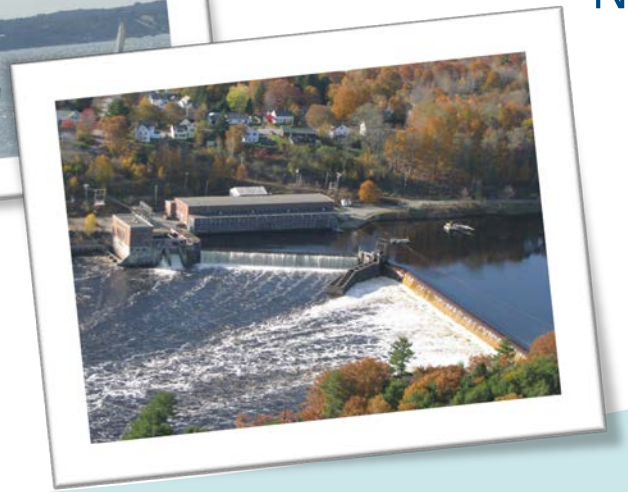
Protected Species Stock Assessments
Marine Mammals, Turtles, ESA Fish

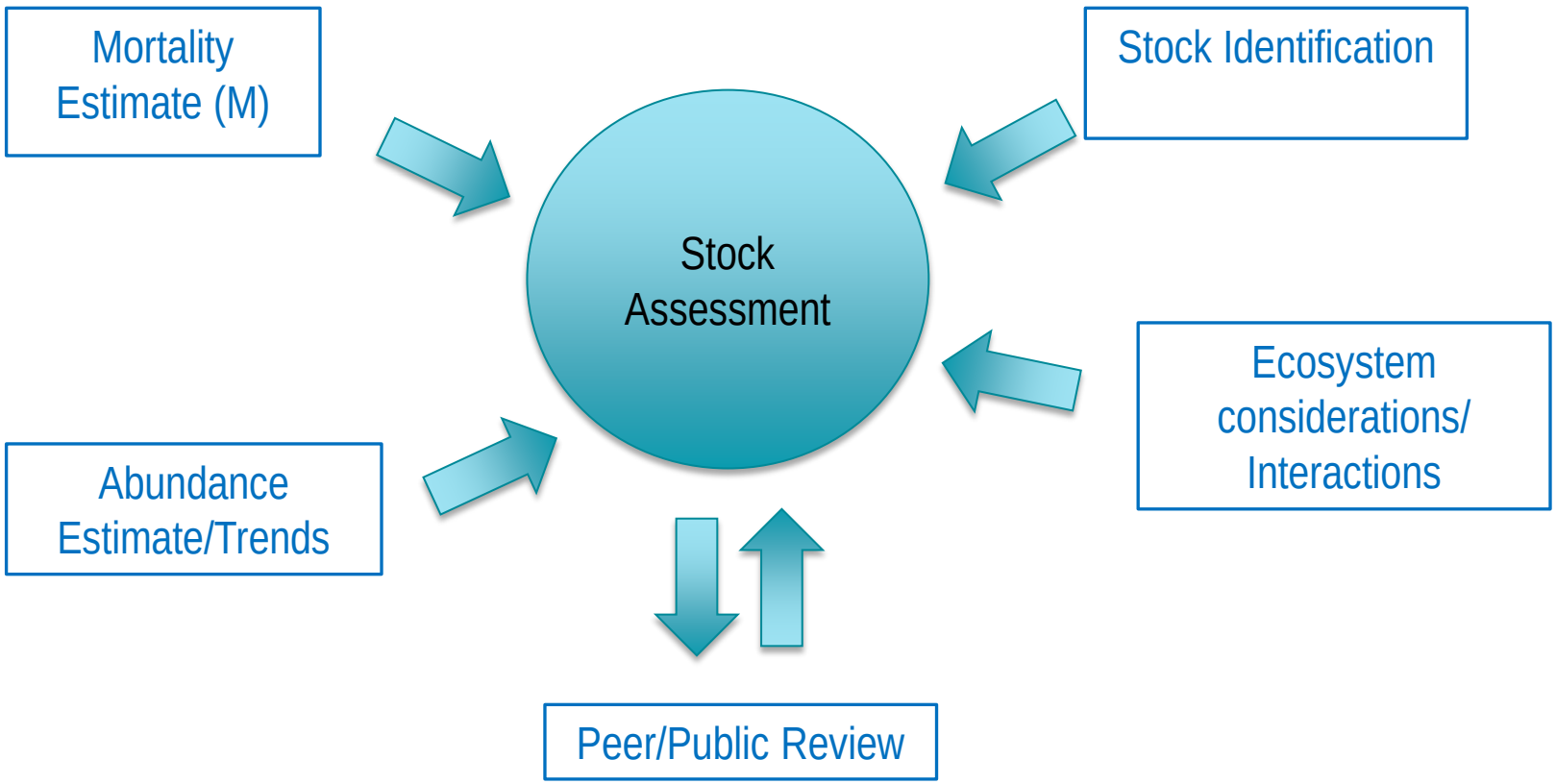


Gordon T. Waring
Heather Haas
John Kocik
Northeast Fisheries Science Center

April 13, 2015

Protected Species Stock Assessments

Conceptual model of the stock assessment process

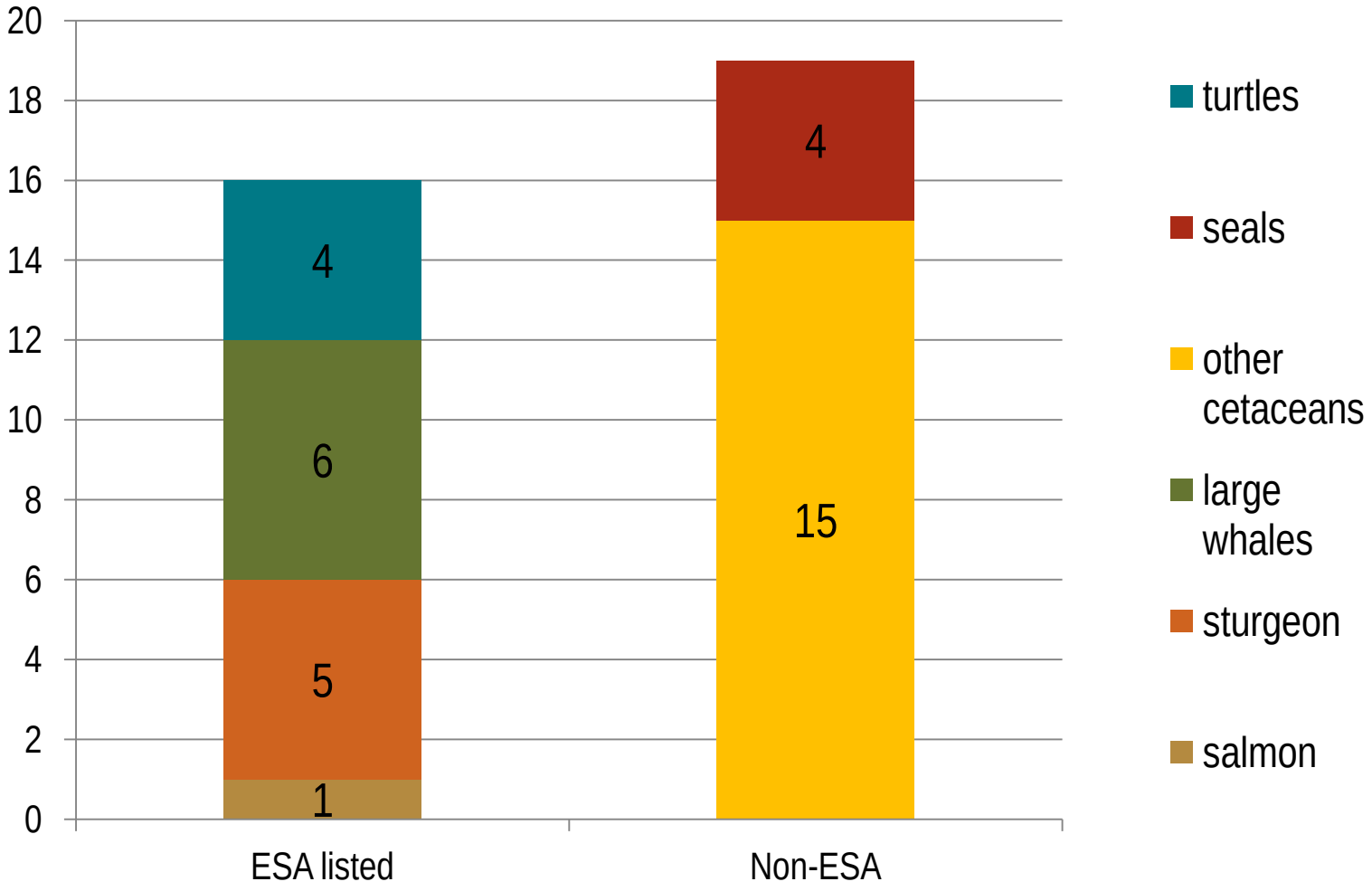


Stock Assessments Vary by Taxa

