

**Business Plan
for the
Perdido Key Beach Mouse
Conservation Fund**

RCF Economic and Financial Consulting, Inc.

July 1, 2005

Executive Summary

The purpose of this report is to develop a business plan for the Perdido Key Beach Mouse (PKBM) Conservation Fund. The Fund will implement the PKBM Conservation Strategy. The business plan includes estimates of the costs of implementing the Conservation Strategy and develops a protocol for allocating contributions to the Fund. Using the implementation cost estimates, the report calculates per-acre contributions. Recommendations are also made for organizing the account structure of the Fund.

Range of Costs to Implement the Conservation Strategy

Annual costs of implementing the Conservation Strategy are reported in Table E1. These annual costs are expected to recur, at varying levels, over a number of years. Consequently, it is important to account for the full cost of implementing the Fund over an extended time period. This cost is calculated as the present value of the annual costs over one hundred years discounted at 5 percent annually, reported Table E2.

Table E1. Annual Costs of Implementing PKBM Conservation Strategy, 2005 prices

| Activity | High | Middle | Low |
|--|--------------|--------------|--------------|
| 1. Surveying and Monitoring | \$197,091 | \$197,091 | \$197,091 |
| 2. Restoration and Maintenance of Dune Habitat | | | |
| a. Restoration | \$1,237,107 | \$989,685 | \$194,526 |
| b. Maintenance | \$52,917 | \$48,417 | \$48,417 |
| 3. Predator Control | \$60,182 | \$60,182 | \$30,091 |
| 4. Mitigation Actions | | | |
| a. Land Acquisition ¹ | \$13,732,848 | \$13,291,771 | \$12,850,693 |
| b. Conservation Easements ² | \$5,493,139 | \$5,316,708 | \$3,212,673 |
| c. Education | \$57,500 | \$57,500 | \$57,500 |
| 5. Genetic Viability Assessment | \$71,041 | \$71,041 | \$71,041 |
| 6. Captive Breeding Programs | \$65,254 | \$65,254 | \$65,254 |
| 7. Creation and Maintenance of Conservation Fund | \$61,780 | \$61,780 | \$61,780 |
| 8. Research Necessary to Achieve Conservation Strategy Goals | \$66,761 | \$42,477 | \$42,477 |
| Total of Activity Costs, plus Land Acquisition | \$15,602,579 | \$14,885,297 | \$13,618,969 |
| Total of Activity Costs, plus Conservation Easements | \$7,362,871 | \$6,910,234 | \$3,980,949 |
| Total of Activity Costs without Land Actions | \$1,869,731 | \$1,593,526 | \$768,276 |

¹ All costs include mouse corridors south of Perdido Key Drive; high includes fee simple acquisition of 10 acres north of Perdido Key Drive, medium 6.5 acres, and low 3 acres.

² All costs include mouse corridors south of Perdido Key Drive; high includes easements on 10 acres north of Perdido Key Drive at a 40 percent easement price, the middle range includes easements on 6.5 acres at a 40 percent easement price, and the low includes easements on 3 acres at a 25 percent easement price.

Table E2. 100-Year Present Value of Costs of Implementing PKBM Conservation Strategy, 2005 prices

| Activity | High | Middle | Low |
|--|---------------|---------------|---------------|
| 1. Surveying and Monitoring | \$4,117,392 | \$4,117,392 | \$4,117,392 |
| 2. Restoration and Maintenance of Dune Habitat | | | |
| a. Restoration | \$25,781,681 | \$20,625,344 | \$4,053,984 |
| b. Maintenance | \$1,102,800 | \$1,009,018 | \$1,009,018 |
| 3. Predator Control | \$1,254,211 | \$1,254,211 | \$627,106 |
| 4. Mitigation Actions | | | |
| a. Land Acquisition ¹ | \$221,662,911 | \$214,543,446 | \$207,423,981 |
| b. Conservation Easements ² | \$88,665,165 | \$85,817,378 | \$51,855,995 |
| c. Education | \$668,751 | \$668,751 | \$668,751 |
| 5. Genetic Viability Assessment | \$162,469 | \$162,469 | \$162,469 |
| 6. Captive Breeding Programs | \$566,475 | \$566,475 | \$566,475 |
| 7. Creation and Maintenance of Conservation Fund | \$61,780 | \$61,780 | \$61,780 |
| 8. Research Necessary to Achieve Conservation Strategy Goals | \$578,708 | \$575,266 | \$575,266 |
| Total with Land Acquisition | \$255,957,178 | \$243,584,153 | \$219,266,222 |
| Total with Conservation Easements | \$122,959,431 | \$114,858,086 | \$63,698,237 |
| Total without Land Actions | \$34,294,267 | \$29,040,707 | \$11,842,241 |

¹ All costs include mouse corridors south of Perdido Key Drive; high includes fee simple acquisition of 10 acres north of Perdido Key Drive, medium 6.5 acres, and low 3 acres.

² All costs include mouse corridors south of Perdido Key Drive; high includes easements on 10 acres north of Perdido Key Drive at a 40 percent easement price, the middle range includes easements on 6.5 acres at a 40 percent easement price, and the low includes easements on 3 acres at a 25 percent easement price.

Allocation of Contributions to the Conservation Fund

The per-acre value of conservation contributions for Perdido Key is calculated as the total cost of implementing the Conservation Strategy divided by the total number of acres of beach mouse habitat on private land. Of 1,067 acres of habitat on the Florida portion of Perdido Key, approximately 240, or 22 percent, are on private land. Table E3 presents the contribution per acre based on the costs in Table E1, distributed over 240 acres of private mouse habitat. Development that proposed to occupy or otherwise disrupt one acre of mouse habitat would make a contribution to the Conservation Fund according to one of the rates in Table E3. If the proposed development could be revised to avoid affecting that acre of habitat, the contribution could be avoided. If revision of plans resulted in a smaller acreage of habitat being affected, the total contribution would be reduced accordingly.

Table E3. Conservation Contributions, per Acre Developed, 2005 prices

| Costs Included in Conservation Strategy | Implementation Cost Scenario | | |
|--|------------------------------|-------------|-----------|
| | High | Middle | Low |
| Total of Activity Costs, plus Land Acquisition | \$1,066,488 | \$1,014,934 | \$913,609 |
| Total of Activity Costs, plus Conservation Easements | \$512,331 | \$478,575 | \$265,409 |
| Total of Activity Costs without Land Actions | \$142,893 | \$121,003 | \$49,343 |

Accounting Structure Recommendations

The recommended accounting and reporting system attempts to utilize existing Escambia County account structure. However, a set of revenue accounts as well as a group of cost or activity centers peculiar to the CMF is proposed, to capture incoming funds and track expenditures in a managerially useful manner.

Since the CMF is not a typical governmental entity tied to fiscal years, it is proposed that the accounting more resemble a commercial enterprise – reporting revenues less expenditures to yield a change in the fund balance.

Background of RCF

Under the leadership of Dr. George S. Tolley, Professor Emeritus of Economics at The University of Chicago, RCF Economic and Financial Consulting, Inc. has developed and applied valuation methods in both market and non-market settings since 1978. It possesses special strengths in the economic analysis of environmental, energy, and real estate issues, as well as sales forecasting. RCF has estimated environmental damages and developed least-cost environmental compliance strategies for private firms and government agencies. In 2000, led by Dr. Tolley and Dr. Barton Smith of The University of Houston, RCF developed an air quality compliance plan for the Houston metropolitan area, much of which was adopted in the revision of the State Implementation Plan. Under the leadership of Dr. Tolley and Dr. Sabina L. Shaikh, RCF is currently completing the estimation of the public's valuation of reducing the number of beach closure days at beaches in the Chicago area. In 2003 and 2004, Dr. Tolley and Dr. Donald W. Jones led the University of Chicago Study of the future of nuclear power in the United States, which has been influential in the policy discussion surrounding new nuclear power construction.

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I. Background

Perdido Key is a Gulf of Mexico barrier island located southwest of Pensacola in northwest Florida and southeast Alabama. The Key is 2,943 acres in extent. The eastern 80% is in Florida and the western 20% is in Alabama. Major portions of the undeveloped area of Perdido Key are primary, secondary, and scrub dunes landward of the gulf-front beaches. Secondary and scrub dunes occur particularly at wider parts of the Key. A major wetland system exists further inland from the secondary and scrub dunes at the widest part of the Key.

The private land portions of Perdido Key are heavily affected by real estate development. Access to the Key is provided by State Road (SR) 292 in Florida and SR 182 in Alabama. Most of the privately owned lands south of the highway and much of that north of the highway have been developed into condominiums, businesses, and single-family homes.

In addition to private lands, the Key has three major tracts of publicly owned land. A portion of Gulf Islands National Seashore (GINS) is on the long, narrow eastern part of the Key; the State of Florida operates Perdido Key State Park Area (PKSP) in the central part of the Key; and Gulf State Park (GSP) is operated by the State of Alabama on the western tip of the Key.

Wild populations of the Perdido Key beach mouse (PKBM), *Peromyscus polionotus trissyllepsis*, occur only on Perdido Key. The U. S. Fish and Wildlife Service (FWS) listed the Perdido Key beach mouse as endangered in 1985. The Florida Fish and Wildlife Conservation Commission (FWC) listed it as threatened in 1975 and reclassified it as endangered in 1986.

A. Pressures on the Perdido Key Beach Mouse

Beach mice have evolved and persisted in coastal dune habitats since the Pleistocene and are adapted to the dynamic environment involving periodic hurricane landfalls. Historically, the extensive amount of pre-development coastal dune habitat along the Gulf coast allowed beach mice to recover after even the most severe hurricane events. Over the last 20 to 30 years the combination of habitat loss from beachfront development, isolation of remaining habitat blocks and beach mouse populations, and destruction of remaining habitat by hurricanes has increased the threat of extinction to several subspecies of beach mice, including the PKBM. Hurricanes Frederick in 1979 and Opal in 1995 significantly reduced beach mouse populations. Most recently, the passage of Hurricane Ivan approximately 12 miles west of Perdido Key in September 2004 caused extensive damage to the natural landscapes on the Key as well as to real estate developments. Much of the primary and secondary dune systems were destroyed or degraded by the storm surge. Additional damage to the dune systems and their vegetation occurred from the plants exposure to salt water during and after the storm. The storm destroyed or severely damaged most of the developments south of SR 292, as well as many north of the road, and the road itself.

B. The PKBM Conservation Strategy and Conservation Management Fund

As part of the effort to preserve the PKBM, a conservation strategy for the mouse has been developed jointly by the Florida Fish and Wildlife Conservation Commission, the Escambia County Board of County Commissioners, and the U.S. Fish and Wildlife Service. Those three entities intend to enter into a Memorandum of Agreement that establishes the Perdido Key Beach Mouse Conservation and Management Fund. The resources in that Fund, and other resources, monetary and in-kind, will be used to implement the Perdido Key Beach Mouse Conservation Strategy.

Another possible stream of revenues into the Conservation Fund could come from activity-based impact contributions, which have been discussed in the public conversations regarding development on Perdido Key. If such an assessment were approved, it most likely would be on an annual basis, providing a continuing stream of revenue into the Fund.

Escambia County is exploring several different funding opportunities for capital improvements and enhancements to Perdido Key. Expansion and repaving of the roadways, sidewalks, bicycle paths, signage, beach access via boardwalks, dune restoration, beach renourishment, beach and dune management, environmental education, streetscaping and additional planning and zoning are all projects which need addressing in the present and future. The Perdido Key Neighborhood Plan is a planning document which describes many of these enhancements. The Plan was adopted by the Board of County Commissioners. The Commission has also approved a Comprehensive Plan Amendment to strengthen concurrency and planning on the Key. This amendment was forwarded to the Department of Community Affairs in June 2005 and is currently under review.

Several funding mechanisms are under consideration and it is expected that multiple sources will be utilized to provide for the planned enhancements. A Tax Increment Finance (TIF) District is proposed by the Commission to establish a funding source dedicated to Perdido Key while also realizing a continued revenue flow to the General Fund. Also under consideration is a Municipal Service Benefit Unit (MSBU) to support conservation management. This MSBU is being considered to apply to existing development, new development, redevelopment or a combination of all three. Grants are utilized on the Key for many projects such as environmental education, dune restoration, beach restoration, habitat management, park development and others as applicable. Mitigation funds for environmental impacts have also been used for park boardwalk and environmental education development.

C. This Report

The purpose of this report is to develop a business plan for the Perdido Key Beach Mouse (PKBM) Conservation Fund. The Fund will implement the PKBM Conservation Strategy. The business plan includes estimates of the costs of implementing the

Conservation Strategy and develops a protocol for allocating conservation contributions to the Fund. Using the implementation cost estimates, the report calculates per-acre contributions. Recommendations are also made for organizing the account structure of the Fund.

The focus of this report was agreed upon at a meeting between the Florida parties (FWC, FWS, and Escambia County) on May 13, 2005. It was further agreed that the draft final report would be submitted four weeks from the anticipated date of contract signature, May 20, to be revised in accordance with comments received at a meeting one week after submittal. The final report was to be completed one week after that meeting.

II. Costs of Implementing the PKBM Conservation Strategy

This section reports the estimated costs of implementing each activity in the PKBM Conservation Strategy. The approach to the cost estimation is discussed in subsection A. Subsection B reports the cost estimates for each component.

To place the costs of implementing the Conservation Strategy for the PKBM in some perspective, it is useful to compare recent spending on another subspecies, the Alabama beach mouse, *P. p. ammobates*. As shown in Table 1, combined state and federal spending on the Alabama beach mouse has exceeded spending on the Perdido Key beach mouse by an order of magnitude in the three-year period from 2001 through 2003.

Table 1. State and Federal Expenditures on the Alabama and Perdido Key Beach Mice, 2001-2003, Current Prices

| | FY 2001 | FY 2002 | FY 2003 | Total, current prices |
|-------------------------|-----------|-------------|-----------|-----------------------|
| Alabama Beach Mouse | \$567,000 | \$1,318,000 | \$820,000 | \$2,705,000 |
| Perdido Key Beach Mouse | \$50,350 | \$114,850 | \$40,650 | \$205,850 |

Source: USFWS, 2003, pp. 10-11, USFWS 2004a, pp. 10-11, USFWS 2004, p. 11.

A. Approach

Two approaches were used to estimate costs. First, a national and international search was conducted to identify similar activities undertaken elsewhere and identify their costs. Second, with assistance from FWC, FWS, and Escambia County personnel, actual costs of activities undertaken recently on Perdido Key or elsewhere in Florida were identified.

Published literature was searched, and personal communication with experts was conducted to identify these activities, understand their scopes and their comparability to the PKBM Conservation Strategy, and determine their costs. Care was taken to include only activities that were comparable in both geographical scope and species. For example, species monitoring on a small island would be considered of comparable geographical scope to Perdido Key. Projects involving other small mammals were considered comparable, but those dealing with large mammals were excluded.

