

WHITE STURGEON & DENSITY DEPENDENCE

- Questions from the YN to PUD Fish Forums
 - Question #1: What can the Forum learn about **detecting density dependence** and its **consequences** from the 30 years of information obtained by the White Sturgeon Stock Assessment project in the lower Columbia and Snake Rivers?
 - Question #2: What has been the Sturgeon Management Task Force's **response(s)** to density dependence in its management of Zone 6 populations?

QUESTION #1

- Background:
 - Density dependence only appears to be occurring in the Bonneville Reservoir White Sturgeon population
 - Potential density dependence in The Dalles Reservoir
 - Fish biologists have speculated for a couple of decades some level of density dependence is taking place within Bonneville Reservoir (\uparrow abundance, \downarrow growth in Zone 6, poor W_r of fish <70 cm FL and 70-109 cm FL)
 - Density dependence only observed mainly in “sub-legal” (~ 2 -3 feet; ages ~ 5 -9) segment of the population
 - Fish biologists have never seen abundances as high as the 2006, 2009, and 2012 estimates (density dependence a recent occurrence?)

QUESTION #1

- Detection of Density Dependence:
 - Population size, annual growth, condition (W_r), and size structure estimates from routine M&E in Zone 6 reservoirs
 - Figure 1 (below) summarizes average population estimates, densities, and biomasses of Zone 6 White Sturgeon populations (Source: WDFW/ODFW)

| RESERVOIR | TIME SERIES | DATA POINTS | SIZE ¹ | AVE POP SIZE ² | AVE DENSITY ³ | AVE BIOMASS ⁴ |
|------------|-------------|-------------|-------------------|---------------------------|--------------------------|--------------------------|
| Bonneville | 1989-2012 | 7 | 20,800 | 159,910 | 7.69 | 64.0 |
| The Dalles | 1987-2011 | 7 | 11,100 | 70,415 | 6.34 | 83.8 |
| John Day | 1990-2013 | 7 | 51,900 | 33,946 | 0.65 | 9.7 |

¹Reservoir size expressed in surface acres

²Average population size includes all White Sturgeon from 61-183 cm and >183cm

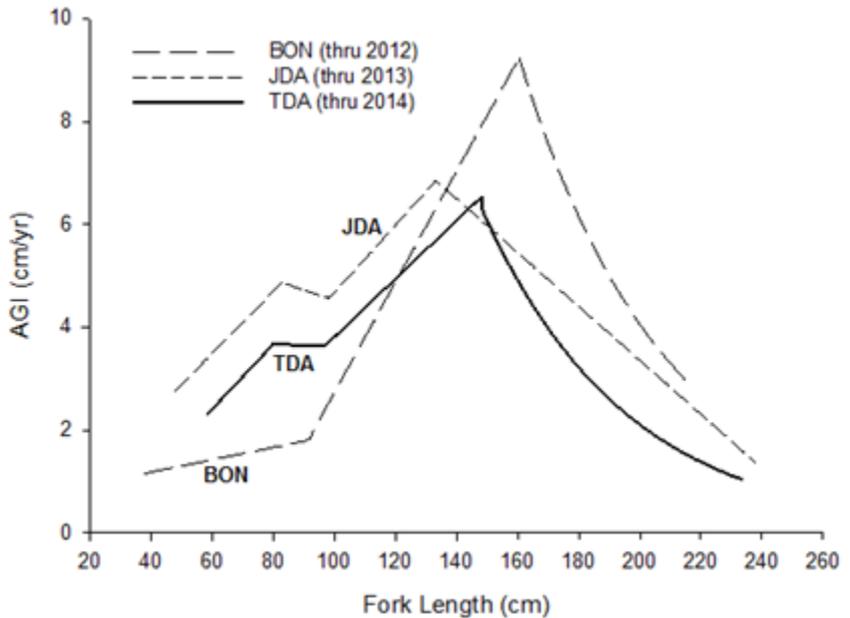
³Population estimate divided by reservoir size

⁴Total poundage is estimated by multiplying total abundance by median weight of sturgeon caught

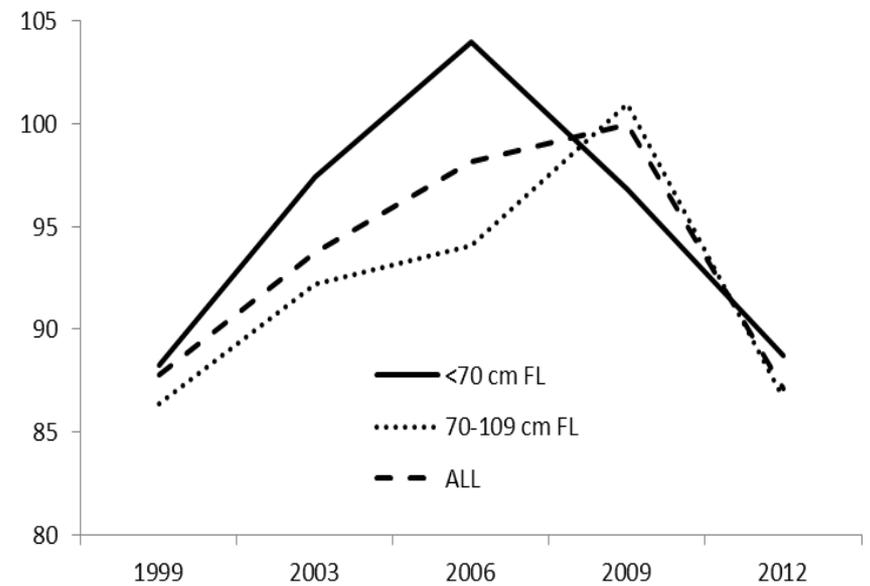
with setlines in a given sampling year

QUESTION #1

- Figure 2: Annual growth increments of White Sturgeon in Zone 6 reservoirs (Source: ODFW)