Three distinct taxa groups with different assessment mandates/frameworks and data sources

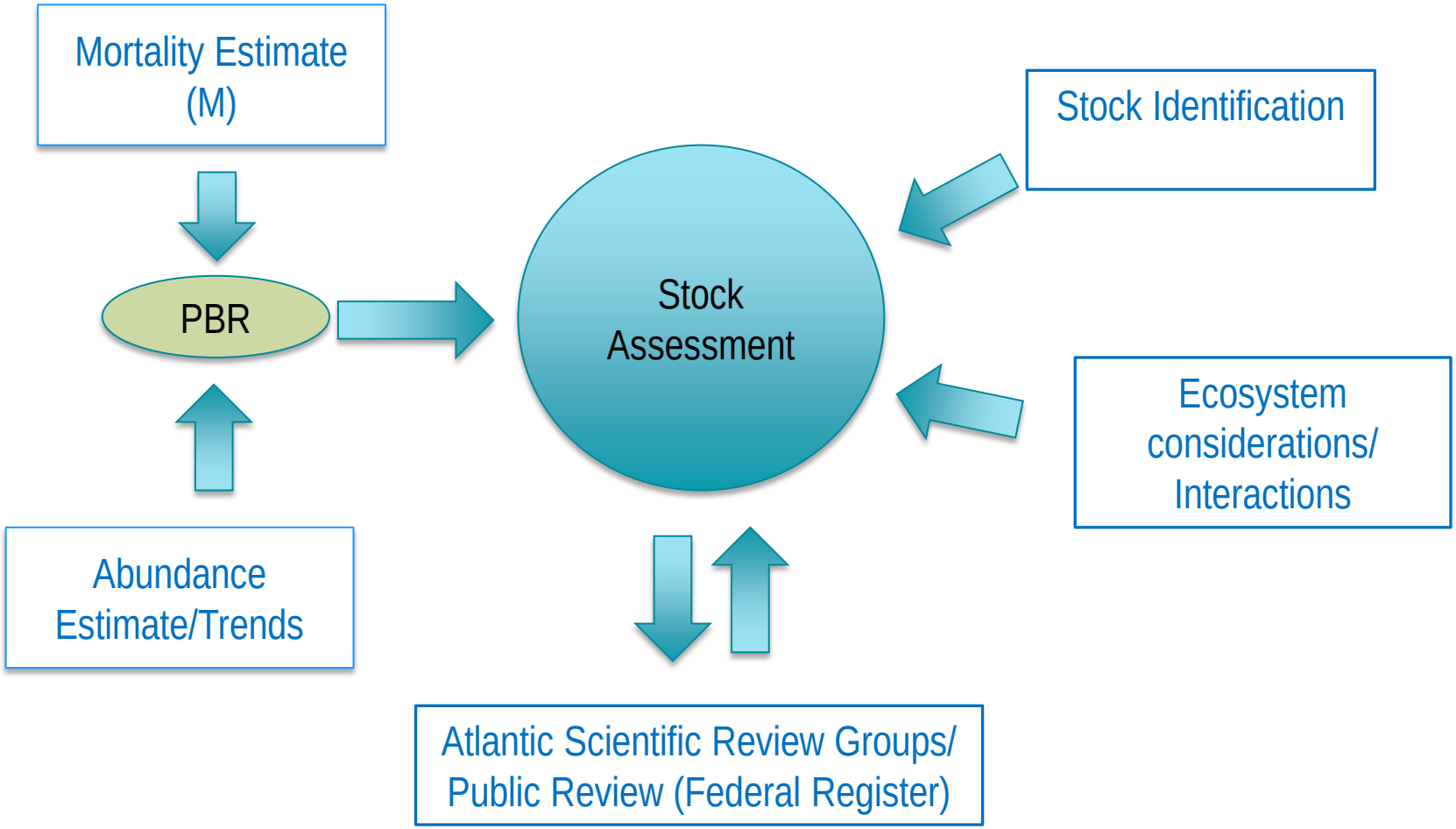
- Marine mammals
  - MMPA prescribed assessment framework
  - Aerial/vessel sighting surveys
- Sea turtles
  - ESA assessment (missing framework)
  - Aerial/vessel sighting surveys
- Salmon and other listed fish
  - ESA assessment
  - Trap counts and reed (nest) surveys