A number of sources were found that contained cost information directly pertinent to Perdido Key and the PKBM. The tables in this report include cost data from a number of species, as well as, costs obtained from studies conducted outside the United States. Some common sense was applied during the search for cost information. For example, the most appropriate cost data are associated with small mammals; but other small species were screened for cost information when it appeared that a study addressed issues similar to those for the PKBM. Habitat management plans that addressed very large

areas and multiple species were excluded if costs were averaged across many habitat types and species populations. In many cases, good cost information would be provided for only one aspect of a study. We included this information to provide comparable costs for component activities of more comprehensive efforts.

As would be expected when gathering information from investigations that cover different species, locations, dates and, importantly, project objectives, costs associated with field studies (monitoring and survey, predator control) are highly variable. We were suspicious of extremely low costs associated with any project. It is likely that labor costs were subsidized, major cost items (overhead) had been underestimated, or the project scope had been inappropriately developed (important tasks not included). We were more confident in costs derived from personal communications with respected and knowledgeable investigators. In addition, cost estimates based on direct inquiries (personal communication) reflected both activities specific to the PKBM and field investigations located on Perdido Key.

Both sources of information were used to seek cost estimates for each component of the Conservation Strategy. In this sense, the two approaches were complementary. In cases where one approach was unable to identify relevant information, the approaches were supplementary. References for specific cost items are reported in the Appendix.

B. Costs of Individual Components

Recurring costs are expressed as annual averages and are reported as annual amounts as well as present discounted values over 10, 50, and 100 years.¹ All costs are expressed in 2005 U.S. dollars. A real discount rate of 5 percent is used.²

1. Surveying and Monitoring

Table 2 provides a range of costs for monitoring and surveying small mammal populations. From this set of studies it appears that yearly surveys average in the range of \$20,000 to \$30,000 per year, with the studies that might best approximate the conditions on Perdido Key located at the higher end of this range. A number of small

¹ The present discounted value concept permits comparison of values or costs at different times, on the assumption that time is money. That is, if a person must make a \$1.00 payment this year and another next year, he could make the first year's payment of \$1.00 immediately, but the value right now of the \$1.00 payment next year is only \$0.9524, because he could put that amount of money in the bank, at 5 percent per annum interest, and in one year it would be worth

\$1.00. The formula for a present discounted value is $PDV = \sum_{t=0}^{t=n} \frac{R_t}{(1+i)^t}$, where R is the revenue to be either paid

out or received, i is the interest rate (alternatively called the discount rate), and t designates the time period, beginning with t = 0 for the initial period and t = n representing the last period. A receipt or expenditure at a more distant date in the future has a lower present value than a receipt or expenditure of identical magnitude at an earlier date. In the tables below, n is set alternatively to 9, 49, and 99 for the 10-year, 50-year, and 100-year present values.

² The average of real discount rates used by the Office of Management and Budget for projects of 30 years and longer duration, from 1979 through 2005, is 4.56 percent (OMB 2005).

mammal surveys were conducted for less than \$15,000 per year, with two studies presenting cost data of less than \$10,000 per year. These lower cost studies should be viewed with a high level of uncertainty, given that survey and monitoring of the PKBM would need to last at a minimum of 5 to 6 weeks, optimally use two field technicians, and require the use of four-wheel-drive vehicles and relatively high per diem rates.

Table 2. Costs of Monitoring and Translocation Projects, 2005 Prices

| Description of Project | Annual Cost | Source |
|---|----------------------|--|
| Monitoring small mammal and songbird communities | \$24,278 | Powell Research Lab http://snrs.url.edu/powell/research.htm |
| Monitoring small mammal on barrier island | \$15,654* | Australian Dept of the Environment & Heritage http://www.deh.gov.au/biodiversity/threatened/publications/recovery/djoongari |
| Monitoring a translocated population | \$7,455 to \$17,891* | Australian Dept of the Environment & Heritage http://www.deh.gov.au/biodiversity/threatened/publications/recovery/djoongari |
| Monitoring a translocated population (contract zoologist) | \$59,189* | Australian Dept of the Environment & Heritage http://www.deh.gov.au/biodiversity/threatened/publications/recovery/djoongari |
| Monitoring and translocating a rodent | \$27,280* | Australian Dept of the Environment & Heritage http://www.deh.gov.au/biodiversity/threatened/action/rodents/rodap6.html |
| Monitoring population and range of beach mouse | \$5,832 | U.S. Fish & Wildlife http://ecos.fws.gov/docs/recovery_plans/1993/930923b.pdf |

* Converted to U.S. dollars with exchange rates of the cost year.

Greater details on the composition of activities and costs were obtained from three sources with first-hand experience of Perdido Key and the PKBM. Costs varied according to the extent of activities undertaken.

In personal communication with Dr. Michael Wooten at Auburn University, we obtained cost estimates for a comprehensive survey and monitoring program. Dr. Wooten has conducted field surveys of the PKBM and offered several insights relevant to a field survey program. Ideally, a field survey program would obtain data relevant to dispersal, birth and death rates, home range, and the spatial pattern of the population density. In addition, the field survey would be able to collect tissue samples suitable for genetic testing. He used the following assumptions in developing his cost estimates:

- Three surveys per year, each lasting 5 to 6 weeks, are need to capture the substantial within year fluctuations in mouse population numbers,
- Two field staff to minimize potential stress to captured mice (rapidly changing weather conditions are stressful to the trapped mice) and for safety concerns for the field staff,
- The need for an all terrain vehicle, and
- The need to stay on or near Perdido Key and the budget for associated housing costs.

Detailed cost information was also received from Dr. John Himes at the Florida Fish and Wildlife Conservation Commission. Dr. Himes also has direct experience with PKBM field sampling and surveys. Based on his estimated resource requirements, survey and monitoring would cost approximately \$54,100 per year (Himes 2005a, 2005b). A substantial difference between the Himes and Wooten estimates is that Himes would only use one field technician for all field work, whereas Wooten suggests using two field technicians.

Escambia County provided estimates of surveying and monitoring costs which include the costs of PKBM and habitat management. Those estimates include periodic equipment costs which, to obtain an approximate annual average, have been divided by their life expectancies. Day also suggests using two full-time environmental specialists, level II. Although the duties of these two personnel would include additional activities such as management of the PKBM and habitat, their full costs are included in this activity, as the other activities are not separately costed. These annual costs are approximately \$197,100. Because the Escambia County activity structure most closely resembles the activities specified in the Conservation Plan, those costs alone are reported in Table 3.

Table 3. Annual Surveying and Monitoring Costs, 2005 Prices

| Cost Category | Cost Items | Number | Cost/year or unit | Annual Cost (average) |
|------------------|---|--------|-------------------|-----------------------|
| Personnel | | | | |
| | Technician | | | \$37,500 |
| | Environmental Specialist II | 3 | \$45,997 | \$137,991 |
| Equipment | | | | |
| | Truck, 4x4 (lifespan ~ 5 yrs) | 1 | \$20,000 | \$4,000 |
| | ATV with trailer (lifespan ~ 5 yrs) | 2 | \$6,000 | \$2,400 |
| | Survey & monitoring equipment; traps; ear tags; clenchers, computer | | | \$10,000 |
| Supplies | | | | |
| | Gasoline, field supplies, etc. | | | \$5,200 |
| Total | | | | \$197,091 |

Table 4 reports the present values of the estimates of survey and monitoring costs over periods of 10, 50, and 100 years, discounted at a real rate of 5 percent.

Table 4. Present Value of Survey and Monitoring Costs, 2005 Prices

| Cost Period | Escambia County Costs |
|-------------|-----------------------|
| 10 years | \$1,603,170 |
| 50 years | \$3,790,086 |
| 100 years | \$4,117,392 |

2. Restoration and Maintenance of Dune Habitat

Restoration of dune habitat is a post-hurricane activity that will occur intermittently, and for which probabilistic, expected values must be estimated. Maintenance involves routine activities such as limited re-vegetation, repair of minor dune blow-outs from small storm surge events, and repair of boardwalks.

a. Restoration

To estimate restoration costs requires several steps. First, the probability of hurricane landfall must be estimated. Second, the expected value of damage to habitat is developed as the restoration cost and must be estimated for a storm of a given magnitude. Third, multiplying the probability of landfall by the value of damages for specific magnitudes of storm gives the expected value of damages in any year. Fourth, the present value of these costs over an extended period must be calculated. Each step involves more detail, such as accounting for storm intensity, nearby landfalls, and details of reconstruction. The following subsections provide these details

i. Expected Value of Dune Reconstruction Costs on Perdido Key after Hurricanes

The calculations begin with annual landfall probabilities, in percents, in Escambia County and surrounding counties, presented in panel 1 of Table 5. For example, the annual probability of a tropical storm (TS) making landfall on Mobile County, in the upper left cell of Table 5 is 2.28 percent. The tropical storm category includes storms with sustained windspeeds of 40 to 75 miles per hour, the hurricane (H) category includes storms with sustained windspeeds from 76 to 115 miles per hour, and the intense hurricane (IH) category includes storms with sustained windspeeds above 115 miles per hour. These are single-landfall probabilities. Multiple incidence probabilities were not available.

Table 5. Probability of Hurricane Landfall Affecting Perdido Key, in Percents*

| Counties | (1) Unweighted probabilities | | | | (2) Location weights | (3) Location-weighted probabilities | | | |
|--------------------|---------------------------------|------|------|---------------|----------------------------|--|------|------|---------------|
| | TS | H | IH | All Storms | | TS | H | IH | All Storms |
| Mobile | 2.28 | 0.60 | 0.14 | 3.02 | 0.6 | 1.37 | 0.36 | 0.08 | 1.81 |
| Baldwin | 3.21 | 0.85 | 0.19 | 4.25 | 1 | 3.21 | 0.85 | 0.19 | 4.25 |
| Escambia | 1.79 | 0.47 | 0.11 | 2.37 | 1 | 1.79 | 0.47 | 0.11 | 2.37 |
| Santa Rosa | 2.28 | 0.60 | 0.14 | 3.02 | 0.5 | 1.14 | 0.30 | 0.07 | 1.51 |
| Okaloosa | 2.34 | 0.62 | 0.14 | 3.10 | 0.35 | 0.82 | 0.22 | 0.05 | 1.09 |
| Sum of Counties | 11.9 | 3.14 | 0.72 | 15.76 | | 8.33 | 2.20 | 0.50 | 11.03 |

*Probability data from William Gray, Colorado State University, United States Landfalling Hurricane Probability Project, <http://www.e-transit.org/hurricane/welcome.html>

Adding across the row for Mobile County in Table 5, the landfall probabilities of the different magnitudes of storm sum to 3.02 percent annually. The landfall probability of any storm striking somewhere in this five-county segment of coastline is the sum of the row and column probabilities, or 15.76 percent, shown in the lower right corner of panel 1.

However, the impact on Perdido Key can be refined by accounting more closely for where a storm would strike, which is accomplished with the location weights shown in panel 2. These location weights account for the effects on Perdido Key of storms making landfall in neighboring counties. Landfall in Escambia County has a weight of 1. Landfalls in neighboring counties have lower impacts on Perdido Key, which is reflected with declining weights for counties to east and west. However, the declining effect is not symmetric. Landfalls in counties to the west have a slightly greater impact on Perdido Key than landfalls in counties to the east, because of the direction of the winds.

Panel 3 multiplies the location weights of panel 2 by the initial county probabilities in panel 1. Each storm category receives the same location weight. Adding the probabilities across the rows and columns of panel 3 yields a regional landfall probability, adjusted for its impact on Escambia County, of 11.03 percent annually.

Table 6 uses the location-adjusted probabilities of Table 5 to develop expected damage probabilities. These damage probabilities are the yearly expected storm damage as a percent of the maximum likely storm damage, with is developed in subsection 2.a.ii below. Continuing the numbering of panels from Table 5, panel 4 contains relative damage weights for the storm categories. The weights use the rule of thumb that, using the Saffir-Simpson 5-category classification of storm strengths, moving each category up the scale involves a 4-fold increase in damages. The TS category is below a category-1 storm, while the H category includes category-1 and 2 storms and the very bottom sustained speeds of category-3 storms. The IH category contains most of the

Table 6. Annual Expected Storm Damage, as Percent of Maximum Expected Damage

| Counties | (4) Damage weights | | | (5) Location- & damage-weighted probabilities | | | |
|-----------------|-----------------------|------|----|--|------|------|------------|
| | TS | H | IH | TS | H | IH | All Storms |
| Mobile | 0.063 | 0.25 | 1 | 0.09 | 0.09 | 0.08 | 0.26 |
| Baldwin | 0.063 | 0.25 | 1 | 0.20 | 0.21 | 0.19 | 0.26 |
| Escambia | 0.063 | 0.25 | 1 | 0.11 | 0.12 | 0.11 | 0.26 |
| Santa Rosa | 0.063 | 0.25 | 1 | 0.07 | 0.08 | 0.07 | 0.26 |
| Okaloosa | 0.063 | 0.25 | 1 | 0.05 | 0.05 | 0.05 | 0.26 |
| Sum of Counties | 0.063 | 0.25 | 1 | 0.52 | 0.55 | 0.50 | 1.57 |

category-3 storms as well as categories 4 and 5. The IH-category storms are assigned a damage weight of 1, H-category storms a weight of 0.25, and the TS storms a weight of 0.0625. Although these county landfall probabilities are available for only three categories of storm, considering the lower probabilities of higher-strength storms, this x4 rule of thumb is expected to capture reasonable damage estimates from storms of different intensity within these three broader categories.

The location-weighted landfall probabilities of panel 3 of Table 5 are multiplied by the damage weights of panel 4 in Table 6 to obtain the location- and damage-weighted probabilities in panel 5 in Table 6.

The aggregate percent of maximum storm damage from hurricane landfall on or around Escambia county is obtained by summing the landfall probabilities of each storm type down the list of counties, then summing those 5-county sums across storm types. The resulting annual landfall probability affecting Perdido Key is 1.57 percent, in the lower right corner of panel 5.

ii. Storm Damages to Habitat

Two approaches were used to estimating storm damages, both involving the damages from Hurricane Ivan. The first approach used the Florida Department of Environmental Protection's (FDEP) published estimates of state and federal funds required for dune reconstruction on Perdido Key (\$5,623,212), plus an additional \$640,000 reported by Escambia County for dune replanting, and add 10 percent to allow for other local costs, for a total of \$6,185,533. When Ivan reached landfall in Baldwin County, Alabama, its sustained windspeeds had fallen to 120 miles per hour, making it a lower-speed category-3 storm, although it falls in the IH category of the present classification. Nonetheless, Ivan's storm surge was very strong, and its damages to habitat were quite extensive. To account for the damages of more intense, but lower-probability storms, the \$6.2 million cost was multiplied by 2, since category 4 and 5 storms would have damages of 4 and 16 times the Category-3 Ivan. This raises the maximum expected storm damage to habitat on Perdido Key to \$12,371,066.

