

WF4313/6613-Fisheries Management

Class 5 – Population dynamics

Announcements



Announcements

- Student sub-unit of the American Fisheries Society Meeting
- Tuesday September 5th @ 5 pm in TH118



Announcements

- Reminder to see website for content, links, and so on.
<https://mcolvin.github.io/WFA4313-Fisheries-Management/>
- No class Monday, University Holiday

In the news



Yes, That's a Huge Floating Mass of Live Fire Ants in Texas

Floods make them more venomous and more aggressive.



Hurricane Fishing



A Day In The Life...

Florida Fish and Wildlife Conservation Commission

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News Releases

News Releases by Email

Public meeting to address managing aquatic plant life on Lake Okeechobee

News Release
Tuesday, August 29, 2017
Media contact: Carol Lyn Parrish, 850-556-2269

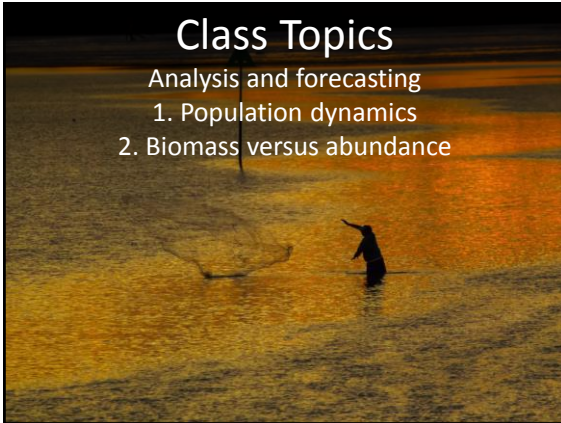
The Florida Fish and Wildlife Conservation Commission (FWC) will hold a public meeting on Thursday, August 31, to address the management of aquatic plants on Lake Okeechobee. The meeting will be from 5 to 8 p.m. at the Clevelston Youth Center, 110 W. Osceola Ave., Clevelston.

The purpose of the meeting is to gather public comment on vegetation and aquatic habitat management on Lake Okeechobee, and also gather input on any suggestions for future management efforts. The FWC, and other managing partners, will be available to discuss the management and answer questions following the public comment process.

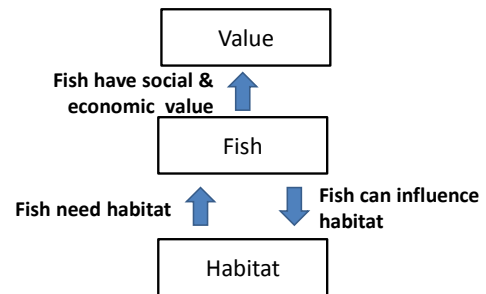
2017		2016		2015	
Jan	Feb	Mar	Apr	May	Jun
Jan	Feb	Mar	Apr	May	Jun
Jul	Aug	Sep	Oct	Nov	Dec

Class Topics

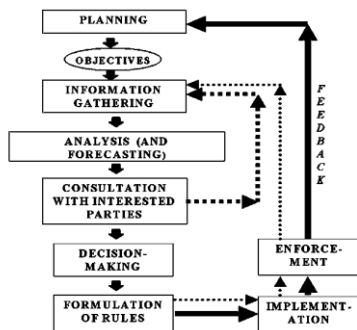
- Analysis and forecasting
1. Population dynamics
 2. Biomass versus abundance



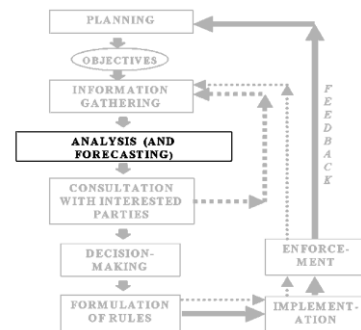
A fishery



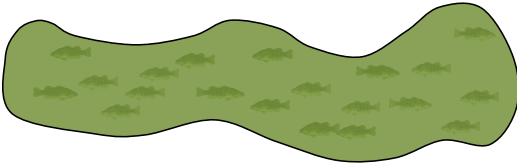
Fisheries Management Conceptually



Fisheries Management Conceptually



"The trouble with fish is that you never get to see the whole population. They're not like trees, whose numbers can be estimated by flying over a forest. Mostly you see fish only when they're caught..." Schnute 1987



Our "view" of fish populations comes from a variety of sources: anglers, commercial fisheries, and sampling gears. Each has inherent biases, and we rarely have complete information about the fishery of concern.