ESA and Non-ESA Stocks



Marine Mammal Stock Assessments

Conceptual model of the stock assessment process



Marine Mammal Stock Assessments (SARs)

Stock assessment/management are hard-wired to the Potential Biological Removal (PBR) formula - described in: "Guidelines for Assessing Marine Mammal Stocks (GAMMS)"

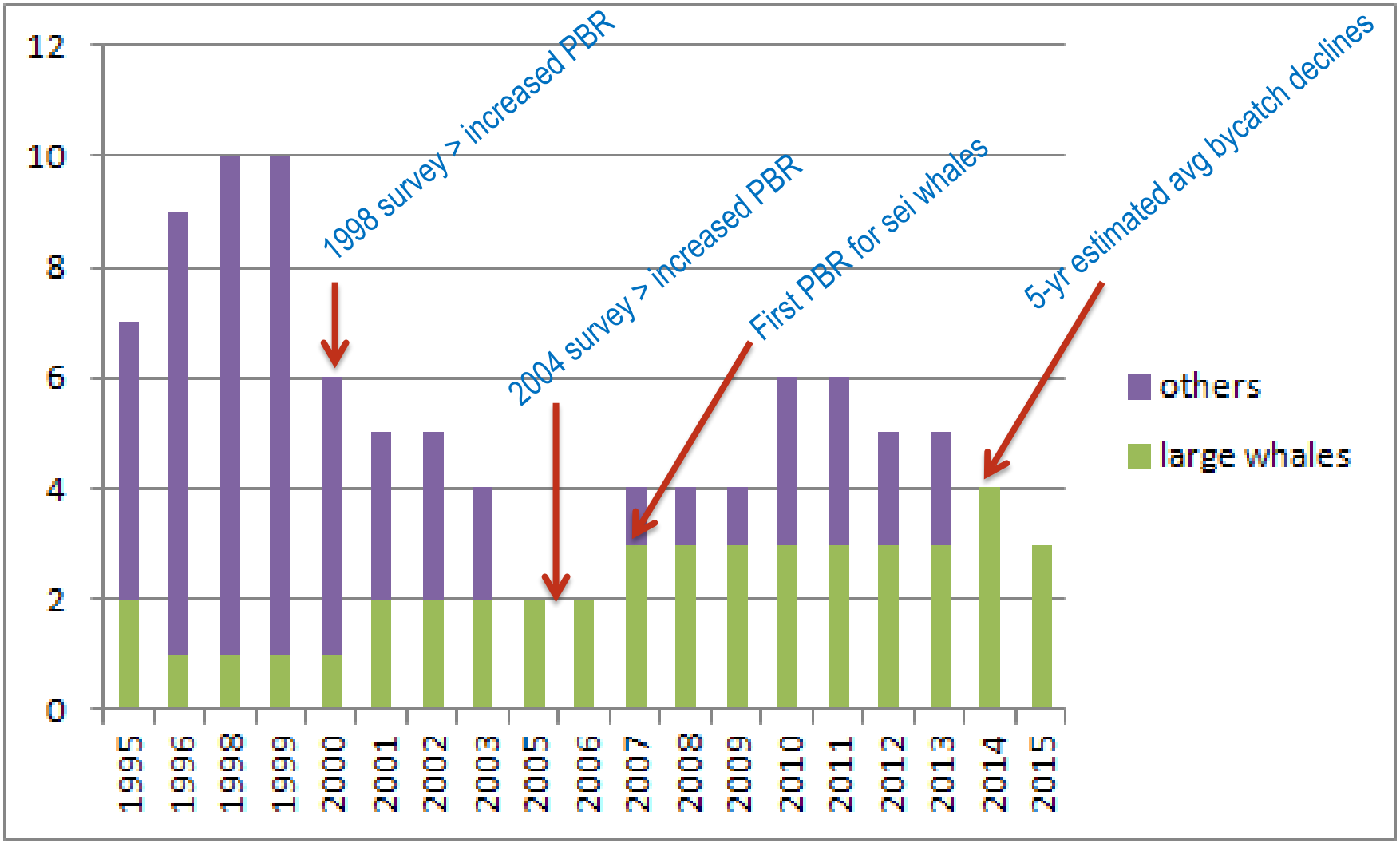
$$PBR = N_{min} \times \tfrac{1}{2} R_{max} \times F_{R\ :\ where}$$

- N_{min} = minimum population estimate
- R_{max} = one-half the maximum theoretical (0.04 cetacean; 0.12 pinniped) or estimated net productivity rate of the stock
- F_R = a recovery factor between 0.1 and 1.0