The second approach used actual costs expended on Perdido Key for reconstruction from Ivan, with data supplied by Escambia County (Day 2005). Expenditures have been an estimated \$2,661,400 for dune reconstruction on 28 acres and \$636,943 for replanting on an estimated 75 acres of private land. To that sum were added an estimated \$225,000 for rebuilding boardwalks. Boardwalk construction cost is estimated at an average of \$225 per linear foot, with variations around that average depending on steps and elevation, from information supplied by Walton County. The total estimate is \$3,523,343. Multiplying by 2 to account for effects of stronger storms yields \$7,046,686.

iii. Expected Value of Storm Damages over Extended Periods

The annual expected value of storm damage to the habitat on Perdido Key is the location- and damage-weighted landfall probability of 1.57 percent times the maximum value of damage of \$12.4 million, or \$195,526. The present value of these habitat damages, discounted over periods of 10, 50, and 100 years are presented in Table 7. A real discount rate of 5 percent is used in all present value calculations. Table 7 reports expected dune reconstruction costs, including boardwalks, using the FDEP cost estimates. These costs exclude beach renourishment, which was beyond the scope of this study.

Table 7. Expected Present Value of Hurricane Reconstruction Costs, with Annual Expected Damages 1.57 Percent of Maximum Likely Damages, 2005 Prices

| Cost Period | Present Value |
|-------------|---------------|
| 10 years | \$1,577,183 |
| 50 years | \$3,728,817 |
| 100 years | \$4,053,984 |

The calculated present expected value of storm damages (estimated as dune reconstruction, replanting costs, and boardwalk repair and reconstruction), even over 100 years, is well below even the reconstruction cost from Ivan, which was around \$3.5 million. Eight storms have struck land in Escambia County over the past century. Without distinguishing their intensities, and assuming no multiple landfalls in a single year, that could represent roughly an annual landfall probability, just in Escambia County, of 8 percent. Table 8 reports the present value of damages with that annual probability. An 8 percent probability is probably too high, since it is not adjusted for either the location of landfall or intensity. Using an undiluted 8 percent probability implicitly assumes all 8 storms were in the IH category used above. Henning (n.d.) offers considerable information on storms striking the western Florida panhandle over an extended period. Considering the intensity and landfall information in Henning's report, 8 percent calculated comparably to the 1.57 percent derived from the Colorado State University information would be high, but the extent of the adjustment is not clear. Consequently, Table 8 uses an annual expectation of 8 percent of maximal damages, which should be an upper bound on estimated reconstruction costs.

Table 8. Expected Present Value of Hurricane Reconstruction Costs, with Annual Landfall Probability/Percent of Maximum Damages of 8 Percent, 2005 Prices

| Cost Period | Present Value |
|-------------|---------------|
| 10 years | \$8,024,192 |
| 50 years | \$18,971,002 |
| 100 years | \$20,625,344 |

iv. Market Insurance

An alternative to holding funds equivalent to expected hurricane damages and borrowing for the repair shortfall in the event of a large storm is to purchase insurance on the market. Consultation with one major re-insurance firm that offers policies which could cover dune reconstruction indicated that the cost of such a policy would be in the range of 10 percent of the maximum damage coverage desired. Table 9 reports the present value of the cost of insurance premiums, under alternative assumptions of full and 5 percent coverage of a maximum damage of \$10.9 million. The annual premium for this coverage is \$1.09 million. This cost is clearly well above the present value of expected damages, but even the 100-year present value fund, if it had been accumulated in time, would be insufficient to cover the damage of a single hurricane if it did strike. These costs could be reduced by purchasing lower coverage, but the 10 percent premium indicates that this company's estimate of damage probabilities is higher than those used in the present modeling. The 10 percent figure should not be taken as a firm offer, as more detailed consultation between the Fund and insurance companies could yield a smaller percentage for the annual premium. At any rate, these premium cost estimates suggest that insurance companies may believe the higher end of the distribution of landfall probabilities, possibly as a reaction to the 2004 hurricane season.

Table 9. Present Value of Market Insurance, 2005 Prices

| Cost Period | Full Coverage |
|-------------|---------------|
| 10 years | \$10,030,240 |
| 50 years | \$23,713,753 |
| 100 years | \$25,781,681 |

An alternative to stand-alone insurance on dune reconstruction through a surplus lines company whose rates are not restricted by regulation would be to inquire about adding on dune coverage to the County's building insurance. The fact that the County gives a considerable business to a company for other property could give some leverage to bring down the rate on dune coverage.

b. Maintenance

Maintenance costs are estimated to involve repairs on an average of 300 feet of dune reconstruction per year, and replacement of between 3 and 5 percent of 1000 feet of boardwalk. These annual costs are estimated to be between \$48,417 and \$52,917 per year, corresponding to 3 and 5 percent annual replacement of boardwalk footage. Table 9 reports the present discounted values of these annual costs for periods of 10, 50 and 100 years. The estimates in Table 10 rely on the cost data supplied by Escambia County.

Table 10. Present Value of Maintenance Costs, 2005 Prices

| Cost Period | Annual Boardwalk Replacement Rate | |
|-------------|-----------------------------------|-------------|
| | 3 percent | 5 percent |
| 10 years | \$392,554 | \$429,039 |
| 50 years | \$928,086 | \$1,014,345 |
| 100 years | \$1,009,018 | \$1,102,800 |

Another cost estimate from Florida reports a 7-year dune restoration and re-vegetation project averaging \$94,681 per year in 2005 prices, although information is not available to reveal cost per acre (Himes 2005a-c).

3. Predator Control

A variety of sources suggest a range of annual costs for predator control between \$12,000 and \$80,000 for a territory roughly equivalent in extent to Perdido Key. High and low estimates are presented for this cost. The cost estimates in Table 11 below use annual costs of \$30,091 for one-quarter time of a wildlife biologist and 10 percent time for a wildlife technician, using recent costs of the U.S. Fish and Wildlife Service on Perdido Key. These costs are comparable to an estimate for predator control costs obtained from a project to preserve the Shark Bay Mouse in Australia (Morris, Speldewinde and Orell 2001). The half-time estimate is double those values.

Table 11. Present Value of Predator Control Costs (higher cost), 2005 Prices

| Cost Period | Half-time | Quarter-time |
|-------------|-------------|--------------|
| 10 years | \$487,945 | \$243,972 |
| 50 years | \$1,153,612 | \$576,806 |
| 100 years | \$1,254,211 | \$627,106 |

Table 12 reports predator control costs at the rate of an animal control officer on Perdido Key for half time, at an annual cost, including overhead, of \$16,200, plus \$2000 per year for vehicle expenses and \$500 per year in miscellaneous equipment. Costs are reported at both half- and quarter-time.

Table 12. Present Value of Predator Control Costs (lower cost), 2005 Prices

| Cost Period | Half-time | Quarter-time |
|-------------|-----------|--------------|
| 10 years | \$130,704 | \$65,352 |
| 50 years | \$309,013 | \$154,507 |
| 100 years | \$335,960 | \$167,980 |

Table 13 lists costs for predator control initiatives at several locations in the United States. These costs averaged more than the costs for survey and monitoring activities, with cost ranging from \$30,000 to \$50,000 per initiative. These costs appear to vary according to scope of program

Table 13. Costs of Comparable Predator Control Projects, 2005 Prices

| Description of Project | Annual Cost | Source |
|--|-------------|--|
| Feral predator control | \$80,509* | Australian Dept of the Environment & Heritage http://www.deh.gov.au/biodiversity/threatened/publications/recovery/djoongari |
| Active non-native predator removal | \$10,116 | Florida Dept. of Environment Protection http://www.dep.state.fl.us/parks/planning/parkplans/StAndrewsStatePark.pdf |
| Colonial waterbird habitat and productivity through selective predator removal in Virginia | \$50,000 | Waterbird Conservation Plan, Mid-Atlantic/NewEngland/Maritimes http://www.fws.gov/birds/waterbirds/manem/projects/9.doc |
| Predator Management | \$34,043 | Alameda National Wildlife Refuge USFWS http://pacific.fws.gov/planning/alameda_ccp.htm |

* Converted to U.S. dollars with exchange rates of the cost year.

4. Mitigation Actions

Mitigation actions include acquisition of land through fee-simple purchase or the use of mitigation ratios for land set-asides, purchase of conservation easements, and educational programs. The costs of each set of activities are reported below.

a. Land Acquisition

Land acquisition may take either of two forms, as land-set asides according to a prescribed mitigation ratio or direct purchase for habitat preservation.

i. Mitigation Ratios for Land Set-Asides

Land set-asides have been required in the cases of a number of endangered species. For example, a developer desiring to build on some habitat for an endangered species would be permitted to do so if he or she purchased a specified number of additional acres of habitat for that species and set them aside permanently for habitat. The ratio of set-aside acres to acres developed is called the mitigation ratio.

For example, the mitigation ratio for the Florida scrub jay is from 2:1 to 5:1, depending on the circumstances of available habitat, to be acquired through outright purchase, perpetual conservation easement, or monetary contribution to the Florida Scrub-Jay Conservation Fund adequate to purchase two acres for each acre developed, plus an additional 5 percent to cover administrative costs (Hankla and Slack 2004, p. 3).

In 2000, the U.S. Fish and Wildlife Service required an 18:1 mitigation ratio to permit development in Walton County, Florida that would affect the Choctawhatchee beach mouse (*P. p. allophrys*) (USFWS 2000, p. 2, item F.1 and p. 4, item H.4).

A mitigation ratio for sand skinks of 2:1 has been accepted under certain circumstances (Sullivan 2005).

ii. Land Purchases

Costs of several potential actions have been estimated.

- Establishment of a mouse corridor along the beach, to the south of Perdido Key Drive, from the private land to the west of PKSP to the western edge of PKSP.
- Establishment of a similar corridor from the east side of PKSP to GINS.
- Purchase of parcels north of Perdido Key Drive, east of PKSP.
- Purchase of parcels north of Perdido Key Drive, west of PKSP.

Land prices vary widely between these zones, from around \$1.5 million per acre north of Perdido Key Drive to nearly \$6.5 million per acre along the beach front near the center of the Key. Land values were estimated from 2004 and 2005 sales transactions and asking prices on some parcels currently available. The sales are particularly valuable because they are real exchanges, but in an area of rapid property price increases, the current asking prices may reflect the most recent trends, but the spread between asking and closing price is not known.

Purchases were assumed to be financed with 30-year mortgages at 6 percent interest. Annual payments on the mortgages were calculated, and the 30-year stream of these payments was discounted at a 5 percent discount rate, as has been done for the present value calculations of the other components of the Conservation Strategy.

A mouse corridor of varying width is assumed for the estimation of the cost of a mouse corridor south of Perdido Key Drive, along the beachfront, joining PKSP and GINS and extending mouse access from the western edge of PKSP to Gulf State Park in the Alabama portion of the Key. The corridor is in two segments, one extending west about 2.03 miles from the western edge of PKSP, the other from the eastern edge of PKSP to the eastern edge of GINS, about 3.40 miles. Roughly 20 acres of land is in each segment, for a total of 40 acres for mouse corridor (Sneckenberger, 2005). Costs of parcels vary within these zones, but mean and median are close. The beachfront land closer to the center of the Key is considerably more expensive than the beachfront land further west.

Tables 14 and 15 report these land purchase cost estimates. Sale prices primarily from 2004 are used in the calculations of land acquisition and easement costs because 2005 sale price data were scarce and unsatisfactory; only a small number of 2005 transactions records contained usable information. A percent increase in price for sales between 2004 and 2005 could not be estimated. In each of Tables 14 through 19, the difference between value per acre and cost of acquisition is attributable to the presence of interest payments in the cost calculations.

Table 14. Present Value of Cost of Acquiring 40 Acres of Mouse Corridor South of Perdido Key Drive, 2005 Prices

| Corridor location | Acres | Median Value per Acre | Corridor Cost |
|---------------------------|-------|-----------------------|---------------|
| East side of PKSP to GINS | 20 | \$6,426,230 | \$149,253,902 |
| To west side of PKSP | 20 | \$2,241,810 | \$52,067,680 |

Parcel acquisition costs north of Perdido Key Drive were estimated with the same methods as the mouse corridor cost: 30-year mortgages at 6 percent. As Table 15 shows, land values north of Perdido Key Drive are lower than the beachfront land values south of that road. The median land values, per acre, east of PKSP are somewhat lower than those west of that park. Acquisition costs of 3, 6½, and 10 acres north of Perdido Key Drive, on either side of PKSP, are shown in Table 15. Such acquisitions could be made in either area or by a selection of parcels from both areas, but the costs in the rows of Table 15, in the column for any acreage would not be added when calculating the total Conservation Strategy cost; that would double the estimate of the acreage acquired. Purchases are assumed to be divided equally between parcels east and west of PKSP when calculating total Strategy costs.

Table 15. Present Value of Cost of Acquiring Parcels North of Perdido Key Drive, 2005 Prices

| Parcel location | Median Value per acre | Cost of | | |
|-----------------|-----------------------|-------------|--------------|--------------|
| | | 3 acres | 6.5 acres | 10 acres |
| West of PSKP | \$1,906,250 | \$6,641,108 | \$14,389,067 | \$22,137,027 |
| East of PKSP | \$1,596,990 | \$5,563,689 | \$12,054,660 | \$18,545,631 |

b. Conservation Easements

Instead of purchasing property outright, this section considers the cost of acquiring conservation easements to create the mouse corridors and to acquire mouse habitat on the parcels discussed in the previous sub-section. Conservation easements vary considerably in price, according to location, best use, the type of restriction, the area of the property under restriction, and other conditions. Conservation easement prices in Florida range from 25 to 75 percent of the unrestricted property value. The easements for mouse corridors could be at the lower end of this range because they would restrict only small proportions of parcels, and the restriction of maintaining vegetation appropriate to mouse habitat might have little or no negative impact on property value.

Tables 16 through 19 report the cost of acquiring mouse corridors and parcel-wide habitat for the same areas examined as fee simple acquisitions in the previous sub-section. Tables 16 and 17 use 25 percent of unrestricted land cost as estimated easement prices, and Tables 18 and 19 use 40 percent. The values reported in these tables are those percents of the fee simple acquisition costs reported in Tables 14 and 15. As was the case for fee simple acquisitions in Table 15, the easement costs for the alternative acreages

north of Perdido Key Drive in Tables 17 and 19 would not be added across areas to the east and west of PKSP. For example, when calculating the total cost of the Conservation Strategy, the acquisition cost of easements on ten acres to the east of PKSP would not be added to the acquisition cost of another ten acres to the west. The total costs are estimated with half of each type of acquisition divided between east and west of PKSP.

