To: Ron Olson
Fr: Ken Newman KEN

Re: Review of Bob Vreeland's memo on sample size for tag loss estimation

November 9, 1987

Vreeland's Memo

Vreeland uses an approximate confidence interval formula for estimates of proportions to construct his table of sample sizes.

The approximate formula is p +/- (Z x sqrt(pq/n)); where p is the estimated tag loss, q is 1-p, Z is the normal test statistic, and n is the sample size. This is a very crude approximation to the confidence interval which will occasionally yield negative values for the lower confidence bound.

He then rearranges the formula to solve for n given p, Z, and a desired width (w), where width equals Z x sqrt(pq/n):

$$n = Z^2 / [w^2] \times [p^2 \times q^2].$$

This result is based on a very simple approximation to the confidence interval, but it is probably adequate for now.

Enhancements

Attached is a floppy disk containing a program named TAGLOSS. TAGLOSS will do one of two things- set an appropriate sample size for planning purposes and compute a confidence interval for tag loss after the fact.

Simply type TAGLOSS to begin the program. The sample size calculation is identical to that given above. The confidence interval calculation is an approximation, but considerably better than the one described above, because it will not yield negative estimates for the lower confidence bound.

Possible Future Work

An alternative approach to the problem of appropriate sample size is to apply a method known as sequential sampling. Roughly, the procedure begins by sampling a few smolts, computing the tag loss, and estimating the precision. IF the precision is inadequate, sample a few more, recompute tag loss and precision, and so on until the desired level of precision is achieved.

With smolt sampling this maybe more trouble than it's worth, but it is another option to consider.

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```
Program TAGLOSS
     A program to estimate either the sample size
necessary to achieve a particular precision level or to
compute a confidence interval on an estimate of tag loss.


Select option: (1) Sample size   (2) Confidence interval 1

Select Confidence Level: (1) 90%  (2) 95%  (3) 99%      2

Enter a guess as to largest tag loss rate, eg, 0.07      0.05

Enter desired half width on confidence interval, eg, 0.01 0.01

SAMPLE SIZE =        1825

A:\>
```

```
Program TAGLOSS
     A program to estimate either the sample size
necessary to achieve a particular precision level or to
compute a confidence interval on an estimate of tag loss.


Select option: (1) Sample size   (2) Confidence interval 1

Select Confidence Level: (1) 90%  (2) 95%  (3) 99%      2

Enter a guess as to largest tag loss rate, eg, 0.07      0.05

Enter desired half width on confidence interval, eg, 0.01 0.02

SAMPLE SIZE =        457

A:\>
```

```
Program TAGLOSS
     A program to estimate either the sample size
necessary to achieve a particular precision level or to
compute a confidence interval on an estimate of tag loss.


Select option: (1) Sample size    (2) Confidence interval 2

Select Confidence Level: (1) 90%  (2) 95%  (3) 99%      2

Enter estimated tag loss rate, eg, .06                  .07

Enter sample size                                       500

0.95% Confidence Interval =  [0.051 0.096]

A:\>
```

```
Program TAGLOSS
     A program to estimate either the sample size
necessary to achieve a particular precision level or to
compute a confidence interval on an estimate of tag loss.


Select option: (1) Sample size    (2) Confidence interval 2

Select Confidence Level: (1) 90%  (2) 95%  (3) 99%      2

Enter estimated tag loss rate, eg, .06                  .07

Enter sample size                                       2000

0.95% Confidence Interval =  [0.060 0.082]

A:\>
```

```
Program TAGLOSS
     A program to estimate either the sample size
necessary to achieve a particular precision level or to
compute a confidence interval on an estimate of tag loss.


Select option: (1) Sample size   (2) Confidence interval 1

Select Confidence Level: (1) 90%  (2) 95%  (3) 99%       2

Enter a guess as to largest tag loss rate, eg, 0.07       .02

Enter desired half width on confidence interval, eg, 0.01 .01

SAMPLE SIZE =        753

A:\>



Program TAGLOSS
     A program to estimate either the sample size
necessary to achieve a particular precision level or to
compute a confidence interval on an estimate of tag loss.


Select option: (1) Sample size   (2) Confidence interval 1

Select Confidence Level: (1) 90%  (2) 95%  (3) 99%       2

Enter a guess as to largest tag loss rate, eg, 0.07       0.07

Enter desired half width on confidence interval, eg, 0.01 .01

SAMPLE SIZE =       2501

A:\>
```

```
Program TAGLOSS
     A program to estimate either the sample size
necessary to achieve a particular precision level or to
compute a confidence interval on an estimate of tag loss.


Select option: (1) Sample size   (2) Confidence interval 1

Select Confidence Level: (1) 90%  (2) 95%  (3) 99%       2

Enter a guess as to largest tag loss rate, eg, 0.07       0.07

Enter desired half width on confidence interval, eg, 0.01 0.02

SAMPLE SIZE =        626

A:\>
```

```
Program TAGLOSS
     A program to estimate either the sample size
necessary to achieve a particular precision level or to
compute a confidence interval on an estimate of tag loss.


Select option: (1) Sample size   (2) Confidence interval 1

Select Confidence Level: (1) 90%  (2) 95%  (3) 99%       1

Enter a guess as to largest tag loss rate, eg, 0.07       0.07

Enter desired half width on confidence interval, eg, 0.01 0.01

SAMPLE SIZE =       1762

A:\>
```