An example: N_{min} = 3,000 animals

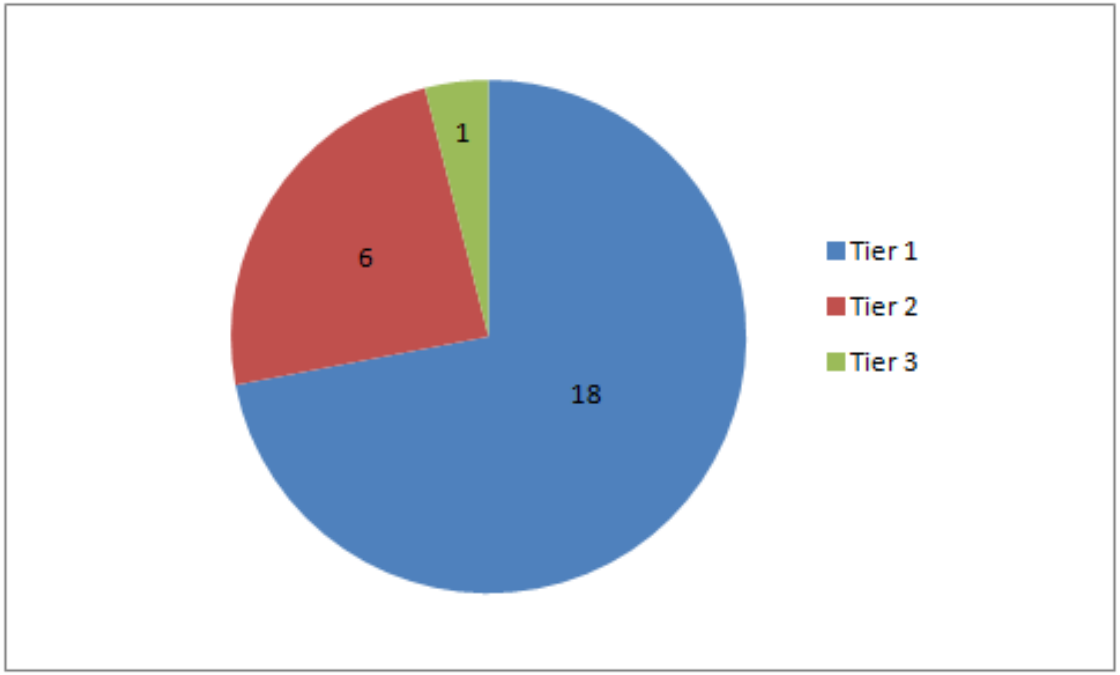
a)	Non-listed cetacean of unknown status	F_R = 0.5;	PBR= 30
b)	with bycatch CV > 0.3	= 0.4;	= 24
c)	cetacean listed	= 0.1;	= 6

Marine Mammal Stocks With M > PBR

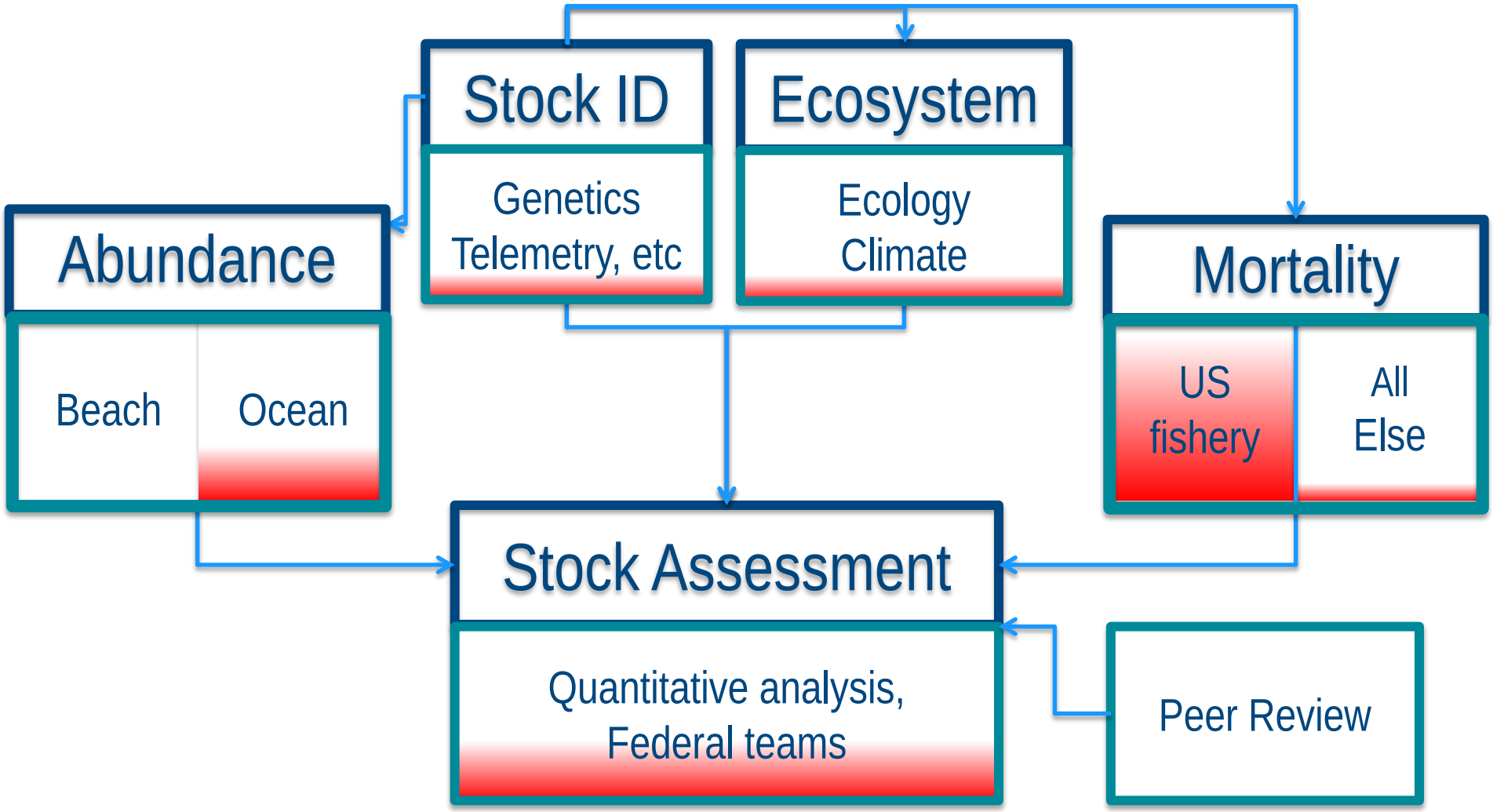


Marine Mammal Stock Assessment Quality

Tier I – Improve stock assessments using existing data..
Tier II – Elevate stock assessments to new national standards of excellence..
Tier III – Next generation assessments…ecosystem-bases approach to assessments..