Table 16. Present Value of Conservation Easement Costs for Mouse Corridors on South Side of Perdido Key Drive, at Easement Prices of 25 Percent of Land Value, 2005 Prices

| Corridor location | Acres | Value per Acre | Corridor Cost |
|---------------------------|-------|----------------|---------------|
| East side of PKSP to GINS | 20 | \$1,606,557 | \$37,313,475 |
| To west side of PKSP | 20 | \$560,453 | \$13,016,920 |

Table 17. Present Value of Conservation Easement Costs on Full Parcels North of Perdido Key Drive, at Easement Prices of 25 Percent of Land Value, 2005 Prices

| Parcel location | Value per Acre | Cost of | | |
|-------------------------|----------------|----------------|----------------|----------------|
| | | 3 acres | 6.5 acres | 10 acres |
| North of PKD, W of PKSP | \$476,563 | \$1,660,277.00 | \$3,597,266.84 | \$5,534,256.68 |
| North of PKD, E of PKSP | \$399,247 | \$1,390,922.34 | \$3,013,665.08 | \$4,636,407.81 |

Table 18. Present Value of Conservation Easement Costs for Mouse Corridors on South Side of Perdido Key Drive, at Easement Prices of 40 Percent of Land Value, 2005 Prices

| Corridor location | Acres | Value per Acre | Corridor Cost |
|---------------------------|-------|----------------|---------------|
| East side of PKSP to GINS | 20 | \$2,570,491.80 | \$59,701,561 |
| To west side of PKSP | 20 | \$896,724.14 | \$20,827,072 |

Table 19. Present Value of Conservation Easement Costs on Full Parcels North of Perdido Key Drive, at Easement Prices of 40 Percent of Land Value, 2005 Prices

| Parcel location | Value per Acre | Cost of | | |
|-------------------------|----------------|----------------|----------------|----------------|
| | | 3 acres | 6.5 acres | 10 acres |
| North of PKD, W of PKSP | \$762,500 | \$2,656,443.21 | \$5,755,626.95 | \$8,854,810.69 |
| North of PKD, E of PKSP | \$638,796 | \$2,225,475.75 | \$4,821,864.13 | \$7,418,252.50 |

c. Education

Costs of education programs are from Florida experience, including Perdido Key. The costs in Table 20 are calculated as a half-time person at \$20,000 per year, \$5,000 in material costs, and for the first five years, a more intensive campaign costing an

additional \$32,500 per year. The last cost is derived from a recent educational campaign on Perdido Key focusing on the PKBM.

Table 20. Present Value of Education Costs, 2005 Prices

| Cost Period | Present Value |
|-------------|---------------|
| 10 years | \$350,439 |
| 50 years | \$626,961 |
| 100 years | \$668,751 |

Table 21 below reports costs on a number of other education projects.

Table 21. Costs of Comparable Public Education Projects, 2005 Prices

| Description of Project | Annual Cost | Source |
|---|----------------|--|
| Public relations/education on Perdido Key: compile research, develop web page and desktop display | \$20,656 | U.S. Fish & Wildlife Service |
| | | Lorna Patrick, e-mail to Bedford Lydon, June 1, 2005 |
| Educational program on sea turtles | \$11,455 | U.S. Fish & Wildlife Service |
| | | Lorna Patrick, e-mail to Bedford Lydon, June 1, 2005 |
| 2-year informational program on PKBM, "Got Habitat" | \$53,454 | Escambia County |
| | | Timothy Day, e-mail to Donald Jones, June 7, 2005 |
| Post signs | \$650 per sign | Lorna Patrick |
| | | U.S. Fish & Wildlife Service, Panama City |

5. Genetic Viability Assessment

The Conservation Fund may conduct studies that would look at the within and between species variability associated with beach mice. Investigations that seek to identify between species variability would use mitochondrial markers. Within species variability could use micro-satellite markers. Costs for these types of studies were collected from researchers who are recognized in the area of population genetics. Costs were broken into two categories: (1) operate an independent facility and (2) contract to an existing facility. Table 22 presents data on costs from a number of sources.

Table 22. Costs of Comparable Conservation Genetics Projects, 2005 Prices

| Activity | Item | Projects | | | | | |
|------------------------|-----------------------|------------------------|-----------------------------------|---------------------|----------------------|------------------|-------------------------|
| | | Hoekstra ¹ | Gerlach ⁵ | Wooten ⁷ | Wyoming ⁶ | FWS ⁸ | Antonovics ⁹ |
| A. Startup Costs | Analyzer | \$135,000 | \$250,000 | | | | |
| | Service Contract | \$8,000 | \$10,000 | | | | |
| | Other Equipment | ~\$25,000 ² | \$30,000 | | | | |
| B. Major Initial Study | Geneticist | | \$20,000 | | | | |
| | Technician | \$35,000 to \$55,000 | | | | | |
| | Supplies | \$20,000 to \$35,000 | \$8,000 to \$10,000 | | | | |
| | Fieldwork | \$5,000 ³ | | | | | |
| | Total | \$60,000 to \$100,000 | \$28,000-30,000 | | \$83,655 | | \$50,000 to \$63,000 |
| | C. Routine Monitoring | Technician | \$15,000 to \$25,000 ⁴ | | | | |
| | Supplies | \$10,000 | | | | | |
| | Fieldwork | \$5,000 | | | | | |
| | Total | \$30,000 to \$40,000 | | | | | |
| Total Cost Only | | | | \$5,164 | | \$1,496 | |

Notes:

1. Dr. H. Hoekstra, University of California, San Diego, Personal communication. Dr. Hoekstra indicates that an experienced laboratory could do the initial study for ~\$30,000 and routine for ~\$15,000.
2. PCR, Visualization system, DNA quantification, Centrifuge, Agarose gel rigs, Pipettes, Computer; assumes availability of freezer, refrigerator, microwave, glassware, etc.
3. Probably could be done by field staff in Florida, with training.
4. Half time technician, depending on number of samples.
5. Dr. G. Gerlach, Marine Biological Laboratory, Woods Hole, Personal communication.
6. Major study to determine genetic composition of a jumping mouse. <http://www.citizenreviewonline.org/jan2004/rodents.htm>.
7. Dr. M. C. Wooten, Auburn University. <http://www.wildflorida.org/cpts/PDF's/Supplement4.pdf>
8. http://ecos.fws.gov/docs/recovery_plans/1987/870812.pdf.
9. Dr. J. Antonovics, University of Virginia, Personal communication.

Acquiring the equipment to operate one's own laboratory would be entail purchasing an expensive sequencer (\$180,000 to \$200,000) and hiring a trained staff (\$150,000 per year). In addition, additional equipment and supplies would need to be purchased for about \$20,000. The costs could be much higher (\$100,000) if there is a need to establish new genetic markers. These costs make it impractical for the conservation fund to establish its own genetics laboratory.

Using an established laboratory and contracting for a genetics analysis would be an efficient use of the Conservation Fund. Himes (2005a) estimated that field data collection to support a within species genetic study would cost approximately \$10,000 per year to analyze 100 mice, 25 PKBM from GINS, 25 PKBM from PKSP, 25 Santa Rosa beach mice (Outgroup # 1), and 25 St. Andrews beach mice (Outgroup # 2). He estimated a per-animal cost of about \$90. His estimate did not include the services of a population geneticist to analyze the data and produce the results. Wooten provided a cost estimate of \$70 per animal. Recently, Wooten analyzed the within variability of 1,000 Alabama beach mice for a total project cost of \$40,000. The study looked at 12 known markers. It appears from our cost data that a genetic analysis using an established laboratory and population geneticist is a viable option for the Conservation Fund.

Table 23 presents costs of other genetics projects undertaken in Florida in recent years. The cost variations are due to variations in scope.

Table 23. Recent Genetics Project Costs from Florida

| Project Cost | Years Duration | Cost per Year |
|--------------|----------------|---------------|
| \$605,000 | 3 | \$201,667 |
| \$62,000 | 3 | \$20,667 |
| \$10,000 | 2 | \$5,000 |
| \$91,000 | 3 | \$30,333 |

Source: Dr. John G. Himes, Northwest Regional Non-Game Biologist, Florida Fish & Wildlife Conservation Commission, Species Conservation Planning Section, Panama City, Florida, June 1, 2005.

Table 24 reports the present value of the costs of a genetics program that begins with an initial major study costing \$50,000. Re-evaluation studies costing \$35,000 in 2005 prices are undertaken 1 and 3 years after hurricanes, which it is estimated occur at an interval of 12 years (the previous century's average of 8 landfalls is more frequent than the landfall implied by the Colorado State University probability estimates used above). Thus every 13th and 16th year, another re-evaluation project is undertaken.

Table 24. Present Value of Genetics Program Costs, 2005 Prices

| Cost Period | Present Value |
|-------------|---------------|
| 10 years | \$85,000 |
| 50 years | \$151,316 |
| 100 years | \$162,469 |

6. Captive Breeding Programs

Hurricane Ivan clearly demonstrated that a rare animal population that only resides on barrier islands can be exposed to catastrophic mortality. The PKBM has survived hurricanes since the Pleistocene, but over the past 30 years development has fragmented and degraded its habitat, making survival after a hurricane considerably more problematic. With this additional risk in mind, the conservation fund may seek a safe haven for the PKBM by developing a captive breeding program. Based on inquiries with investigators familiar with facilities that can maintain mice populations, we received cost estimates from a premier facility, the *Peromyscus* Genetic Stock Center in South Carolina, reported in Table 25. Our personal communications with researchers (e.g., Michael Wooten) indicated that this facility is both capable and likely to be the least expensive breeding facility. Their cost estimate for maintaining the PKBM would include two items (1) trapping at \$14,213 and annual maintenance of \$21,041.

Table 25. Cost Estimate for Importing a Single Species into the University of South Carolina *Peromyscus* Genetic Stock Center and for Its Annual Maintenance, 2005 Prices

| | | |
|--------------------|---|-----------------|
| Set-up | | \$14,213 |
| | Trapping (housing, travel, food, animal transportation) | \$2,529 |
| | Testing (comprehensive profile, including murine and human pathogens) | \$1,821 |
| | Materials (based on 50 cages/species) | |
| | Cages, cage lids, water bottles, sipper tubes, bottle stoppers | \$2,883 |
| | Cage rack | \$1,416 |
| | BioBubble (containment apparatus)* | \$5,564 |
| Annual Maintenance | | \$21,140 |
| | Per diem (\$0.41/cage/day x 365 days x 50 cages) | \$7,483 |
| | Supplies, computer access, sampling materials | \$5,058 |
| | Tech time (salary + fringe)** | \$8,598 |
| Total | | \$35,352 |

* A BioBubble containment facility costs \$22,000 and can accommodate up to four different species.

** A technician can manage up to four different species and costs \$34,393 (salary plus fringe) per year.

While we believe the above costs to be realistic, several important items should be noted that have a substantial effect on a breeding program. First, unlike the mice normally kept by the Center, it may be that federal and state regulations would require that all PKBM die a natural death. All breeding centers regularly cull non-breeding mice. If the PKBM must be kept until they perish naturally, the center could be forced to maintain very large populations of the mice. Second, PKBM raised under laboratory conditions could suffer high mortality rates when released onto Perdido Key. To minimize this problem, protocols could be established specifying that individuals born in the lab be released regularly and, whenever possible, with individuals in the colony that had been born in the wild.

Table 26 reports costs of other captive breeding programs for small mammals. The cost range is wide because of differences in scope of the projects.

Table 26. Costs of Comparable Captive Breeding Projects, 2005 Prices

| Description of Project | Annual Cost | Source |
|--|-------------|--|
| Captive breeding of small mammal, small scale effort | \$5,825* | Australian Department of the Environment & Heritage http://www.deh.gov.au/biodiversity/threatened/publications/recovery/djoongari |
| Captive breeding of small mammal, setup | \$231,090* | Australian Dept of the Environment & Heritage http://www.deh.gov.au/biodiversity/threatened/publications/recovery/djoongari |
| Breeding colony of beach mice | \$2,333 | U.S. Fish & Wildlife Service http://ecos.fws.gov/docs/recovery_plans/1993/930923b.pdf |

* Converted to U.S. dollars with exchange rates of the cost year.

Table 27 reports the present value of the costs of maintaining a captive breeding program for the PKBM. These costs include a one-time set-up cost of \$14,213, recurring annual costs of \$21,14, and, for the first four years, a re-entry study at \$30,000 per year.

Releasing captive-bred mice with acceptable mortality rates is often challenging. Mice raised in captivity may lose their fear of predators, become diurnal, and may not display normal exploratory and social behaviors. Consequently, research is needed to find an approach to transition mice from captivity to the wild. Therefore, beyond the maintenance of a captive breeding colony (Section 6), research will be necessary on appropriate methods of releasing captive breed mice, at an estimated cost of \$30,000 a year for 4 years.

Table 27. Present Value of Costs of Maintaining a Captive Breeding Program, 2005 Prices

| Cost Period | Present Value of Costs |
|-------------|------------------------|
| 10 years | \$297,310 |
| 50 years | \$531,137 |
| 100 years | \$566,475 |

7. Creation and Maintenance of Conservation Fund

The cost of creating the Fund is the cost of the contract with RCF Economic and Financial Consulting, Inc. to establish its business plan, \$61,780. Escambia County will not charge a fee for administering the fund. However, Table 27 reports the present value of administrative costs if they are charged. The first year includes the RCF contract cost and all years include a fee of 5 or 7 percent of the income in the Fund, up to either \$100,000 or \$250,000, after which income no further fee would be collected. Because Escambia County has indicated it will not charge such administrative fees, only the contract cost is included in the summary tables of total Conservation Strategy costs, not the administrative fees also included in Table 27.

Table 27. Present Value of Administrative Costs, if Charged, in 2005 Prices

| Cost Period | Upper Limit of Administrative Charges | | | |
|-------------|---------------------------------------|-----------|-----------------------|-----------|
| | \$100,000 | | \$250,000 | |
| | Administrative Charge | | Administrative Charge | |
| | 5% | 7% | 5% | 7% |
| 10 years | \$103,352 | \$120,181 | \$152,814 | \$189,428 |
| 50 years | \$158,657 | \$197,607 | \$261,374 | \$341,412 |
| 100 years | \$167,014 | \$209,308 | \$282,269 | \$370,665 |

8. Research Necessary to Achieve Conservation Strategy Goals

Tables 28 and 29 below report research project costs aimed at preserving comparable species in Florida and at other locations around the United States and around the world. The scope and duration of the projects vary.

Table 28. Costs of Recent Research Projects in Florida

| Subject | Total Project Cost | Years Duration | Average Cost per Year |
|-----------------------------------|--------------------|----------------|-----------------------|
| Habitat | \$187,000 | 5 | \$37,400 |
| Habitat | \$86,000 | 3 | \$28,667 |
| Habitat | \$36,000 | 3 | \$12,000 |
| Habitat, Conservation | \$66,000 | 3 | \$22,000 |
| Habitat, Conservation | \$208,000 | 6 | \$34,667 |
| Mouse Relocation | \$7,000 | 1 | \$7,000 |
| Mouse Relocation | \$17,000 | 2 | \$8,500 |
| Conservation | \$369,000 | 5 | \$73,800 |
| Population Dynamics | \$11,000 | 3 | \$3,667 |
| Population Dynamics, Genetics | \$290,000 | 4 | \$72,500 |
| Population Dynamics, Conservation | \$188,000 | 6 | \$31,333 |
| Population Dynamics, Habitat | \$170,000 | 6 | \$28,333 |

Source: Dr. John G. Himes, Northwest Regional Non-Game Biologist, Florida Fish & Wildlife Conservation Commission, Species Conservation Planning Section, Panama City, Florida, June 1, 2005.

