELDSIZE)+(E55) Crop Savings:E57: (FIELDSIZE)+(E56) Crop Savings:E58: (FIELDSIZE)+(E57) Crop Savings:E59: (FIELDSIZE)+(E58)
CropSavings:E61:(AC)
Crop Savings:E62: (FIELDSIZE)+(E61) Crop Savings:E63: (FIELDSIZE)+(E62) Crop Savings:E64: (FIELDSIZE)+(E63) Crop Savings:E65: (FIELDSIZE)+(E64) Crop Savings:E66 (FIELDSIZE)+(E65) Crop Savings:E67: (FIELDSIZE)+(E66) Crop Savings :E68 (FIELDSIZE)+(E67) Crop Savings:E69 (FIELDSIZE)+(E68) Crop Savings:E70 (FIELDSIZE)+(E69) Crop Savings:E72: (AC) Crop Savings:E73 (FIELDSIZE)+(E72) Crop Savings:E74 (FIELDSIZE)+(E73) Crop Savings:E75 (FIELDSIZE)+(E74) Crop Savings:E76 (FIELDSIZE)+(E75) Crop Savings:E77 (FIELDSIZE)+(E76) Crop Savings:E78 (FIELDSIZE)+(E77)
Crop Savings:E79: (FIELDSIZE)+(E78)
Crop Savings:E80: (FIELDSIZE)+(E79)
Crop Savings:E81: (FIELDSIZE)+(E80)
CropSavings:F6: (D6)-(E6)
CropSavings:F7: (D6)-(E7)
Crops avings :F8: (D6)-(E8)
Crop Savings:F9: (D6)-(E9)
Crop Savings:F10: (D6)-(E10)
Crop Savings:Fll: (D6)-(Ell)
Crop Savings:F12: (D6)-(E12)
Crop Savings:F13: (D6)-(E13)
Crop Savings:F14: (D6)-(E14)
Crop Savings:F15: (D6)-(E15)
Crop Savings:F17: (D6)-(E17)
Crop Savings:F18: (D6)-(E18)
Crop Savings:F19: (D6)-(E19)
Crop Savings:F20: (D6)-(E20)
Crop Savings:F21: (D6)-(E21)
Crop Savings:F22: (D6)-(E22)
Crop Savings:F23: (D6)-(E23)
Crop Savings:F24: (D6)-(E24)
Crop Savings:F25: (D6)-(E25)
Crop Savings:F26: (D6)-(E26)
Crop Savings:F28: (D6)-(E28)

For more information please visit http://wildlifedamage.unl.edu

Crop Savings:F29: (D6)-(E29)
Crop Savings:F30: (D6)-(E30)
Crop Savings:F31: (D6)-(E31)
Crop Savings:F32: (D6)-(E32)
Crop Savings:F33: (D6)-(E33)
Crop Savings:F34: (D6)-(E34)
Crop Savings:F35: (D6)-(E35)
Crop Savings:F36: (D6)-(E36)
Crop Savings:F37: (D6)-(E37)
Crop Savings:F39: (D6)-(E39)
Crop Savings:F40: (D6)-(E40)
Crop Savings:F41: (D6)-(E41)
Crop Savings:F42: (D6)-(E42)
Crop Savings:F43: (D6)-(E43)
Crop Savings:F44: (D6)-(E44)
Crop Savings:F45: (D6)-(E45)
Crop Savings:F46: (D6)-(E46)
Crop Savings:F47: (D6)-(E47)
Crop Savings:F48: (D6)-(E48)
Crop Savings:F50: (D6)-(E50)
Crop Savings:F51: (D6)-(E51)
Crop Savings:F52: (D6)-(E52)
Crop Savings:F53: (D6)-(E53)
Crop Savings:F54: (D6)-(E54)
Crop Savings:F55: (D6)-(E55)
Crop Savings:F56: (D6)-(E56)
Crop Savings:F15: (D6)-(E15)
Crop Savings:F57: (D6)-(E57)
Crop Savings:F58: (D6)-(E58)
Crop Savings:F59: (D6)-(E59)
Crop Savings :F61: (D6)-(E61)
Crop Savings:F62: (D6)-(E62)
Crop Savings:F63: (D6)-(E63)
Crop Savings:F64: (D6)-(E64)
Crop Savings:F65: (D6)-(E65)
Crop Savings:F66: (D6)-(E66)
Crop Savings:F67: (D6)-(E67)
Crop Savings:F68: (D6)-(E68)
Crop Savings:F69: (D6)-(E69)
Crop Savings:F70: (D6)-(E70)
Crop Savings:F72: (D6)-(E72)
Crop Savings:F73: (D6)-(E73)
Crop Savings:F74: (D6)-(E74)
Crop Savings:F75: (D6)-(E75)
Crop Savings:F76: (D6)-(E76)
Crop Savings:F77: (D6)(E77)
Crop Savings:F78: (D6)(E78)
Crop Savings:F79: (D6)(E79)
Crop Savings:F80: (D6)(E80)
Crop Savings:F81: (D6)(E81)
Crop Savings:G6 ((F6)/E6)+l)
Crop Savings :G7 ((F7)/E7)+l)
Crop Savings:G8 ((F8)/E8)+1)
Crop Savings:G9 ((F9)/E9)+l)
Crop Savings:G10 ((F10)/E10)+l)
Crop Savings:Gll ((F11)/E11)+1)
Crop Savings:G 12 ((F12)/E 12)+1)
Crop Savings:G13 ((F13)/E 13)+1)
Crop Savings:G14 ((F14)/E 14)+1)
Crop Savings:G15 ((F15)/E 15)+1)
Crop Savings:G17 ((F17)/E 17)+1)
Crop Savings:G18 ((F18)/E 18)+1)
Crop Savings:G 19 ((F19)/E 19)+1)
Crop Savings: G20 ((F20)/E20)+l)
Crop Savings:G21 ((F21)/E21)+1)
Crop Savings :G22 ((F22)/E22)+l)
Crop Savings:G23 ((F23)/E23)+l)
Crop Savings:G24

