SPINOFFS

Spinoffs are relatively short learning modules inspired by the LTAs. They can be easily implemented to support student learning in courses ranging from prealgebra through calculus. The Spinoffs typically give students an opportunity to use mathematics in a real world context.

LTA - SPINOFF 15A	The Capture-Recapture Method
LTA - SPINOFF 15B	Florida Scrub-Jay Populations and Habitat
LTA - SPINOFF 15C	Population Models with Recursive Equations

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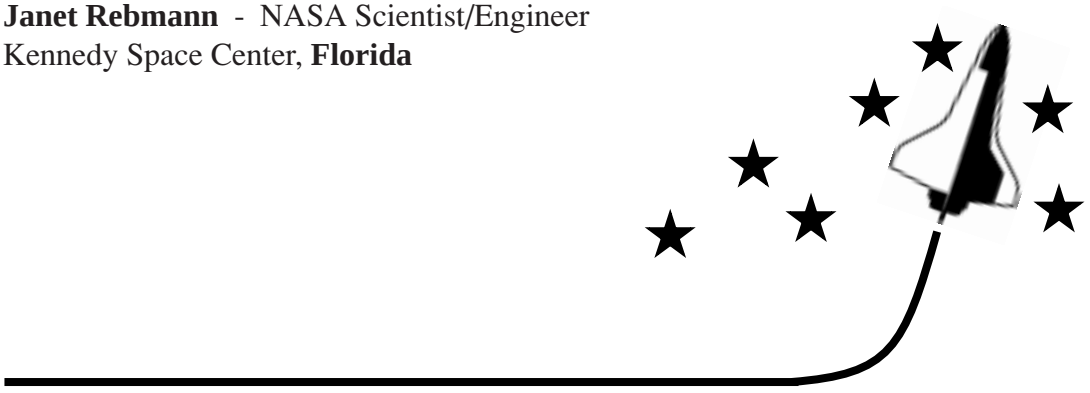

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SPINOFF 15B

Florida Scrub-Jay Populations and Habitat

Because it is a threatened species, there is great interest in monitoring the Florida Scrub-Jay, a species of bird that had been thriving on the lands of the Kennedy Space Center. Some scientists have studied different habitats and their effects on the Scrub-Jay population. The results in the three tables below are based on studies conducted at the Kennedy Space Center. The label "ha" represents hectare, a measure of land area.

Table 1

Scrub Oak Cover (%)	Scrub-Jay Density (birds/ha)
22	0
27	0
28	0.9
29	0.7
33	0.2
39	0.5
42	0
46	0.2
60	0.2
61	0.4
62	0.7
65	2.2
66	1.0
79	0.8
80	0.9
82	0.9
93	1.8

Table 2

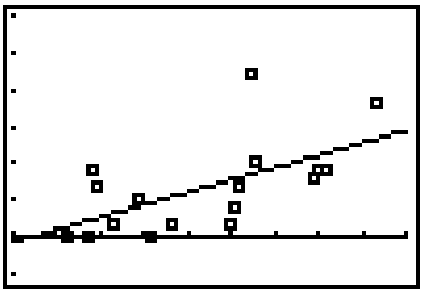
Pine Cover (%)	Scrub-Jay Density (birds/ha)
0	0
0	0.2
0	0.4
0	0.6
0	0.9
0	1.6
0	2.2
2	0.1
2	0.2
2	0.4
2	0.7
6	0.2
9	0.5
9	0.8
12	0.9
12	1.0
15	0.5
24	0
30	0.3
37	0.1
39	0
42	0.5
52	0
52	0.1

Table 3

Open Space (%)	Scrub-Jay Density (birds/ha)
0	0.1
3	0
3	0.2
3	0.3
3	0.5
6	0
6	0.2
6	0.3
8	0.2
8	0.4
8	0.7
8	0.8
8	0.9
19	1.7
22	2.2
24	1.0
24	1.1

Assuming that there is a desire to create an environment conducive to a thriving Scrub-Jay population, what type of habitat should be used? Based on the above tables, should there be an attempt to have an abundance of scrub oak, or an abundance of pine, or an abundance of open space? We will investigate the relationships inherent in Tables 1 through 3.

Correlation, regression, and scatterplots are important tools for investigating relationships between two variables. The scatterplot for the scrub oak/Scrub-Jay density is shown below, with a straight line superimposed.



Visual examination of this scatterplot indicates that there appears to be a pattern showing that larger densities of Scrub Jays are found in greater scrub oak cover. We can use correlation to decide whether there is a significant linear correlation between the two variables, then we can use regression to find the equation of the straight line that best fits the data. Using the TI-83™ LinRegTTesT option found in the STAT TESTS menu, for example, results in the following values:

r = 0.609
p = 0.00951
y = 0.01675x - 0.2298

The value of r is the linear correlation coefficient. The closer this value is to +1 or –1, the stronger the linear relationship. The p-value is used to determine if there is a significant relationship between two variables. A "small" p-value (such as one below 0.05) suggests that there is a significant linear correlation between the two variables. This p-value of 0.00951 is significant. The regression equation that best fits the points is the equation of the straight line:

y = 0.01675x - 0.2298

Based on the scatterplot, the p-value, and the regression equation, we can conclude that the percentage of scrub cover is related to the density of Scrub-Jays, and that the relationship can be described by the regression equation shown above. The relationship makes sense when we recognize that when Scrub-Jays are in scrub oak cover, they are protected from the hawks that are their predators.

Exercises

1) Using the data in the Table 2, construct a scatterplot for the paired data that relates pine cover and Scrub-Jay density. Then find the value of the linear correlation coefficient, the p-value, and the equation of the regression line. Based on these results, is there a relationship between pine cover and Scrub-Jay density? Does more pine cover correspond to greater Scrub-Jay density? If you want to encourage the Scrub-Jay population, does it make sense to plant pines?

2) Using the data in Table 3, construct a scatterplot for the paired data that relates open space and Scrub-Jay density. Then find the value of the linear correlation coefficient, the p-value, and the equation of the regression line. Based on these results, is there a relationship between open space and Scrub-Jay density? Does more open space correspond to greater Scrub-Jay density? If you want to encourage the Scrub-Jay population, does it make sense to create open spaces? How might you explain the results obtained here to those presented in Exercise 1? Is it possible that scrub oak cover and open space are each conducive to the Scrub-Jay population? If so, how?

3) You want to encourage the Scrub-Jay population and you have land available that contains areas with scrub oak coverage, areas with pine coverage, and open areas. You can modify the land to have more or less of each type. What should you do?