Table 29. Costs of Population Dynamics Projects in Other Locations, 2005 Prices

| Description of Project | Annual Cost | Source |
|--|-------------|--|
| Field study of a Florida mouse | \$33,049 | Florida Conservation Commission http://www.wildflorida.org/cptps/fy2003_04updates.asp |
| Field study of a beach mouse | \$33,049 | Florida Conservation Commission http://www.wildflorida.org/cptps/PDFs/Supplement4.pdf |
| Life history and habitat studies of beach mice | \$22,434 | U.S. Fish & Wildlife http://ecos.fws.gov/docs/recovery_plans/1987/870812.pdf |
| Abundance/Distribution of Small Mammals | \$25,819 | Funding the Natural Resource Challenge – 2003 http://www.nature.nps.gov/Challenge/reportstocongress.cfm |
| Allegheny woodrat inventory | \$4,131 | Funding the Natural Resource Challenge – 2003 http://www.nature.nps.gov/Challenge/reportstocongress.cfm |
| Santa Rosa Beach mouse use of hurricane fragmented landscape | \$22,721 | Funding the Natural Resource Challenge – 2003 http://www.nature.nps.gov/Challenge/reportstocongress.cfm |

FWC estimates an average annual cost of planned research projects to improve scientific understanding of the PKBM at \$66,761, including overhead costs (Himes 2005a). Two alternative programs are considered: (1) Conduct habitat and population viability analysis (PVA) in the second year, use this full cost of \$66,761, conduct further habitat research but omit the PVA (cost estimated at \$24,284) for the next five years; thereafter conduct habitat studies every other year; and (2) conduct the full array of

habitat studies during the first five years, and the PVA within the same period of time; every five years thereafter, conduct the full array of studies for a 2-year period. Table 30 reports the present value of the research costs of these two programs. The two programs' costs are very similar.

Table 30. Present Value of Research Costs Necessary to Achieve Conservation Strategy Goals, 2005 Prices

| Cost Period | Present Value of Costs, Program 1 | Present Value of Costs, Program 2 |
|-------------|-----------------------------------|-----------------------------------|
| 10 years | \$308,233 | \$303,492 |
| 50 years | \$544,072 | \$544,436 |
| 100 years | \$578,708 | \$575,266 |

C. Cost Summary

Table 31 reports annual costs of implementing the Conservation Strategy for the first year, in 2005 prices. Some the costs reported in this table are average annual values. Others are costs for the first year. For some of the activities, annual variations around the average value are relatively small, such as for monitoring and surveying. In education, the first five years' activities include a more intensive educational campaign, which give way to a longer-term, less intensive set of activities; the average value would virtually eliminate the effect of the first five years additional activities, but Table 31 reports the first-year cost. In the cases of the genetics, captive breeding, and other research costs, an initial study in the first year is not repeated in subsequent years. The costs of setting up and maintaining the fund occur only in the first year. In the genetics and other research programs, there are no activities in some years, and those years have zero costs. When costs do occur in subsequent years, they appear at different years in different components of the program, making average annual costs at best a rough guide to any given year's cost. First-year costs are presented for these activities.

The high, middle, and low scenarios correspond to the ranges of costs presented for each of the activities in the previous sections. Where no realistic ranges of programmatic costs were determined in the individual sections, the same cost is reported in all three columns.

Table 31. Annual Costs of Implementing PKBM Conservation Strategy, 2005 Prices

| Activity | High | Middle | Low |
|--|--------------|--------------|--------------|
| 1. Surveying and Monitoring | \$197,091 | \$197,091 | \$197,091 |
| 2. Restoration and Maintenance of Dune Habitat | | | |
| a. Restoration | \$1,237,107 | \$989,685 | \$194,526 |
| b. Maintenance | \$52,917 | \$48,417 | \$48,417 |
| 3. Predator Control | \$60,182 | \$60,182 | \$30,091 |
| 4. Mitigation Actions | | | |
| a. Land Acquisition ¹ | \$13,732,848 | \$13,291,771 | \$12,850,693 |
| b. Conservation Easements ² | \$5,493,139 | \$5,316,708 | \$3,212,673 |
| c. Education | \$57,500 | \$57,500 | \$57,500 |
| 5. Genetic Viability Assessment | \$71,041 | \$71,041 | \$71,041 |
| 6. Captive Breeding Programs | \$65,254 | \$65,254 | \$65,254 |
| 7. Creation and Maintenance of Conservation Fund | \$61,780 | \$61,780 | \$61,780 |
| 8. Research Necessary to Achieve Conservation Strategy Goals | \$66,761 | \$42,477 | \$42,477 |
| Total of Activity Costs, plus Land Acquisition | \$15,602,579 | \$14,885,297 | \$13,618,969 |
| Total of Activity Costs, plus Conservation Easements | \$7,362,871 | \$6,910,234 | \$3,980,949 |
| Total of Activity Costs without Land Actions | \$1,869,731 | \$1,593,526 | \$768,276 |

¹ All costs include mouse corridors south of Perdido Key Drive; high includes fee simple acquisition of 10 acres north of Perdido Key Drive, medium 6.5 acres, and low 3 acres.

² All costs include mouse corridors south of Perdido Key Drive; high includes easements on 10 acres north of Perdido Key Drive at a 40 percent easement price, the middle range includes easements on 6.5 acres at a 40 percent easement price, and the low includes easements on 3 acres at a 25 percent easement price.

Table 32 reports the present values of the full cost of Strategy implementation over the 100-year horizon reported in the previous sections. These calculations fully account for the different costs in different years and the widely differing annual spending patterns of some of the activities. The 100-year present value is only about 7.4 percent greater than the 50-year present value for the largest-cost items because of the discounting, and the longer time horizon may give a more realistic estimate of long-term species protection costs. The high, middle, and low ranges reflect the alternative activity levels and costs discussed in the individual cost sections.

Table 32. 100-Year Present Value of Costs of Implementing PKBM Conservation Strategy, 2005 Prices

| Activity | High | Middle | Low |
|--|---------------|---------------|---------------|
| 1. Surveying and Monitoring | \$4,117,392 | \$4,117,392 | \$4,117,392 |
| 2. Restoration and Maintenance of Dune Habitat | | | |
| a. Restoration | \$25,781,681 | \$20,625,344 | \$4,053,984 |
| b. Maintenance | \$1,102,800 | \$1,009,018 | \$1,009,018 |
| 3. Predator Control | \$1,254,211 | \$1,254,211 | \$627,106 |
| 4. Mitigation Actions | | | |
| a. Land Acquisition ¹ | \$221,662,911 | \$214,543,446 | \$207,423,981 |
| b. Conservation Easements ² | \$88,665,165 | \$85,817,378 | \$51,855,995 |
| c. Education | \$668,751 | \$668,751 | \$668,751 |
| 5. Genetic Viability Assessment | \$162,469 | \$162,469 | \$162,469 |
| 6. Captive Breeding Programs | \$566,475 | \$566,475 | \$566,475 |
| 7. Creation and Maintenance of Conservation Fund | \$61,780 | \$61,780 | \$61,780 |
| 8. Research Necessary to Achieve Conservation Strategy Goals | \$578,708 | \$575,266 | \$575,266 |
| Total with Land Acquisition | \$255,957,178 | \$243,584,153 | \$219,266,222 |
| Total with Conservation Easements | \$122,959,431 | \$114,858,086 | \$63,698,237 |
| Total without Land Actions | \$34,294,267 | \$29,040,707 | \$11,842,241 |

¹ All costs include mouse corridors south of Perdido Key Drive; high includes fee simple acquisition of 10 acres north of Perdido Key Drive, medium 6.5 acres, and low 3 acres.

² All costs include mouse corridors south of Perdido Key Drive; high includes easements on 10 acres north of Perdido Key Drive at a 40 percent easement price, the middle range includes easements on 6.5 acres at a 40 percent easement price, and the low includes easements on 3 acres at a 25 percent easement price.

III. Allocation of Contributions to the Conservation Fund

The costs of implementing the Conservation Strategy identified in Section II.B will be met in part by contributions to the Conservation Fund from conservation contributions. The protocol for calculating the conservation contribution per acre of footprint on mouse habitat is comprised of two steps as shown and described below:

$$\text{Contribution per Acre of Development} = \frac{\text{Total Cost of Conservation Strategy}}{\text{Acres of Private PKBM Habitat}}$$

The contribution per acre of development is determined by dividing the total cost of implementing the conservation strategy by the acres of PKBM habitat on private land in the Florida portion of the Key, which is estimated to be about 240 acres (USFWS 2004b; Patrick 2005a, b).

Conservation Contribution =

$$\text{Contribution per Acre of Development} * \text{Habitat Area Affected by Development}$$

At the May 13, 2005 meeting of the Conservation and Management Fund partners and RCF, it was determined that current scientific information indicates that all units of habitat may be equally valuable. Accordingly, per-acre conservation contributions are not varied according to location.

If private development can avoid beach mouse habitat, no conservation contribution is involved. If a developer chooses, development can be planned so as to avoid or minimize use of habitat, which would reduce the amount of the contribution.

Table 33 reports the range of conservation contributions derived from application of the allocation formula in this section to the range of possible activities in the Conservation Strategy.

Table 33. Conservation Contribution, per Acre Developed, 2005 Prices

| Costs Included in Conservation Strategy | Implementation Cost Scenario | | |
|--|------------------------------|-------------|-----------|
| | High | Middle | Low |
| Total of Activity Costs, plus Land Acquisition | \$1,066,488 | \$1,014,934 | \$913,609 |
| Total of Activity Costs, plus Conservation Easements | \$512,331 | \$478,575 | \$265,409 |
| Total of Activity Costs without Land Actions | \$142,893 | \$121,003 | \$49,343 |

Using this formula, contributions would cover the same percent of the Conservation Strategy's implementation costs as the percent of the approximately 240

acres of private habitat that are developed. It is expected that these acres will be largely developed within 7 to 10 years, at which time income flows into the Fund would fall. Nonetheless, continuing contributions at some level would be associated with re-developments that could occur in the distant future, but predicting those activities is outside the scope of the current effort.

The Fund may choose to defer some proportion of the conservation contribution on an acre developed on mouse habitat. Unless the Fund charges interest on the deferred portion of the contribution, deferral would be equivalent to a free loan from the Fund to the developing party. The appropriate interest rate to use for this calculation would be the interest rate the Fund receives on any assets it holds.

If interest is not charged on deferred portions, the amount deferred should be adjusted for inflation between the date of the development and the date of payment of the deferred portion. Without such an adjustment, the real value of the contribution would be lower than its value would have been at the time of development. The all-U.S. Consumer Price Index, as published by the U.S. Bureau of Labor Statistics (2005), would be a suitable index for making this price level adjustment. The appropriate set of calculations is provided below. The amount of deferred contribution to be paid at some future date is

$$C_{t(dev)}^{t(pay)} = C_{t(dev)} \frac{CPI_{t(pay)}}{CPI_{t(dev)}}$$

where the subscript t(dev) denotes the date (year) of the development, when the non-deferred part of the contribution was made, and the superscript t(pay) denotes the date when the deferred contribution is made.³ The deferred contribution, in the prices of the date of deferral, is multiplied by the ratio of the consumer price index at the repayment date to the CPI at the deferral date to obtain the magnitude of the deferred contribution at its contribution date in the prices of the development date. Since inflation is difficult to predict, the actual, current dollar amount of the deferred contribution anticipated at a particular date in the future could be estimated only roughly.

If the Fund chooses to charge interest on the deferred component of a conservation contribution, the price level adjustment should not be made, because the market interest rate contains the inflation rate within it (the market interest rate is the sum of the “real” interest rate, which is not observed directly, and the expected rate of inflation, which is generally very close to the actual rate of inflation).

³ The development-year contribution must be multiplied by the ratio of the two CPI values because the CPI is constructed relative to prices in a particular year or average of several years, known as the base period of the index. Division of the CPI value of any year X by the CPI value of another year Y converts the price index level of year X to an index with year Y as the base. Thus, the formula above converts the payment year CPI to a base of the development year, and the magnitude of the ratio will tell the percent change in the price level between the development year and the payment year. Multiplication of the deferred conservation contribution at the time of development by this ratio converts the contribution to its equivalent value in the prices of the year when the contribution is scheduled to be made.

IV. Accounting Protocols for the Conservation Fund

Section A discusses the timing of revenues and expenditures and issues that must be addressed if the two flows of funds diverge. Section B recommends an accounting and reporting protocol for the Fund.

A. The Time Pattern of Revenues and Expenses

The term revenue is used to refer to any inflow into the fund (from contributions, donations, grants, etc.). The terms expenses, costs, and expenditures are used interchangeably to refer to outflows from the fund. The magnitudes and timing of costs have been projected in Section II. Given those estimates, the same questions must be asked of revenues: how much revenue to expect and when those revenues will arrive.

1. Timing of Revenues

Four main sources of revenues may be anticipated: conservation contributions, state and federal grants, private grants and donations, and income from assets. These sources of revenues can be expected to differ in their regularity. Most of the revenues from conservation contributions can be expected to appear over the first 5 years or so of the Fund's existence. Given the current pace and character of real estate development on the Key, most of the major opportunities to make major alterations to current land use patterns will occur soon. When those developments have been approved, the magnitude of conservation contribution revenues will drop off. Thereafter conservation contributions will derive primarily from more modest modifications—for example, the addition of a tennis court, construction of a room extension or a garage to a private dwelling, etc.

Second, some of the types of activity included in the Conservation Strategy are candidates for funding through federal or state grants and programs, or both. Some of the research might receive such funding. Some of the post-hurricane restoration clearly would qualify for federal and state funding. Other preservation activities such as education could attract at least partial federal or state funding. The regularity of funds from such sources is questionable, as it would depend on the competitiveness of applications and public budgets.

Third, various private sources exist. Private foundations such as The Nature Conservancy or the World Wildlife Fund are potential sources for some funding, possibly including the acquisition of fee simple land or conservation easements. Purely private donations, which could be tax deductible, could be attracted from local residents and visitors to the Key's parks. This revenue source also would not be expected to be highly regular.

Finally, the Fund may accumulate assets. While most grants, government or private, would require full expenditure within the grant period, other revenue sources could be retained if they exceeded expenditures in a given period.

2. Timing of Income and Expenditures

The cost calculations have been made with a 100-year time profile, which would be far too cumbersome to present in full here. However, the first ten years of expenditures, shown in Table 34, are representative of the full time period's expenditure pattern. The expenditures in Table 34 are in 2005 prices and are not discounted. The first row shows the annual expenditures for the full array of Conservation Plan activities, including land acquisition and the purchase of easements, under the low scenario. The second row eliminates land acquisition, and the third row eliminates easement purchase as well, also under the low scenario. Both of these expenditures end in year 30. Without the land acquisitions activities, the first year's expenditures are nearly one-third greater than those in succeeding years, because of the existence of several activities that have initial, non-recurring components. Expenditures vary between years because of intermittent equipment replacements, varying dates of research activities, etc. In general, from year 2 through year 100, the expenditures, excluding land acquisition and easement purchases, range between \$500 thousand and \$600 thousand.