Sea Turtle Stock Assessment



How much does NEFSC contribute to regional need?

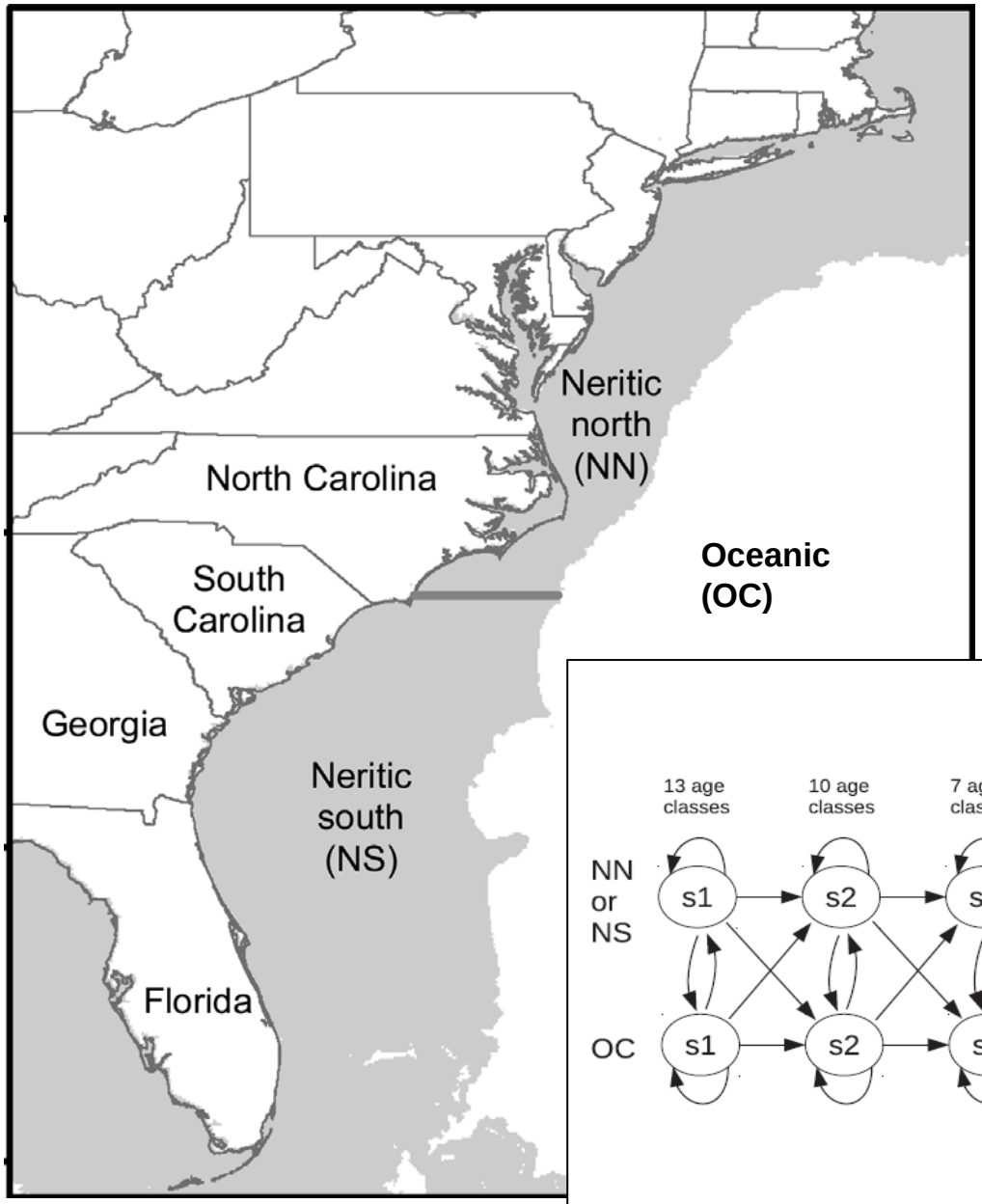
Sea Turtle Stock Status and Assessment Quality

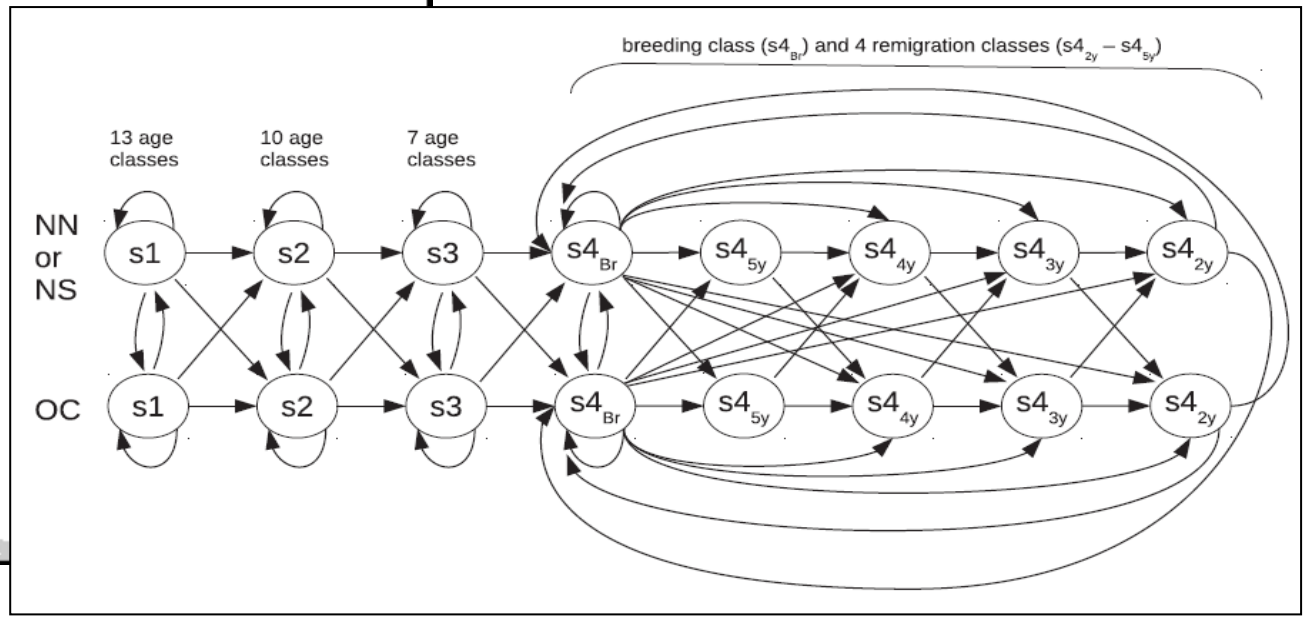
- Relevant sea turtle stocks
  - NW Atlantic Loggerhead DPS(Threatened)
  - Leatherback (Endangered)
  - N. Atlantic Green DPS (proposed, Threatened)
  - Kemp's ridley (Endangered)
- Most assessments varied from 2007-2011, based on data from 2005-2011
- All are GPRA Tier I