For more information please visit http://wildlifedamage.unl.edu

((F24)/E24)+l)
Crop Savings:G25 :
((F25)/E25)+l)
Crop Savings:G26:
((F26)/E26)+l)
Crop Savings:G28:
((F28)/E28)+l)
Crop Savings:G29:
((F29)/E29)+l)
Crop Savings:G30:
((F3O)/E3O)+1)
Crop Savings :G31:

Crop Savings:G32:
((F32)/E32)+l)
Crop Savings:G33:
((F33)/E33)+l)
Crop Savings:G34:
((F34)/E34)+l)
Crop Savings:G35:
((F35)/E35)+l)
Crop Savings:G36:
((F36)/E36)+l)
Crop Savings:G37:
((F37)/E37)+l)
Crop Savings:G39:
((F39)/E39)+l)
Crop Savings :G40:
((F40)/E40)+l)
Crop Savings : G41:

Crop Savings:G42:
((F42)/E42)+l)
Crop Savings:G43:
((F43)/E43)+l)
Crop Savings: G44:
((F44)/E44)+l)
Crop Savings:G45:
((F45)/E45)+l)
Crop Savings:G46:
((F46)/E46)+l)
Crop Savings:G47:
((F47)/E47)+l)
Crop Savings:G48:
((F48)/E48)+l)
Crop Savings:G50:
((F5O)/E5O)+1)
Crop Savings:G51:

Crop Savings:G52:
((F52)/E52)+l)
Crop Savings:G53:
((F53)/E53)+l)
Crop Savings:G54:
((F54)/E54)+l)
Crop Savings:G55:
((F55)/E55)+l)
Crop Savings:G56:
((F56)/E56)+l)
Crop Savings:G57:
((F57)/E57)+l)
Crop Savings:G58:
((F58)/E58)+l)
Crop Savings:G59:
((F59)/E59)+l)
Crop Savings :G61:

Crop Savings:G62:
((F62)/E62)+l)
Crop Savings:G63:
((F63)/E63)+l)
Crop Savings:G64:
((F64)/E64)+l)
Crop Savings:G65:
((F65)/E65)+l)
Crop Savings:G66:
((F66)/E66)+l)
Crop Savings:G67:
((F67)/E67)+l)
Crop Savings:G68 :
((F68)/E68)+l)
Crop Savings:G69:
((F69)/E69)+l)
Crop Savings:G70:
((F70)/E70)+l)
Crop Savings:G72:
((F72)/E72)+l)
Crop Savings:G73:
((F73)/E73)+l)
Crop Savings: G74:
((F74)/E74)+l)
Crop Savings: G75:
((F75)/E75)+l)
Crop Savings:G76:
((F76)/E76)+l)
Crop Savings :G77:
((F77)/E77)+l)
Crop Savings:G78:
((F78)/E78)+l)
Crop Savings:G79:
((F79)/E79)+l)
Crop Savings :G80:
((F80)/E80)+l)
Crop Savings:G81
((F812)/E81)+1)

For more information please visit http://wildlifedamage.unl.edu