Table 34. Timing of Expenditures, First 10 Years, Thousands of 2005 Dollars

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| With land acquisition | \$13,664 | \$13,471 | \$13,471 | \$13,471 | \$13,441 | \$13,374 | \$13,342 | \$13,342 | \$13,342 | \$13,342 |
| With easements | \$4,026 | \$3,833 | \$3,833 | \$3,833 | \$3,803 | \$3,736 | \$3,704 | \$3,704 | \$3,704 | \$3,704 |
| Without land acquisition or easements | \$814 | \$621 | \$621 | \$621 | \$591 | \$524 | \$492 | \$492 | \$492 | \$492 |

Figures 1 through 3 show the yearly income to the Fund and expenditures of the Conservation Strategy under each of the possible per-acre conservation contributions reported in Table 33, with and without land acquisition actions. The scales differ sufficiently between income in the first few years and expenditures that variations in the annual expenditures are difficult to see in those figures, so Figure 4 presents expenditures with no land purchases or easement acquisitions to facilitate observation of expenditure variations. The flows of income are in 2005 prices and are based on the following assumption regarding acres developed annually: 1 acre developed in the first year, 5 in the second year, 10 in the third, 25 in the fourth, 35 each in years 5 through 8, and 19 in the ninth, for a rapid development of 200 acres; in years 10 through 20, 1 acre per year is assumed to be developed or re-developed. Expenditures are also in 2005 prices.

Figure 1. Income from Conservation Contributions and Expenditures of the Conservation Strategy with No Land Actions during the First 20 Years of the Fund, 2005 Prices

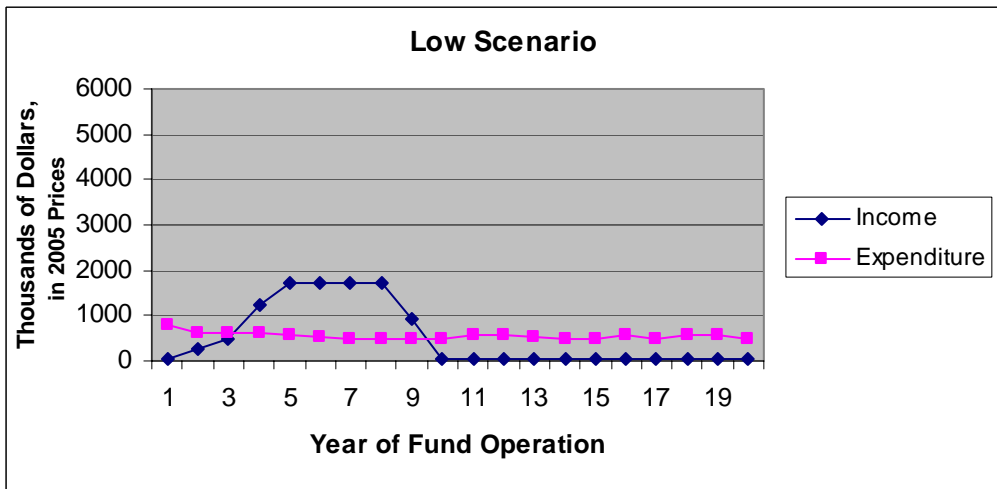
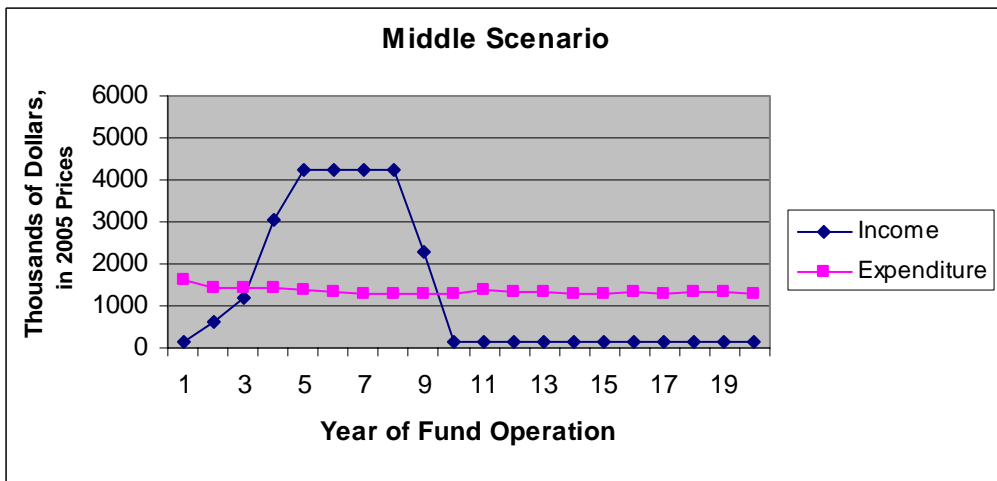
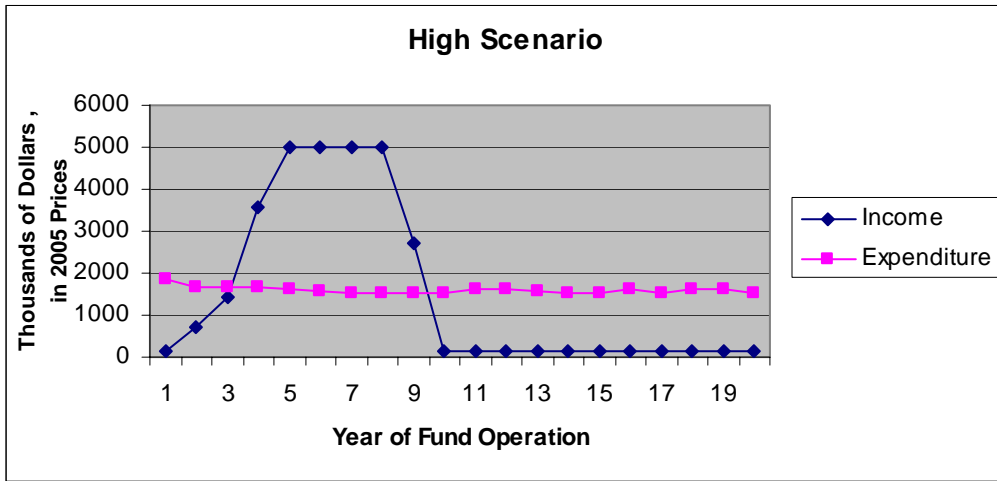


Figure 2. Income from Conservation Contributions and Expenditures of the Conservation Strategy with Land Acquisitions during the First 20 Years of the Fund, 2005 Prices

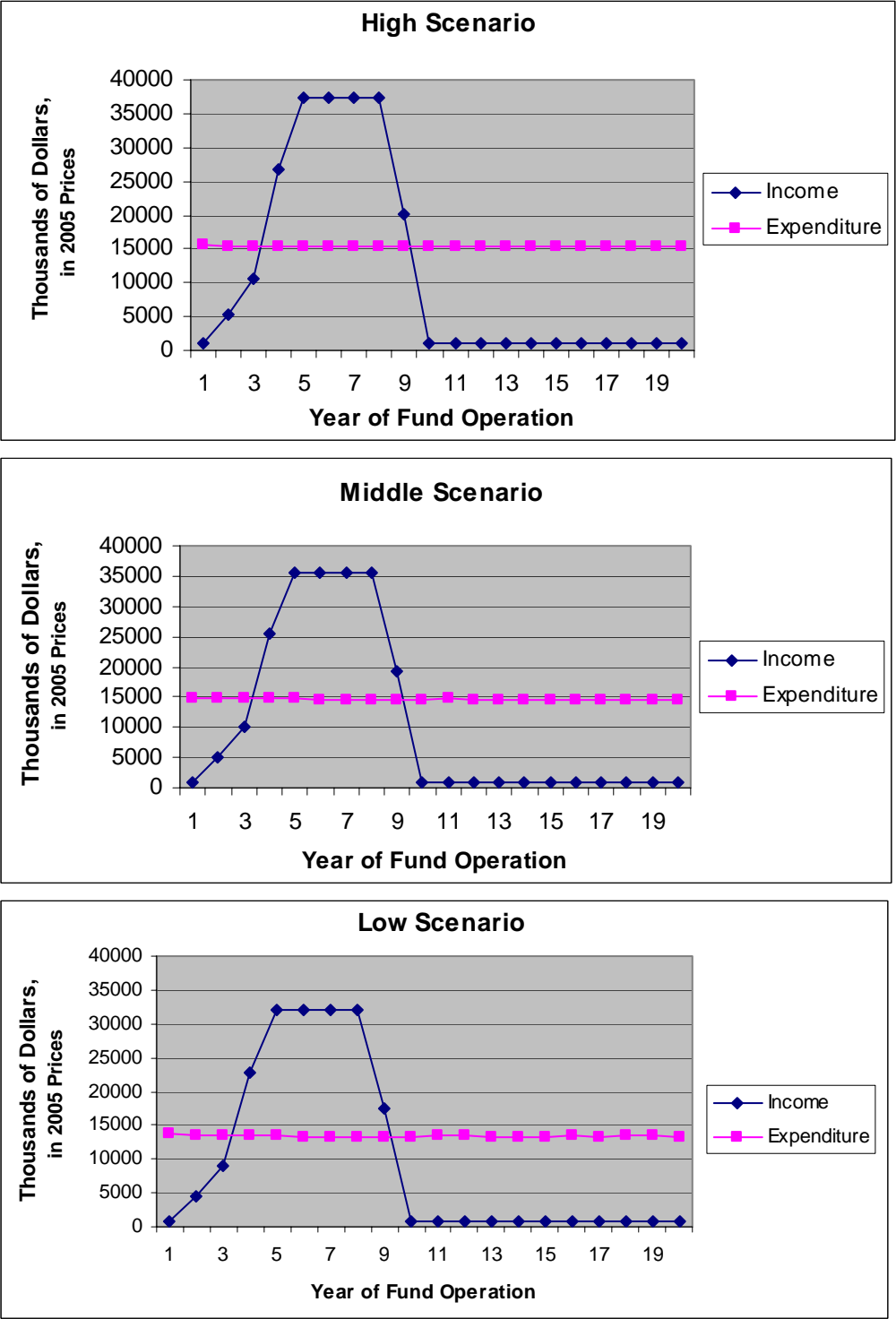


Figure 3. Income from Conservation Contributions and Expenditures of the Conservation Strategy with Easement Acquisitions during the First 20 Years of the Fund, 2005 Prices

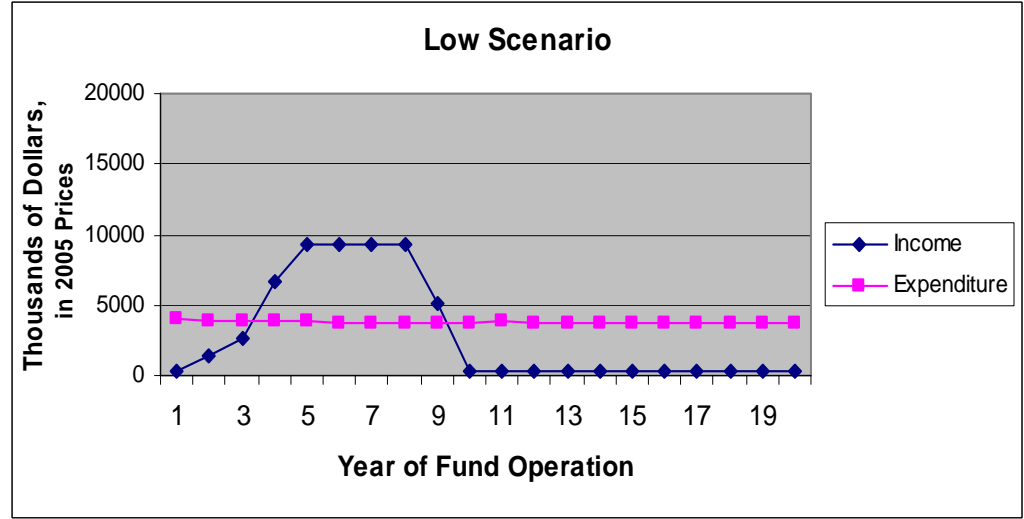
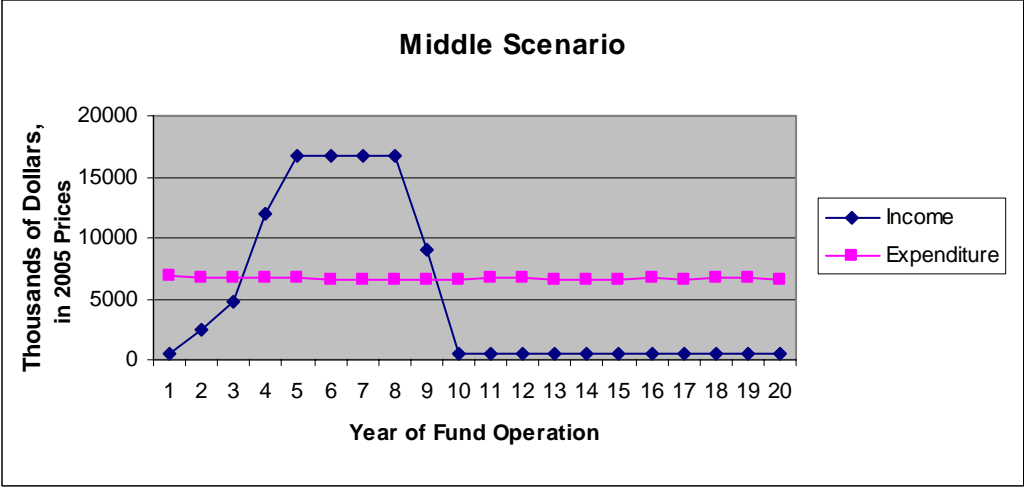
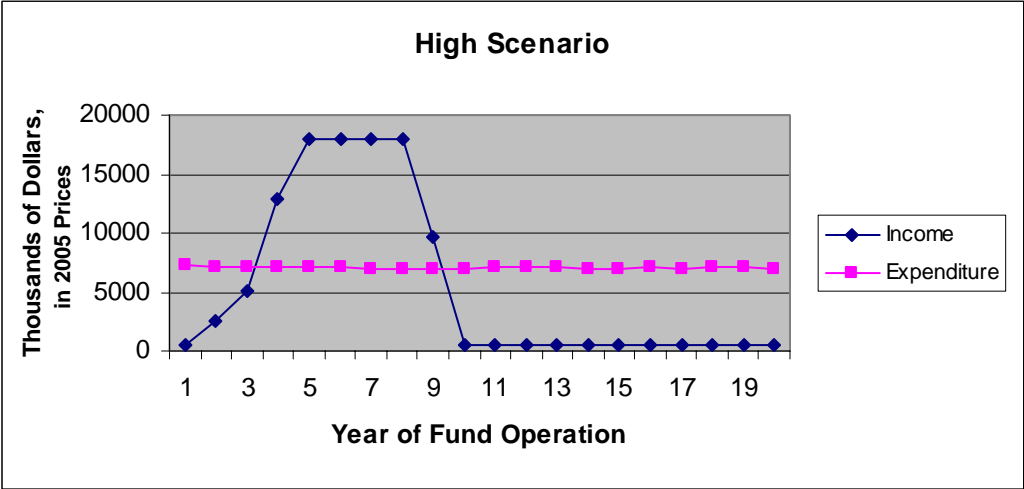
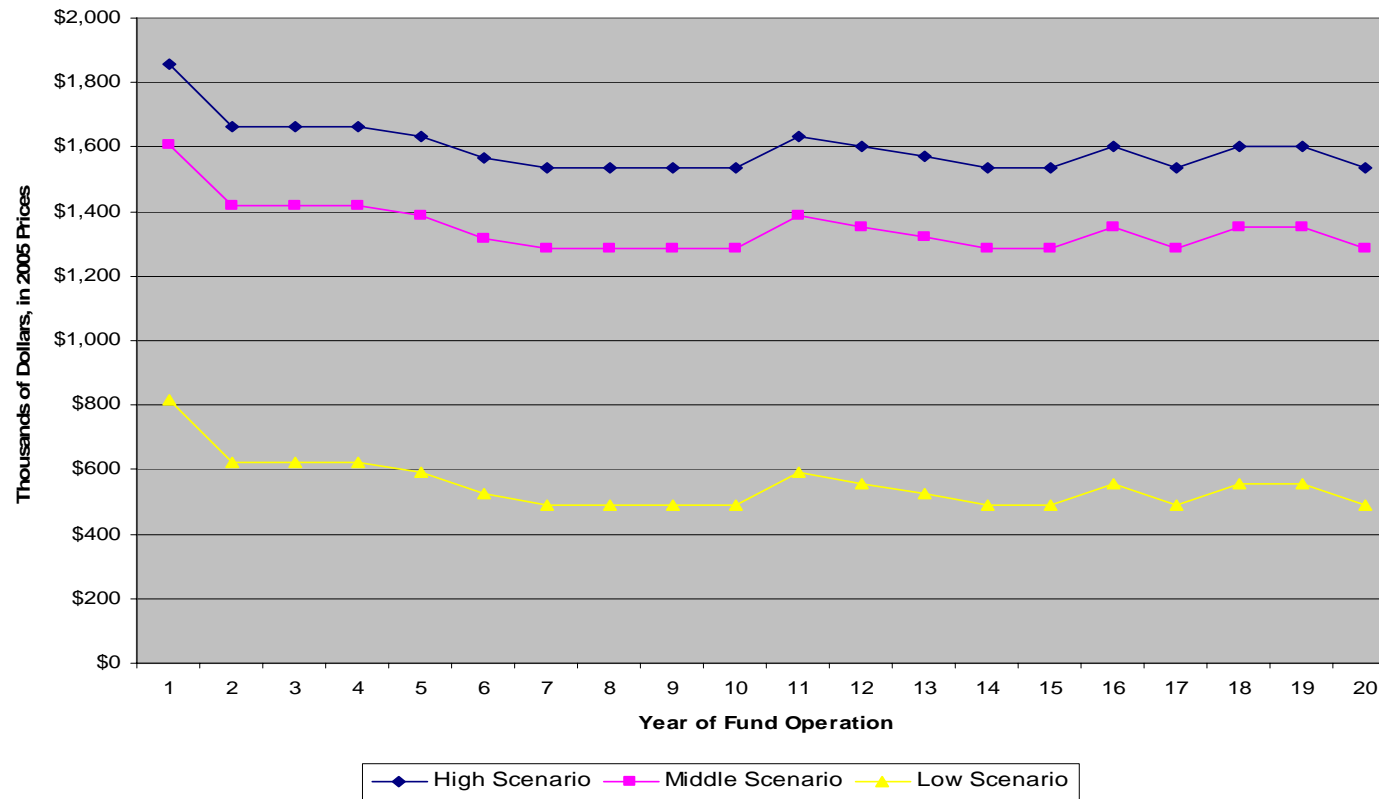


