**Southern range brook trout abundance modeling summary**

**1 Nov 2015**

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**Table 1. Dataset details**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Source** | **Affiliation** | **Sample year range** | **Count of sites** | **Count of site visits** | **Count of all individual fish (% BKT)** |
| Sweka | USFWS | 2010-2015 | 11 | 61 | 11,409 (96.5) |
| Williams | NPS-SHEN | 1982-2012 | 157 | 1505 | 134,968 (99.6) |
| Petty | WVU | 2000-2012 | 1 | 13 | 690 (100) |
| Grossmana | UGA | 1991-2004 | 1 | 14 | 442 (100) |
| Habera | TWRA | 1991-2014 | 8 | 131 | 11,758 (69.1) |
| Kulp | NPS-GSMNP | 1984-2014 | 71 | 793 | 64,857 (78.2) |
| Rabern | GA-DNR | 1991-2014 | 22 | 148 | 3981 (99.2) |
| Kashiwagia | MD-DNR (MBSS) | 2000-2015 | 8 | 113 | 3389 (96.7) |
| Reeser | VDGIF | 1990-2014 | 12 | 111 | 7214 (97.8) |
| Staley | MD-DNR (Central Region) | 1994-2013 | 12 | 40 | 1881 (71.3) |
| Mullican | MD-DNR (Western Region II) | 1988-2011 | 8 | 143 | 9462 (63.7) |
| Wampler | MD-DNR (Western Region I) | 2008-2013 | 21 | 126 | 6259 (99.8) |
| Rankin | SC-DNR | 2004-2012 | 4 | 24 | 1016 (100) |
| **Totals** |  |  | **336b** | **3222** | **257,326 (91.1)** |

aExcluded from model run (version: 1 Nov 15) because data lack pass-level records.

b326 sites included in model run (version 1 Nov 15), excluding sites from Grossman (1), Kashiwagi (8), and Kulp (FCP-1, a rainbow trout population).

**Table 2. N-mixture model components (version: 1 Nov 2015)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Category** | **Script name** | **Inputs** | **Outputs** | **Description** |
| Data formatting | CreateFishCountArray.R | BKT\_DATA.csv | Data\_FishCountAr.rData  (objects YOYFish, ADUFish, ALLFish) | Creates array for YOY and adult fish counts indexed by site, year, and efishing pass. Defines adults and YOY based on TL and seasona. |
|  | CreateSiteCovariates.R | BKT\_COVS\_SITES.csv | Data\_SiteCovsStd.Rdata (objects: lat.std, lon.std, uba.std, aspect.std, slope.std, elev.std) | Creates vectors of covariates indexed by site. |
|  | CreateSeasonalCovariates.R | BKT\_COVS\_ENV.csv | Data\_SeasonalClimateStd.RData (objects: FallPrcpStd, WinterPrcpStd, SpringPrcpStd, FallTmeanStd, WinterTmeanStd, SpringTmeanStd) | Creates matrices of standardized seasonal-mean climate variables indexed by site and year. Fall is defined for year t-1. |
|  | CreateDetectionCovariates.R | BKT\_COVS\_SAMPLES.csv  (and raw DAYMET files named by SiteID, not included) | Data\_DetectionCovs.Rdata (objects: sampday.std, prcp7day.std) | Creates matrices of standardized sampling day-of-year (indexed by site x year) and precip in prior 7 days from DAYMET data, indexed by site x year. Calls DAYMET raw data files. Use DAYMET batch extraction for raw DAYMET files. |
| Build models and plot results | Model\_Nmix.R | .RData files from data formatting scripts (“Data\_...”); calls JAGS code | NA | Adapted from Kanno et al. (in press) Freshwater Biology |
|  | Model\_Call\_Nmix\_ADUMod.R | Calls “Model\_Nmix.R” | 1. Result\_Out\_ADU.RData (objects: “out1” from coda.samples, “out2” from jags.samples); 2. Result\_Est\_ADU.RData (objects: y.est, N.est); 3. Result\_EnvCovHisto\_YOY.pdf (histograms of seasonal climate associations with adult abundance); 4. Result\_ObsN-ExpN\_ADU.pdf (plots of observed and estimated abundance by site) 5. RMSE | Calls Nmix model and plots environmental covariates (from out2$g.0) and model fit (from obs and expected N). Calculates RMSE from observed and expected abundance. |
|  | Model\_Call\_Nmix\_YOYMod.R | Calls “Model\_Nmix.R” | Same as above but for YOYs | Same as above but for YOYs |
|  | Model\_Call\_Nmix\_ALLMod.R | Calls “Model\_Nmix.R” | Same as above but for total abundance (YOY + adult) | Same as above but for total abundance (YOY + adult) |
| Additional plotting | Plot\_Length-Weight.R | DATA\_BKT.csv | LengthWeight\_Species.pdf | Plots length-weight for brook trout, rainbow trout, and brown trout in the dataset |

aBased on length-frequency histograms in Petty et al. (2005), I defined adults as individuals > 69 mm TL for samples before June 15 or as >99 mm TL for samples on or after June 15.

**Table 3. Model summary (version: 1 Nov 2015)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **Climate associations with abundance** | | | | | |
|  |  | **Precipitation** | | | **Air temperature** | | |
| **Model** | **RMSE** | **Fall (year t-1)** | **Winter** | **Spring** | **Fall (year t-1)** | **Winter** | **Spring** |
| YOY | 7.4 | Positive | Negative | Negative | - | - | Positive |
| Adult | 4.6 | Negative | Positive | - | - | Positive | - |
| All (YOY + adult) | 8.6 | Positive | Negative | - | - | Positive | Positive |