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EaglePOPd Web Interactive: Software to investigate the demography of Bald Eagles in the Northeast, USA from 1990-2018

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Overview of the software application

We used empirical time series data of breeding adult Bald Eagles from seven NE states, a symbolic population matrix model representing the life cycle of the species, and a combinatorial optimization algorithm to investigate the demographic properties of the recovery of Bald Eagles in the Northeast, USA from 1990-2018.

This interactive application allows the user to view the algorithm-predicted asymptotic and transient quantities for Bald Eagles in the Northeast, USA between 1990-2018.

Demographic quantities include:
1) Life table
2) Predicted annual abundances
3) Predicted bi-annual abundances
4) Predicted bi-annual hatchling abundances
5) Predicted bi-annual immature and non-breeding adult abundances
6) Predicted bi-annual breeding adult abundances
7) Predicted abundances during the breeding period
8) Predicted abundances during the non-breeding period
9) Migration and dispersal

10) Asymptotic growth rates
11) Survival rates
12) Stable stage distribution
13) Reproductive value
14) Sensitivities
15) Elasticities
16) Damping ratio and convergence time
17) Cumulative growth
18) Stochastic growth rate
19) Transient growth rate
20) Harmonic vs. arithmetic mean abundances
21) Loss of genetic diversity
22) Population inertia
23) Reactivity
24) Maximum amplification
25) Maximum attenuation

Interactive Software User Tutorial

Preparing and running the software:
Step 1: Download the "EaglePOPd.R" software code.
Step 2: Download each of the 15 .txt files ("BestAlgorithmPredictedModelsNortheast.txt", "NEW_AA_Northeast", "NEW_PA_Northeast", "NEW_SA_Northeast", "NEW_PS_Northeast", "NEW_Adults_January_Northeast", "NEW_Adults_June_Northeast", "NEW_Subadults_January_Northeast", "NEW_Subadults_June_Northeast", "NEW_Juveniles_June_Northeast", "NEW_AdultsAbsorbPercent_Northeast", "NEW_AdultsPurgePercent_Northeast", "NEW_SubdultsAbsorbPercent_Northeast", "NEW_SubadultsPurgePercent_Northeast" and "NEW_TIMESERIES_Northeast".) and save them in a specific location on your computer.
Step 3: In R Studio, install the appropriate versions of the six packages: "shinyBS", "shiny", "popdemo", "rgl", "FSA", and "rmarkdown". The appropriate versions are listed below.
Step 4: Open the EaglePOPd.R file in R studio and set the working directory to the location where you saved the .txt files.
Step 5: Click "Run All". Begin interacting with the software application.

Additional files:
This code requires 15 pre-saved text files: "BestAlgorithmPredictedModelsNortheast.txt", "NEW_AA_Northeast", "NEW_PA_Northeast", "NEW_SA_Northeast", "NEW_PS_Northeast", "NEW_Adults_January_Northeast", "NEW_Adults_June_Northeast", "NEW_Subadults_January_Northeast", "NEW_Subadults_June_Northeast", "NEW_Juveniles_June_Northeast", "NEW_AdultsAbsorbPercent_Northeast", "NEW_AdultsPurgePercent_Northeast", "NEW_SubdultsAbsorbPercent_Northeast", "NEW_SubadultsPurgePercent_Northeast" and "NEW_TIMESERIES_Northeast".

The EaglePOPd code automatically draws upon the information in these 15 files to display the algorithm-predicted results for each of the 25 demographic properties.

Each of the .txt files were generated using a combinatorial optimization algorithm (Hanley et al. *unpublished manuscript*) in conjunction with the sum abundances of breeding Bald Eagle pairs from seven Northeastern USA states.

Technical details

This app was written under R version 4.0.2 (2020-06-22) -- "Taking Off Again"
Copyright (C) 2020 The R Foundation for Statistical Computing Platform: x86_64-w64-mingw32/x64 (64-bit) and requires R packages: “devtools (Version 2.3.2)”, “shinyBS (Version 0.61)”, “shiny (Version 1.3.2)”, “rgl (Version 0.100.26)”, “popdemo (Version 1.3-0)”, “FSA (Version 0.8.25)” and “rmarkdown (Version 1.14)”.

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License

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Package Updates

2019.10.01. The EaglePOPd software was updated to incorporate suggestions made by scientific peer reviewers during the formal peer review process. The updates to the EaglePOPd software include changes to the wordings in some paragraph narratives. The supporting .txt files, graphics, scientific results, and the mathematical equations (that generated the results) remain unchanged when compared to the original version.

2020.10.24. Changes made at the request of formal peer reviewers to the ClosedCounterPOPd eCommons since the original submission include: (1) the correction of typos in the narratives, and (2) the alteration of the code and readme to include R and package versioning information.