Figure 4. Expenditures of the Conservation Strategy with No Land Actions during the First 20 Years of the Fund, 2005 Prices



3. Dealing with Temporary Gaps between Revenue and Expenditures

If the Fund is not allowed to borrow, revenues must equal or exceed expenditures in each period, unless accumulated assets are spent in addition to the income derived from them. In circumstances where proposed expenditures exceed revenues, then the scale of activities would have to be adjusted to meet the available revenues.

If borrowing is permitted, it would be constrained by uncertainties in the Fund's future income stream.

B. Accounting and Reporting Protocol

The recommended accounting and reporting system needs to be able properly to track revenue received by the Fund, indicating the source, whether restricted or not, and for what purpose the funds are earmarked.

Expenditures need to be identified by both the activity for which they are being spent, e.g. dune restoration, and the nature of the expenditure, e.g. salaries and wages.

Generated reports must provide the Conservation Management Fund (CMF) partner agencies with information on the financial status, including comparisons to plans and budgets, of the various conservation activities underway.

1. Accounting

The elements of the proposed accounting and reporting system include tracking the financial transactions of any important ongoing activity or non-recurring project in Activity Centers – cost centers in the county system – with an Administration center used for receiving incoming funds and to record expenditures of a general nature.

Given the nature of the CMF – that is, its activities are not tied to the county's tax year, but rather the focus is on reporting on the ongoing resources in the fund – there may be no need for budgetary accounts, encumbrances and the like. While budgets must be created, actual expenses can be reported against budgets in the manner of a commercial enterprise. However, if finance personnel are more comfortable using all the features of the county system of budgetary accounts, this will work as well.

Since Escambia County will be maintaining the books of the CMF (albeit as a separate trust fund), the existing account structure used by the County may be utilized as much as possible. Obviously, cost centers and accounts specific to the CMF will have to be integrated into the County's system. The existing structure of a complete account code is as follows:

xxx -Fund
 xxxxxx -Cost Center
 xxxxx -Detail revenue or expense account

a. Fund (CMF)

The county will assign a fund number to CMF that will serve as the first part of the overall account number, possibly “882”. This fund will not be incorporated into the county’s financial reports.

b. Activity Centers

Based on the types of activities and projects contemplated, the following “activity centers” might be established, using the cost center portion of the account structure. In some cases, “sub-centers” would be needed. For example, in addition to reporting on how much is being spent on dune restoration activity, it might be desirable to know the amounts spent at Perdido Key State Park, Gulf Islands National Seashore, etc. These sub-centers are reflected below as bolded numbers. At present, the county finance department has not assigned cost center numbers, so sample numbers are used for illustration.

| <u>Sample Number</u> | <u>Activity Center</u> |
|----------------------|----------------------------------|
| 100000 | General Administration |
| 101000 | Dune Restoration and Maintenance |
| 101100 | -GINS |
| 101200 | -PKSP |
| 101300 | -Private |
| 102000 | Survey and Monitoring |
| 102100 | -GINS |
| 102200 | -PKSP |
| 102300 | -Private |
| 103000 | Education |
| 104000 | Marketing |
| 105000 | Predator Control |
| 106000 | Captive Breeding |
| 107000 | Research |
| 108000 | Genetic Viability Assessment |
| 109000 | FWC Activities (Note) |
| 109xxx | -Specific activities |
| 110000 | Land Acquisition |
| 111000 | Easement Acquisition |
| 112000 | Debt Service (if applicable) |

According to the Memorandum of Agreement establishing the CMF, “Funds in the CMF received from mitigation from FWC permitting will be accounted for separately within the CMF.” Accordingly, it would seem that FWC activities would be accounted for in a separate activity center, with sub-centers as needed.

Additional activity centers can be added if the activity is important enough to be reported separately – e.g. “Enforcement” or “PKBM Support.” Non-recurring projects would be assigned an activity center title and number as well.

c. Revenue Accounts

To account for all incoming funds in appropriate detail, we recommend establishing the following revenue accounts:

- Conservation Contributions
- Habitat Impact Assessments
- Grants – Unrestricted
- Grants – Restricted
- Donations – Unrestricted
- Donations – Restricted
- Investment Income
- Debt Proceeds (if applicable)

The conservation contributions, along with unrestricted grants and donations and investment income would be captured in the General Administration activity center. From there, the funds would be allocated (book entry only) to the activity centers as decided by the CMF partners.

Some restricted funds might also be captured in Administration, but most would be credited to the activity center where the supported activity will take place.

d. Expenditures

Where possible, the expense-account numbers would be those used by the county – e.g.: 51201 – Regular Salaries and Wages, 53401 – Other Contractual Services, 55201 – Operating Supplies.

Some expenditures may be peculiar to CMF, e.g., Non-recurring Projects – FWC, Dune Replanting, Seasonal Help, etc. These accounts need to be numbered, probably consistently with the existing account structure.

e. Account Coding of Transactions

Several examples illustrate the structure outlined above:

| | |
|------------------|--|
| 882-101100-51201 | Salaries of personnel performing dune restoration activities at Gulf Islands National Seashore |
| 882-105000-55201 | Operating supplies for use in predator control activities |

A proposed chart of accounts is attached.

| PERDIDO KEY BEACH MOUSE CONSERVATION MANAGEMENT FUND Chart of Accounts | |
|---|---|
| <u>Assets</u> | |
| Cash | Assumes that cash receipts are deposited in a County bank account for the benefit of the CMF. |
| Receivables | Conservation Contributions Represents amounts from developers and landowners for contributions to the CMF, identified by the MOA partners. |
| Investments | Represents any excess funds invested. May need to grow to substantial amounts if investment income is needed to sustain the Fund. |
| <u>Liabilities and Fund Balance</u> | |
| <u>Liabilities</u> | |
| Vouchers payable | |
| Due to other entities | Any loans from the County, FWC or FWS |
| Fund Balance | |
| General | |
| FWC | Since FWC contributions are to be accounted for separately per the MOA, unspent funds from this source are restricted. |
| Restricted | Represents the unspent portion of any restricted donations or grants. Will require subsidiary ledger accounts. |

Revenues

Conservation Contributions

Habitat Impact Assessments

Grants - Unrestricted

Grants – Restricted

Generally credited to the appropriate activity center- e.g., grants for the purpose of dune restoration would be credited to that center

Donations – Unrestricted

Donations - Restricted

Generally credited to the appropriate activity center- e.g., donations for the purpose of dune restoration would be credited to that center

Allocations

Used to transfer unrestricted funds (book entry only) to activity centers as directed by CMF partners

Investment Income

Expenditures

Salaries & Wages

Payroll Taxes

Employee Benefits

Seasonal Help

If staff will work in only one area, the above might be charged directly to the appropriate activity center. A more flexible approach would be to charge everything to Administration and then charge out based on work orders and time reporting.

Advertising

Brochures

Equipment

Motor Vehicles

Maintenance

Fuel

Operating Supplies

Office Supplies

Consultants

Computer Equipment

Planting Costs

Meetings

Audit

Legal

Land Acquisitions

Easement Acquisitions

Activity Centers

General Administration
 Dune Restoration and Maintenance
 Survey and Monitoring
 Education Programs
 Predator Control
 Captive Breeding
 Genetic Viability Assessment
 Other Research
 Marketing
 Land Acquisition
 Easement Acquisitions

2. Budgets

Setting workable budgets will be a very important activity of the CMF partners to ensure productive use of the Fund resources. If financial reporting is to be done on a monthly or quarterly basis, the budgets should be calendarized as accurately as possible. If the County system will not allow month-by-month calendarization, the use of budgetary accounts will work as well.

3. Reporting

The proposed report package would consist of several reports:

- A summary of the CMF activity, showing the total revenues and expenditures by account, the change in the fund balance and the current fund balance (Table 35)
- A summary of CMF activity showing revenue and expenditures by Activity Center in spreadsheet format. Table 36 illustrates in budget format; actual results could be presented similarly.
- Individual reports for each Activity Center, showing sub-center amounts as well, along with budgets. Samples are presented in Table 37.
- A balance sheet, showing the composition of the Fund. (Table 38)

Of course, various detail ledgers should be maintained – for capital equipment, inventories, etc.

Table 35. PKBM Conservation and Management Fund Statement of Operations

| October 1, 2005 - September 30, 2006 | | |
|---|-------------|-------------|
| Revenues | Actual | Budget |
| Conservation Contributions | \$1,740,000 | \$1,850,000 |
| Grants - Unrestricted | 515,000 | 500,000 |
| Grants - Restricted | 132,000 | 154,000 |
| Donations - Unrestricted | 40,000 | 35,000 |
| Donations - Restricted | 70,000 | 73,100 |
| Investment Income | 3,250 | 3,250 |
| | 2,500,250 | 2,615,350 |
| Expenditures | | |
| Salaries & Wages | \$650,000 | \$667,500 |
| Payroll Taxes | 120,000 | 124,450 |
| Employee Benefits | 80,000 | 81,200 |
| Consultants | 25,000 | 29,100 |
| Computer Equipment | 15,000 | 19,000 |
| Meetings | 10,000 | 9,150 |
| Audit | 80,000 | 7,000 |
| Legal | 15,000 | 16,000 |
| Advertising | 4,000 | 4,700 |
| Brochures | 5,000 | 6,000 |
| Land Acquisition | 450,000 | 479,000 |
| Easements | 28,000 | 30,000 |
| Equipment | 80,000 | 83,250 |
| Trucks | 60,000 | 68,500 |
| ATVs | 34,000 | 35,000 |
| Maintenance | 55,000 | 54,000 |
| Fuel | 26,000 | 24,300 |
| Seasonal Help | 40,000 | 43,500 |
| Replanting Costs | 250,000 | 295,000 |
| | 2,027,000 | 2,076,650 |
| Increase (decrease) in | | |
| Fund balance | 473,250 | 538,700 |
| Fund balance 10/1/05 | 0 | 0 |
| Fund balance 9/30/06 | \$473,250 | \$538,700 |

