

Recovery Action Prioritization Instructions

These instructions outline procedures to run the Recovery Action Prioritization model developed by NCSU (C. Ashton Drew, ashton.drew@gmail.com) for the USFWS Caribbean Field Office.

Part 1: Set-up

You need to have a pdf viewer, MS Excel, and R. R Studio is also very helpful, but not required.

Unzip the **RecoveryActionPrioritization.zip** file into a folder where you will also save the results from the model runs. You should have:

- RecoveryActions_20150323.xlsx
- RecoveryActions_DataCheckList.pdf
- RecoveryActionPrioritization_Definitions.pdf
- RecoveryActionPrioritization_Instructions.pdf
- RecoveryActionPrioritization_V1.R
- RecoveryActionPrioritization_Report.pdf

Part 2: Enter and Review Recovery Action Data in Excel Table

Open the file **RecoveryActions_YYYYMMDD.xlsx** (date should reflect most recent edits).

Save the file to reflect the new date as **RecoveryActions_YYYYMMDD.xlsx**

Each row in the recovery action table represents one potential Recovery Action. These should be based on the recovery objectives for each species, but wording may differ from the Recovery Plan documents. In this table, each action that is entered and attributed must be a distinct, independent unit with a clear objective. For example, neither “research” nor “monitoring” alone is an action, but “Research to determine stable/increasing/decreasing population trend” or “Monitor to determine success of and need to continue existing anti-poaching program” could be action items. You can recognize a “good” action item by the fact that it should be fairly clear what specific steps would be required to implement the action and fairly easy to estimate cost and time requirements. If it is difficult to attribute the action (i.e., fill in all the data for that action), the action is probably too broad or too vague.

The columns provide the data to calculate the objective functions that represent the criteria by which “good” decisions meet the mandate of the US Fish and Wildlife Service endangered species program. These are:

- Minimize the risk of immediate extinction (probability of extinction in 5 years, if action is not taken)
- Maximize the gain in the long-term (50 year) probability of persistence
- Maximize the probability of positive reclassification (from Endangered to Threatened to Recovered and from Unknown to Known population status)

The table does not calculate or compare the objectives; this is done later within the R program and output to new summary tables.

The decision horizon assumed by this model is a 5 year cycle to prioritize among possible actions. It is critical that the data in the table be reviewed prior to each model run (e.g., at 5 year intervals). Some projects will have been completed while others might have been determined to be ineffective or obsolete. Costs may have changed as technology advances or partnerships evolve. The value of the prioritization depends upon the quality of the input data.

Use the definitions provided **RecoveryActionPrioritization_Definitions.pdf** to complete and review the table.

Include all recovery actions for all Threatened and Endangered species EXCEPT those with established species-specific long-term management programs (e.g., Manatee, Puerto Rican Parrot, and Yellow Shouldered Blackbird).

Perform data checks as outlined in **RecoveryActions_DataCheckList.pdf**.

Resave the data (ensure that you save with current date).

Create a comma delimited copy of the data file as **RecoveryActions_YYYYMMDD.csv**

Part 3: Run Recovery Action Prioritization Tool in R

The decision analysis for recovery action prioritization is run in the program R. Ideally, the program can be run in interactive development environment (IDE, such as R Studio) as this will provide line numbers and color coding of the program text. This will facilitate finding the locations to edit in the following instruction. The following instructions reference line number locations for the code as it appears in R Studio. If you cannot install R Studio, we recommend that you use the Edit->Find to search for text (which we also provide below) in the code.

Open **RecoveryActionPrioritization_V1.R** in R Studio. Then follow line number instructions below (or in R follow the “find text” instructions below, using the Edit->Find commands) to make changes in four locations:

Go to Line 22 (or Find text “DEFINE BUDGET”)

Replace the dollar value in the line “fiveyearbudget <- 500000”

This should be the total amount of FWS money expected to be available to allocate towards recovery actions over the upcoming 5 year cycle. This dollar amount sets the limit for how many and which actions can be selected within any given set. It DOES NOT INCLUDE money (real or in-kind) from partners.

Go to Line 31-33 (or Find text “IMPORT”)

Replace the drive letter, the folder, and the file name to match the files you unzipped and/or edited.

```
setwd("E:/P_PriorityES/data/Post-Workshop/")  
input <- read.csv("RecoveryActions_20150323.csv", header=TRUE, sep=",")
```

Note the direction of the slashes in the directory name and the presence of quotes around the directory name (in the setwd line) and around the file name (in the input line). All of the model output will be deposited into this same folder.

Got to Line 70 (or Find text "SIMULATION")

Replace the number of simulation value in the line "sims <- 1000"

The default number of simulations is 1000.

Go to Lines 144-146 (or Find text "OBJECTIVE 3")

Replace the transition weights, if desired in the lines:

```
wUK <- 1.0  
wET <- 1.5  
wTR <- 3.0
```

These weights indicate the relative value of the three possible reclassification transitions: unknown to known (wUK), endangered to threatened (wET), and threatened to recovered (wTR). Default values for these transitions are currently set to 1.0, 1.5, and 3.0, respectively. Thus, in the default, a transition from threatened to recovered is valued three times as much as a transition from unknown to known and twice as much as a transition from endangered to threatened. You should explore how changing these weights affects the final ranking of various decisions alone and within decision sets.

Go to Lines 168-170 (or Find text "OBJECTIVE 4")

Replace the transition weights, if desired.

```
wRisk <- 1.5  
wPersist <- 1.0  
wReclass <- 2.0
```

These weights indicate the relative value of the three objectives within a single decision framework: minimize risk (wRisk), maximize persistence gains (wPersist), and maximize reclassification (wReclass). Default values for the risk, persistence, and reclassification weights are 1.5, 1.0, and 2.0, respectively. Thus, reclassification is valued most, followed by the need to minimize risk. A potential gain in persistence is valued least, but overall the values are fairly close. Again, you should explore how changing these weights affects the final ranking of various decisions alone and within decision sets.

Resave the R file.

Run the R file.

In R Studio, select Code -> Run Region -> Run All

In R, select Edit -> Run All

Go to the folder that contains the R code and data file to view the output tables (csv files can be opened in Excel). The code should generate five output tables:

- CandidateActions.csv
- NonCandidateActions.csv
- ActionCounts.csv
- WeightedObjectivesSets.csv
- RiskObjectiveSets.csv
- PersistObjectiveSets.csv
- ReclassObjectivesSets.csv

These tables can be opened in Excel. Staff should briefly review the Candidate.csv and NonCandidateAction.csv tables to ensure that all actions for consideration have been assigned to the candidate list. Descriptions of these tables are provided in the project report (RecoveryActionPrioritization_Report.pdf).