Sea Turtle Assessment Framework

- No standard reference points for determining level of takes which can be authorized
- Various metrics used to assess abundance
- NEFSC involved in 5 year project to provide scientific advice to improve sea turtle assessment framework

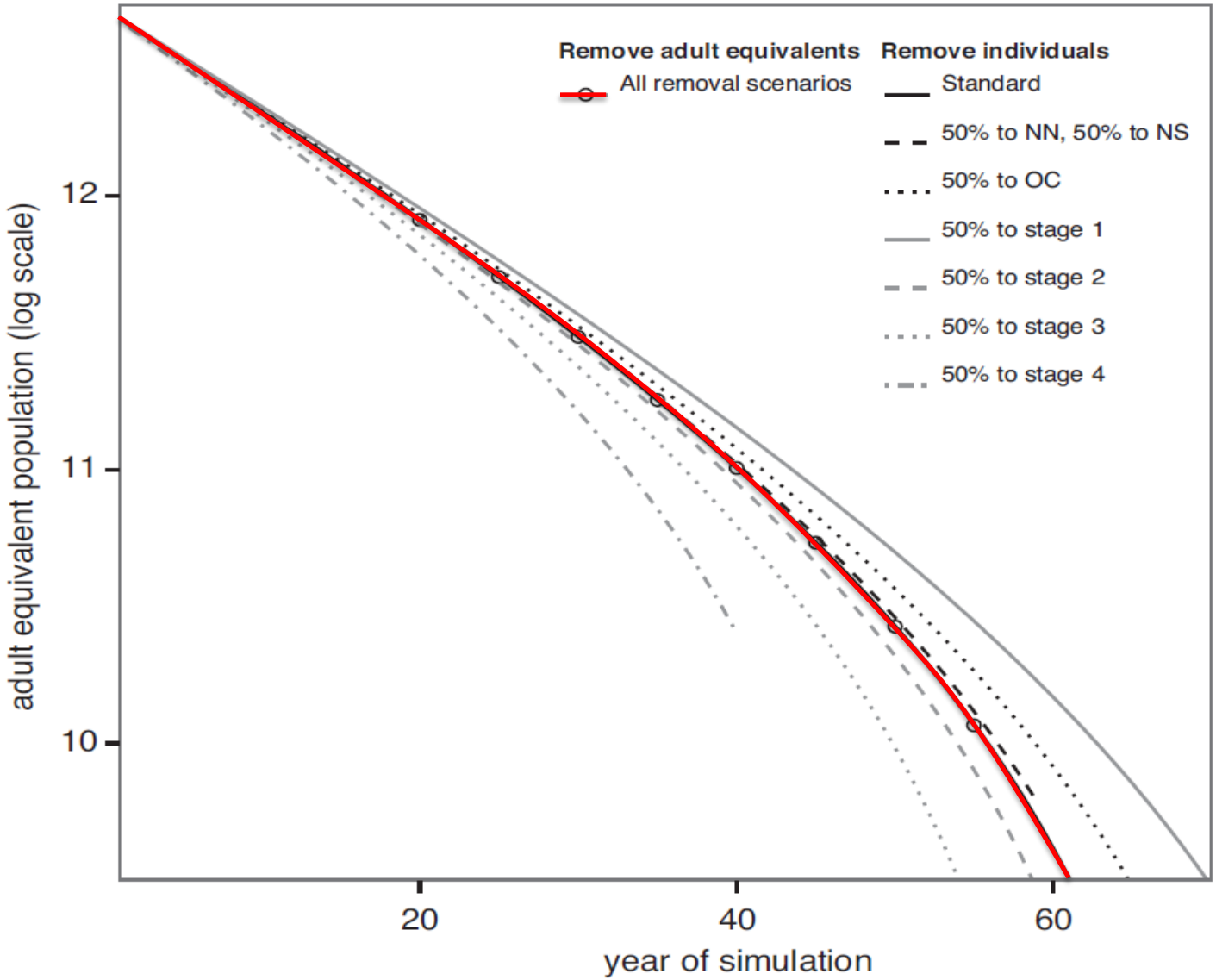
Building a better assessment toolbox starting with loggerhead turtles