Table 36. PKBM Conservation and Management Fund, Hypothetical Budget, October 1, 2005 – September 30, 2006

| | Consolidated Activity Centers | Activity Centers | | | | | | | | | | | |
|----------------------------|-------------------------------------|---------------------------|------------------------|--------------------------------------|-----------------------|---------------|---------------------|------------------------------------|---------------------|---------------|-------------------|---------------------|-------------------------|
| | | General Administration | Survey & Monitoring | Dune Restoration & Maintenance | Education Programs | Marketing | Predator Control | Genetic Viability Assessment | Captive Breeding | Research | FWC Activities | Land Acquisition | Easement Acquisition |
| Revenue Accounts | | | | | | | | | | | | | |
| Conservation Contributions | 1,850,000 | 1,600,000 | - | - | - | - | - | - | - | - | - | - | - |
| Habitat Impact Assessments | 350,000 | 350,000 | - | - | - | - | - | - | - | - | - | - | - |
| Grants - Unrestricted | 500,000 | 500,000 | - | - | - | - | - | - | - | - | - | - | - |
| Grants - Restricted | 154,000 | 40,000 | - | 58,000 | 15,000 | - | 1,000 | - | 25,000 | 15,000 | - | - | - |
| Donations - Unrestricted | 35,000 | 35,000 | - | - | - | - | - | - | - | - | - | - | - |
| Donations - Restricted | 73,100 | 5,000 | 3,000 | 6,000 | 5,000 | - | 100 | - | 4,000 | - | - | 50,000 | - |
| Allocations | - | (1,712,900) | 76,200 | 860,000 | 5,000 | 25,000 | 29,000 | 35,000 | 7,700 | 75,000 | 250,000 | 200,000 | 150,000 |
| Investment Income | 3,250 | 3,000 | - | - | - | - | - | - | - | - | 250 | - | - |
| Total Revenue | 2,965,350 | 820,100 | 79,200 | 924,000 | 25,000 | 25,000 | 30,100 | 35,000 | 36,700 | 90,000 | 500,250 | 250,000 | 150,000 |
| Expenditures | | | | | | | | | | | | | |
| Salaries & Wages | 677,500 | 40,000 | 45,000 | 300,000 | 18,500 | 15,000 | 19,000 | 28,000 | 23,000 | 59,000 | 110,000 | 10,000 | 10,000 |
| Payroll Taxes | 127,450 | 3,000 | 12,000 | 52,000 | 3,350 | 3,000 | 3,000 | 3,100 | 1,000 | 11,000 | 30,000 | 3,000 | 3,000 |
| Employee Benefits | 83,200 | 4,000 | 4,000 | 26,000 | - | 2,500 | 800 | - | 900 | 10,000 | 31,000 | 2,000 | 2,000 |
| Consultants | 30,100 | 16,000 | 5,000 | - | - | - | 100 | - | 3,000 | 1,000 | 3,000 | 1,000 | 1,000 |
| Computer Equipment | 19,000 | 5,000 | 500 | 3,000 | 1,000 | 1,000 | 500 | 1,000 | 2,000 | 4,000 | 1,000 | - | - |
| Meetings | 9,150 | 2,000 | 100 | - | 650 | - | 500 | 400 | 2,000 | - | 3,500 | - | - |
| Audit | 7,000 | 5,000 | - | - | - | - | - | - | - | - | 2,000 | - | - |
| Legal | 21,000 | 6,000 | - | - | - | - | - | - | - | - | 5,000 | 5,000 | 5,000 |
| Advertising | 4,700 | 200 | - | - | 500 | 3,000 | - | - | - | - | 1,000 | - | - |
| Brochures | 6,000 | 200 | 300 | - | 1,000 | 500 | 1,000 | - | - | - | 3,000 | - | - |
| Land Acquisition | 583,000 | - | - | - | - | - | - | - | - | - | 275,000 | 204,000 | 104,000 |
| Easements | 55,000 | - | - | - | - | - | - | - | - | - | 5,000 | 25,000 | 25,000 |
| Equipment | 83,250 | - | 300 | 70,000 | - | - | 200 | 2,000 | 4,000 | 5,000 | 1,750 | - | - |
| Trucks | 68,500 | - | 10,000 | 45,000 | - | - | 1,000 | - | 500 | - | 12,000 | - | - |
| ATVs | 35,000 | - | - | 35,000 | - | - | - | - | - | - | - | - | - |
| Maintenance | 54,000 | - | 1,000 | 53,000 | - | - | - | - | - | - | - | - | - |
| Fuel | 24,300 | - | 1,000 | 15,000 | - | - | 3,000 | - | 300 | - | 5,000 | - | - |
| Seasonal Help | 43,500 | - | - | 35,000 | - | - | 1,000 | 500 | - | - | 7,000 | - | - |
| Replanting Costs | 295,000 | - | - | 290,000 | - | - | - | - | - | - | 5,000 | - | - |
| Total Expenditures | 2,226,650 | 81,400 | 79,200 | 924,000 | 25,000 | 25,000 | 30,100 | 35,000 | 36,700 | 90,000 | 500,250 | 250,000 | 150,000 |
| Revenues less Expenditures | 738,700 | 738,700 | - | - | - | - | - | - | - | - | - | - | - |
| Fund Balance 10/1/05 | 0 | | | | | | | | | | | | |
| Fund Balance 9/30/06 | 738,700 | | | | | | | | | | | | |

NA— Not applicable.

Table 37. Examples of Individual Reports for Each Activity Center

| | Budget | Actual | | Budget | Actual |
|------------------------------|-----------|-----------|------------------------------|-------------|-------------|
| Revenues | | | Revenue Accounts | | |
| Allocation from General Fund | \$860,000 | \$867,700 | Conservation Contributions | \$1,600,000 | \$1,690,000 |
| Grants - restricted | 58,000 | 60,000 | Habitat Impact Assessments | 350,000 | 352,000 |
| Donations - restricted | 6,000 | 8,100 | Grants - Unrestricted | 500,000 | 515,000 |
| | 924,000 | 935,800 | Grants - Restricted | 40,000 | 132,000 |
| | | | Donations - Unrestricted | 35,000 | 40,000 |
| | | | Donations - Restricted | 5,000 | 70,000 |
| | | | Investment Income | 3,000 | 3,250 |
| | | | | 2,533,000 | 2,802,250 |
| Expenses | | | Allocations | | |
| Salaries & Wages | 300,000 | 294,600 | To Dune Restoration | \$860,000 | \$867,700 |
| Payroll Taxes | 52,000 | 51,000 | To Survey & Monitoring | 76,200 | 290,000 |
| Employee Benefits | 26,000 | 27,000 | To Education | 5,000 | 6,000 |
| Equipment | 70,000 | 68,000 | To Marketing | 25,000 | 23,500 |
| Trucks | 45,000 | 51,000 | To Predator Control | 29,000 | 90,000 |
| ATVs | 35,000 | 21,000 | To Genetic Viability Assess. | 35,000 | 31,000 |
| Maintenance | 53,000 | 51,000 | To Captive Breeding | 7,700 | 85,000 |
| Fuel | 15,000 | 19,000 | To Research | 75,000 | 75,000 |
| Seasonal Help | 35,000 | 43,000 | To FWC Activities | 250,000 | 250,000 |
| Computer Equipment | 3,000 | 2,800 | To Land Acquisition | 200,000 | 160,000 |
| Replanting Costs | 290,000 | 300,000 | To Easement Acquisition | 150,000 | 148,000 |
| | 924,000 | 928,400 | Total | 1,562,900 | 2,026,200 |
| Net result | \$0 | \$7,400 | | | |
| | | | Expenses | | |
| | | | Salaries & Wages | 40,000 | 38,500 |
| | | | Payroll Taxes | 3,000 | 2,200 |
| | | | Employee Benefits | 4,000 | 3,800 |
| | | | Consultants | 16,000 | 18,000 |
| | | | Computer Equipment | 5,000 | 5,000 |
| | | | Meetings | 2,000 | 2,000 |
| | | | Audit | 5,000 | 5,000 |
| | | | Legal | 6,000 | 6,000 |
| | | | Advertising | 200 | 175 |
| | | | Brochures | 200 | 225 |
| | | | | 81,400 | 80,900 |
| | | | Allocations & expenses | 1,644,300 | 2,107,100 |
| | | | Net result | \$888,700 | \$695,150 |

Table 38. PKBM Conservation and Management Fund Balance Sheet, September 30, 2006

| | | | |
|---------------------|---------|------------------|-----------|
| Assets | | | |
| Cash | | | \$93,250 |
| Fees receivable | | | |
| Service | 50,000 | | |
| FWC | 20,000 | | |
| County | 30,000 | 100,000 | |
| Investments | | 280,000 | |
| | | <u>280,000</u> | |
| | | <u>\$473,250</u> | |
| Liabilities | | | |
| Vouchers payable | | | \$130,000 |
| Fund Balance | | | |
| General | 251,000 | | |
| FWC | 40,000 | | |
| Restricted | 52,250 | 343,250 | |
| | | <u>343,250</u> | |
| | | <u>\$473,250</u> | |

Text References

Day, Timothy (Environmental Specialist II, NESD/EQD, Escambia County) (2005). E-mail communication to Donald Jones, June 8, 2005.

Hankla, Dave, and James J. Slack (2004) Memorandum: Amended Guidance for Assessing Mitigation Needs for Florida Scrub-Jays,” U.S Fish and Wildlife Service, Jacksonville, Florida, February 24 and April 1.

Henning, Richard G. (Staff Meteorologist, Major, U.S.A.F.) (n.d.) “A History of Hurricanes in the Western Florida Panhandle 1559-1999.” 46th Weather Squadron, Eglin Air Force Base, Florida.

Himes, John G. (Northwest Regional Non-Game Biologist, Florida Fish & Wildlife Conservation Commission, Species Conservation Planning Section, Panama City, Florida) (2005a). “PKBM Strategic Costs1.doc,” June 1, 2005.

Himes, John G. (2005b). 3 e-mails to Donald Jones, June 9, 2005.

Himes, John G. (2005c). E-mail to Donald Jones, June 10, 2005.

Office of Management and Budget (OMB), Executive Office of the President (2005). Circular no. A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*, Appendix C, Discount Rates for Cost-Effectiveness, Lease Purchase, and Related Analyses, January.

Patrick, Lorna (Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, Panama City, Florida)(2005a). E-mail communication to Donald Jones, June 6, 2005.

Patrick, Lorna (2005b). E-mail communication to Donald Jones, June 8, 2005.

Sullivan, Daniel (Endangered Species Coordinator, Florida Fish and Wildlife Conservation Commission), E-mail to Terry Doonan, June 13, 2005.

U.S. Bureau of Labor Statistics (2005). Consumer Price Indexes.
<http://www.bls.gov/cpi/home.htm>.

U.S. Fish and Wildlife Service (USFWS) (2005). *Federal and State Endangered and Threatened Species Expenditures, Fiscal Year 2003*. January.

U.S. Fish and Wildlife Service (USFWS) (2004a). *Federal and State Endangered and Threatened Species Expenditures, Fiscal Year 2002*. January.

U.S. Fish and Wildlife Service (USFWS) (2003). *Federal and State Endangered and Threatened Species Expenditures, Fiscal Year 2001*. January.

U.S. Fish and Wildlife Service (USFWS) (2004b). "Perdido Key Beach Mouse Habitat on Perdido Key in Florida and Alabama." Mimeo. Panama City, Florida Field Office, May 26.

Appendix. Data Sources for Cost Calculations

II.B.1. Surveying and Monitoring

Timothy Day, “County Costs.xls,” June 7, 2005; e-mail to Donald Jones, June 7, 2005, 2 e-mails to Donald Jones, June 8, 2005.

John G. Himes, “PKBM Strategic Costs1.doc,” June 1, 2005.

Michael Wooten (Auburn University), personal communication With John Krummel.

II.B.2.a. Dune Reconstruction

Hurricane landfall probabilities:

William Gray, Colorado State University, United States Landfalling Hurricane Probability Project, <http://www.e-transit.org/hurricane/welcome.html>

Hurricane damages by storm magnitude:

William Gray, Colorado State University, United States Landfalling Hurricane Probability Project, Landfalling Tropical Cyclone Webpage Questions and Answers, <http://www.e-transit.org/hurricane/faq.html>, answer 18.

Overall dune reconstruction costs:

Timothy Day, “County Costs.xls,” June 7, 2005; e-mail to Donald Jones, June 7, 2005, 2 e-mails to Donald Jones, June 8, 2005; e-mail to Donald Jones, July 1, 2005.

John G. Himes (Northwest Regional Non-Game Biologist, Florida Fish & Wildlife Conservation Commission, Species Conservation Planning Section, Panama City, Florida), “PKBM Strategic Costs1.doc,” June 1, 2005.

Florida Department of Environmental Protection (FDEP), Division of Water Resource Management, Bureau of Beaches and Coastal Systems. *2004 Hurricane Recovery Plan for Florida’s Beach and Dune System*. November 30, 2004, p. 20; Table 1 (page 3 of 3); map on p. A-13.

Keith Wilkins (Director, Neighborhood and Environmental Services Department, Escambia County), E-mail to Donald Jones, July 1, 2005.

Replanting costs:

Brad Pickel (Director of Beach Management, Walton County TDC), e-mail to Lorna Patrick, June 1, 2005.

Timothy Day, e-mail to Donald Jones, June 8.

Boardwalk costs:

Brad Pickel, e-mail to Lorna Patrick, May 25, 2005.

II.B.2.b. Dune Maintenance

Replanting costs estimated on a per-mile basis from:

Brad Pickel, e-mail to Lorna Patrick, May 25, 2005.

II.B.3. Predator Control

Higher cost: John Dunlap (District Supervisor and Wildlife Biologist, USFWS, Bristol, Florida), letter to Lorna Patrick, May 23, 2005.

Lower cost: Timothy Day, "County Costs.xls," June 7, 2005; e-mail to Donald Jones, June 7, 2005.

Australian case: Morris, Keith, Peter Speldewinde, and Peter Orell. "The Recovery Plan for Djoongari or the Shark Bay Mouse (*Pseudomys fieldi*) 1992-2001," Department of the Environment and Heritage, Australian Government (ISSN 0816-9713), section 3.4. <http://www.deh.gov.au/biodiversity/threatened/publications/recovery/djoongari/>

II.B.4.a. Land Acquisition

Chris Jones (Escambia County Property Appraiser), www.chrisjones.org. [MAPS](#) data provided by Inter-Local Mapping and Geographic Information Network (IMAGINE) project of Escambia County.

Enoch Leatherwood (Escambia County Property Appraiser's Office), 2004-to-present property transaction table.

Metro Market Trends, Inc., Pensacola, Florida. "Transactions 2004-present, Perdido Key, all sales except condos."

Sandra Sneckenberger (Biologist, U.S. Fish and Wildlife Service, Panama City), 2 e-mails to Donald Jones, June 27, 2005.

II.B.4.b. Conservation Easements

Michael Herran (Bureau of Appraisal, Division of State Lands Florida Department of Environmental Protection), personal communication with Donald Jones, June 2, 2005.

Charles Hardee (Senior Attorney, Florida Fish and Wildlife Conservation Commission, Tallahassee), E-mails to Donald Jones, June 1, 2, 10.

II.B.4.c. Education

Lorna Patrick, 2 e-mails to Bedford Lydon, June 1, 2005

Timothy Day, "County Costs.xls," June 7, 2005; e-mail to Donald Jones, June 7, 2005.

II.B.5. Genetic Viability Assessment

J. Antonovics (University of Virginia), Personal communication with Robert O'Neill, June 2005.

G. Gerlach (Marine Biological Laboratory, Woods Hole, Massachusetts), Personal communication with Robert O'Neill, May 2005.

Hopi Hoekstra (University of California, San Diego), E-mail to Robert O'Neill, May 24, 2005.

II.B.6. Captive Breeding Programs

Michael Dewey (Director, *Peromyscus* Genetic Stock Center, University of South Carolina), personal communication with Terry Doonan.

Terry Doonan (Regional Wildlife Diversity Conservation Biologist, Species Conservation Planning Section, Florida Fish & Wildlife Conservation Commission, Lake City, Florida) (2005). Fax to Donald Jones, May 31, 2005.

Terry Doonan, E-mail to Donald Jones, June 27, 2005.

Julie Weston (*Peromyscus* Genetic Stock Center, University of South Carolina), personal communication with John Krummel, June 2005.

II.B.7. Creation and Maintenance of Conservation Fund

Timothy Day, Personal communication with Eric Stuhlmann, June 6, 2005.

Keith Wilkins, E-mail to Donald Jones, June 27, 2005.

II.B.8. Research Necessary to Achieve Conservation Strategy Goals

John G. Himes, "PKBM Strategic Costs1.doc," June 1, 2005; e-mails to Donald Jones, June 9 and 10, 2005.