**Resource Management Action Plan**

In this subunit, you will produce a natural resource management action plan for a population of yellow-bellied marmots (*Marmota flaviventris*) living in the Fruita Historical Area of Capitol Reef National Park, Utah. Each section of this course discussed concepts you should employ to plan your study of this population and your development of a management program.

## Part 1: Research

Construct a plan and a timetable for undertaking field research on this population. What information do you need to learn about this species? Which sampling methods will you use to gather data? What timetable will you use (months, years) for collecting data?

## The Yellow-Bellied Marmots of the Fruita Historical Area of Capitol Reef National Park, Utah

The Fruita Historical Area of Capitol Reef National Park, Utah, preserves a pioneer Mormon settlement. During the late 1800s, Mormons settled in this valley of the Fremont River and cultivated orchards to provide fruit to the surrounding Mormon towns. The Fremont River and Sulphur Creek provided irrigation water, and the protection afforded by the surrounding 1,500-foot-high rocky cliffs provided a mild climate ideal for orchards. The Fruita Historical Area comprises a 2.5-square-mile horseshoe-shaped valley around rocky, treeless Johnson Mesa and extends from Mott Orchard in the north to the Group Campground in the south (see the below map). The lushness of Fruita contrasts dramatically with the surrounding Utah desert and provides an oasis for the animals of the area.

Yellow-bellied marmots were present in the valley prior to Mormon settlement and are believed to have arrived at Fruita by immigration along the Fremont River from Boulder Mountain to the west. Normally a montane species, these valley marmots have evolved

an unusual life history in that they emerge from hibernation in mid-March (compared to late May for montane populations) and enter into hibernation in mid-August (compared to early November for montane populations). The marmots are popular with park visitors, but the orchard crew observed marmots climbing the fruit trees and expressed concern that the marmots might be causing damage to the trees, so the Resource Management team of Capitol Reef engaged a biologist to study the population and recommend a marmot management program.

The Fruita marmot population consists of three subpopulations separated by barriers of human activity: the Sprang subpopulation—occupying Sprang Cottage, Johnson Orchard, and the northern edge of the Picnic Ground—is separated from the Gifford subpopulation—occupying Jorgenson Pasture, Gifford House, and Gifford Orchard—by the Picnic Ground; the Group Camp subpopulation—occupying the Group Camp, Pendleton Field, and Mulford Orchard—is separated from the Gifford subpopulation by the Campground. Thus the population can be considered to be a metapopulation composed of three "island" populations.

From the information you have learned, which factors do you think might be important for the conservation of this species? When you have finished your field research plan and timetable, compare your product to the scientific research actually conducted to study this population: Answer Key 1: Research.


## Part 2: Data Analysis

In a real study, your analysis would reorganize the "raw" data into summary tables in order to evaluate trends, and statistical tests would be performed to test for significant differences. This process takes time, so summary tables are provided to help you determine the following information, and statistical tests are being deferred in favor of interpretation:

**1. Population Size and Carrying Capacity:** Plot the data for population size over time and then decide from the resulting graph whether this population is r-selected or K-selected. Estimate the carrying capacity for this population.
     a. Data: Population Size and Carrying Capacity
     b. Answer Key 2: Population Size and Carrying Capacity

**2. Reproduction:** Examine the data on reproduction of the females in the three subpopulations. Are all three subpopulations similar in their reproduction? What conclusions can you draw from the data?
     c. Data: Reproduction
     d. Answer Key 3: Reproduction

**3. Mortality:** Examine the data on the causes of mortality for each of the three subpopulations. Are the subpopulations similar in causes of mortality? Which age group suffers the highest mortality?

e. Data: Mortality
f. Answer Key 4: Mortality

**4. Food Resources:** On the map presented earlier, identify the food resources used by each subpopulation. What conclusions do you draw from these data?
g. Data: Food Resources
h. Answer Key 5: Food Resources

**5. Hibernacula:** On the map presented earlier, locate the burrows that were identified as probable hibernacula (marmots were captured at these burrows at the beginning of their above-ground season). Can you determine any characteristics that make these burrows quality hibernacula?
i. Data: Hibernacula
j. Answer Key 6: Hibernacula

**6. Identify the threats and pressures this population faces. Which pressures will decrease population size?**
k. Answer Key 7: Threats and Pressures

## Part 3: Conclusions and Management Recommendations

Determine how to manage the marmot population. What measures do you recommend the park employ to conserve the population, and across what time frame should the park act? Compare your recommendations to the conclusions from the actual study: Answer Key 8: Conclusions and Recommendations for Management of the Fruita Marmot Population.