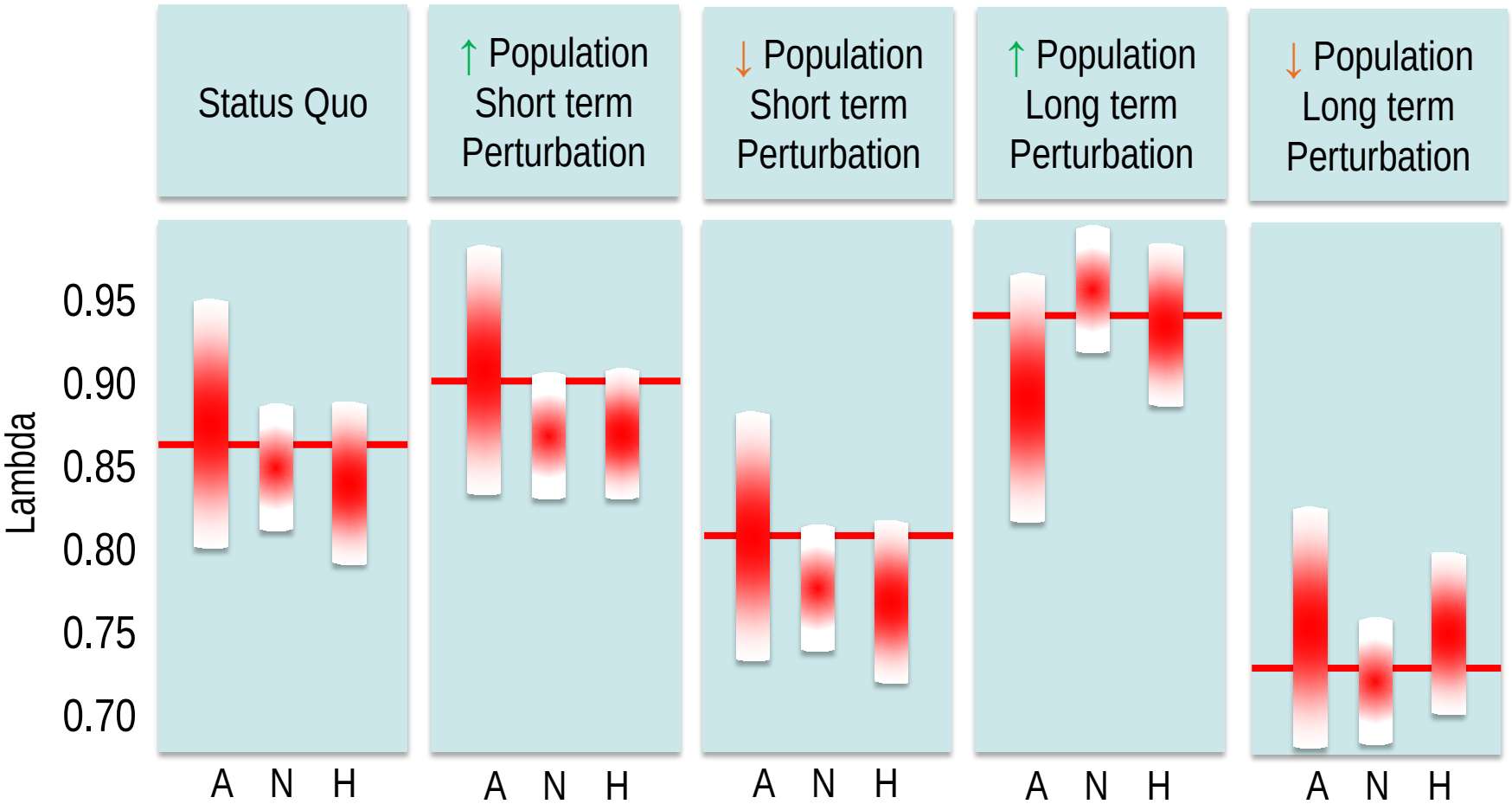


Loggerhead Population Model

Monitoring Removals by Life Stage is Important



Next Question: What metric should we monitor?



– = "True" lambda
A = Aerial Survey for stage II-IV
N = Nests
H = Hatchlings

Ecological and Management Scenarios

Quantitative Methods

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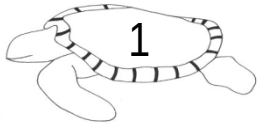
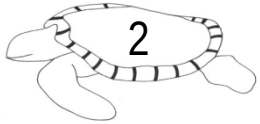
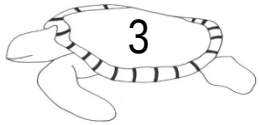
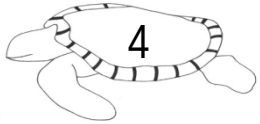
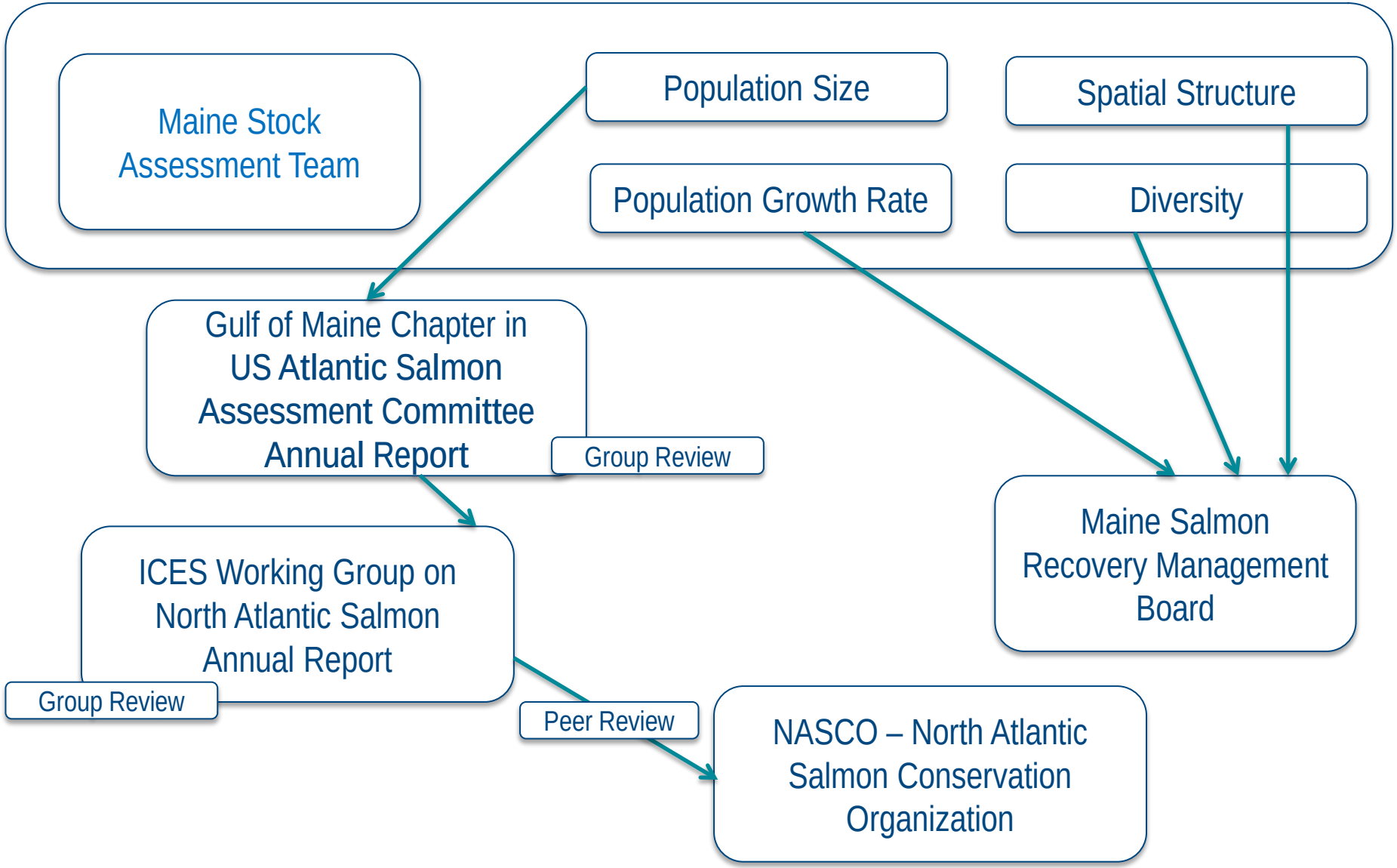
	☹	😐	☺	☺	☺	☺
 1	☺	☹	☹	☹	☺	☺
 2	☺	😐	😐	😐	☹	😐
 3	☺	☺	😐	☹	☺	😐
 4	😐	☺	😐	☺	☺	😐