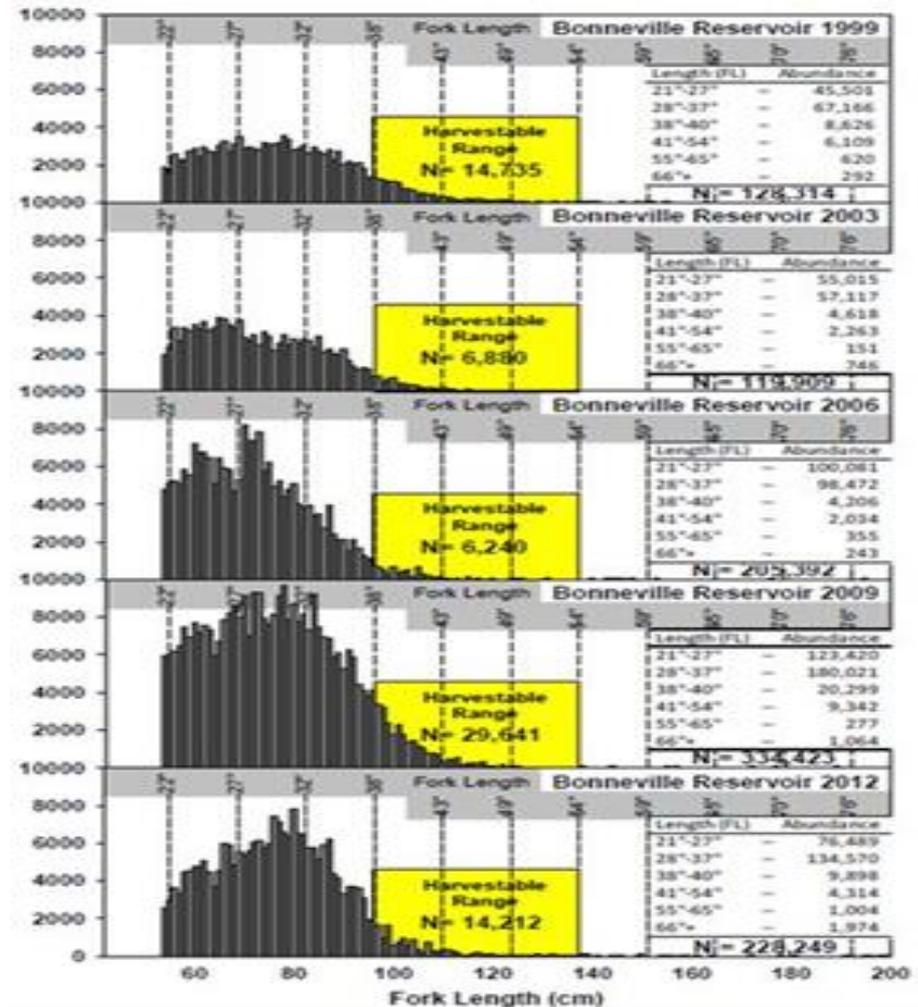


- Figure 3: Mean W_r of White Sturgeon <70 and 70-109 cm FL in Bonneville Reservoir, 1999-2012 (Source: ODFW)



QUESTION #1

- Figure 4: Population estimates (1999-2012) and size structure of Bonneville Reservoir White Sturgeon Population (Source: ODFW)



QUESTION #1

- Detection of Density Dependence:
 - PUDs' M&E programs (current) are estimating population abundance, growth, and condition
 - Proposed changes to M&E programs (interval to annual) will be able to track those metrics and trends more accurately
 - Question of when, what size/age class, and if(?) we'll detect dependence in the project areas
 - Do we really want density dependence occurring?
 - Once you're there it's hard to back out?

QUESTION #1

- Consequences:
 - Technically unknown at this time
 - Aside from tracking annual growth increment, abundance, and W_r , no density dependence specific investigations are being performed on Bonneville Reservoir (Zone 6 reservoirs)
 - Reduced non-treaty and treaty fishing opportunities and harvest due to slow recruitment into the harvest slot-limit

QUESTION #1

- Potential Consequences:
 - Select your favorite density dependence ecological effect(s)
 - Disease
 - Downstream emigration
 - Predation (all species uniformly, preferred prey, yearling White Sturgeon, sensitive species)
 - Reduced population productivity (spawning and recruitment rates)

QUESTION #1

- Miscellaneous:
 - Diet/bioenergetic data gaps for lower Columbia River
 - Some diet work performed in Zone 6 from 1987-91
 - Unclear what the limiting factor in the environment is
 - Unsure what number, level of effort, and resources are needed to remove (harvest or translocation) “sub-legal” to reduce density dependence
 - Density dependence potentially occurring in a population solely maintained through natural reproduction and recruitment (and all variables that +/- effect that)
 - Project areas being bolstered with plants of large and robust hatchery fish with high (better than nature) survival rates

QUESTION 2

- Co-Managers widened the slot limit regulation of harvestable White Sturgeon from 43-54 inches FL to 38-54 inches FL in the Bonneville Reservoir
- In 2006, the Tribes proposed to conduct experimental population control by harvesting up to 10% of the most abundant size classes over a two year period
 - Goal: Increase growth rates of juvenile White Sturgeon

QUESTION 2

- In 2008, the Tribes promoted the idea of translocating White Sturgeon from Bonneville Reservoir to John Day and The Dalles reservoirs
- Continued M&E of White Sturgeon populations in Zone 6 reservoirs

DISCUSSION