Atlantic Salmon Stock Assessment

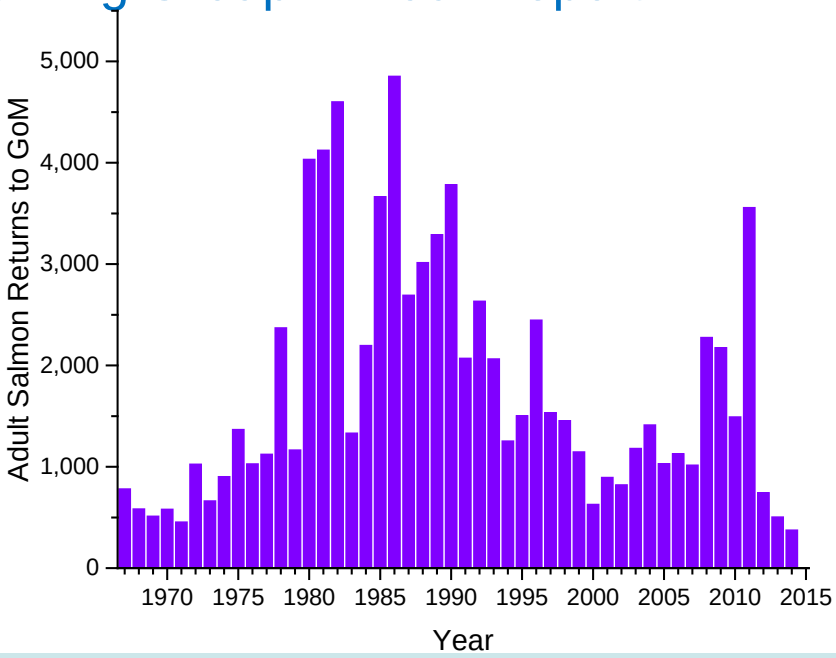


Atlantic Salmon Stock Assessment Overview

- Reference points:
  - Conservation Spawning Escapement (min. # adults seed critical habitat w/eggs)
  - Population growth rate - Replacement Rate (10 year geometric mean)
  - Viable Salmonid Population Approach (Day 3)
- Data sources:
  - Abundance – adult census at traps or redd counts
  - Stock ID – river specific – genetic profiles for broodstock and fishery interactions
  - Human interactions – fish passage at dams; marine fisheries, legacy of past river uses
- Links to management:
  - Direct – ESA stock assessment for Maine and Science Support for NASCO Commissioners

Atlantic Salmon Gulf of Maine DPS Current Status

- **Stock Assessment Method**
  - Population Size – Census (trap and redd counts)
  - Also Viable Salmonid Population methods (day 3)
- **Reports – annually**
  - US Atlantic Salmon Assessment Committee Annual Report
    - Integrating Maine Spatial Structure Based Assessment
  - ICES North Atlantic Salmon Working Group Annual Report
- **Status – Very Low**
  - Returns in 2014
  - 375 fish
  - 8 rivers
  - Primarily hatchery smolts



Atlantic Salmon and Sturgeons - Status

- Shortnose Sturgeon
  - Listed at creation of ESA
  - *By congress*

- Atlantic Sturgeon
  - Petitioned to List, Biological Review Team (*genetics and distribution*)
  - 5 Distinct Population Segments
    - Gulf of Maine = Threatened
    - Southern 4 = Endangered

- Atlantic Salmon
  - Petitioned, used *Evolutionarily Significant Unit (ESUs)* to evaluate
  - Historically 4 DPS – Distinct Population Segments (dual listing with USFWS)
  - Extant Populations
    - Gulf of Maine DPS – endangered
    - Outer Bay of Fundy – listed in Canada, managed primarily by Canada

Fish Stock Assessment Quality

- **Atlantic salmon** = GPRA Tier 2; updated in 2014 based on data from 2014
  - Ecosystem concerns work ongoing
- **Atlantic sturgeon** = GPRA Tier 1; updated in 2007, next update scheduled for 2017, data in 2016
- **Shortnose sturgeon** = GPRA Tier 1; updated in 2014 based on data from 2007-2014 (varies by DPS)