Thinking *inside* the box

Fish

Value

Habitat

10 Fish or
28 Kilograms

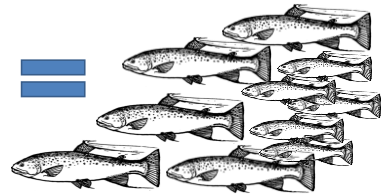
Thinking *inside* the box

Fish

Value

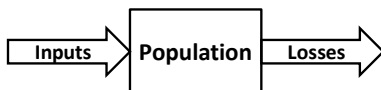
Habitat

10 Fish or
28 Kilograms



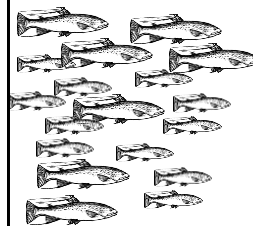
Thinking *outside* the box

Population dynamics in a nutshell:

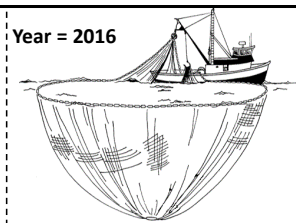


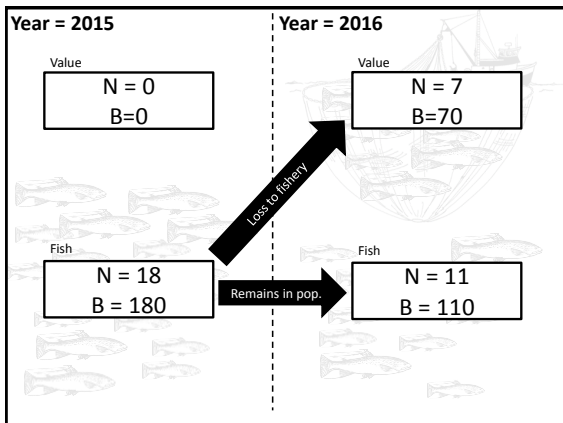
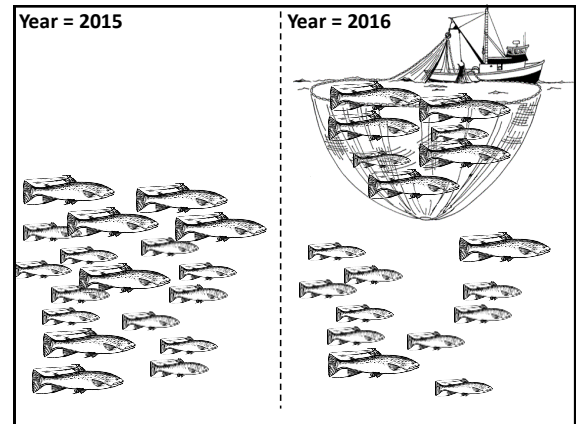
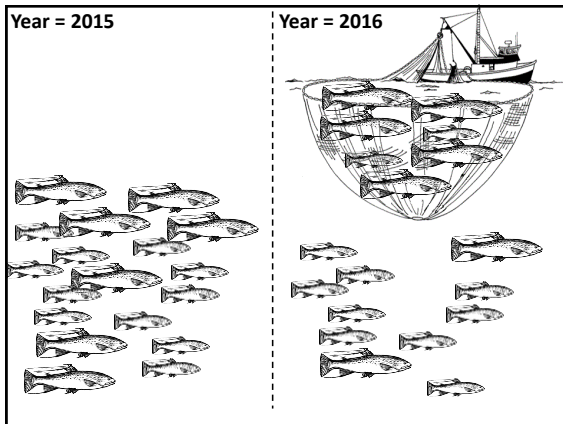
$$[\text{Population change}] = [\text{Inputs}] - [\text{Outputs}]$$

Year = 2015



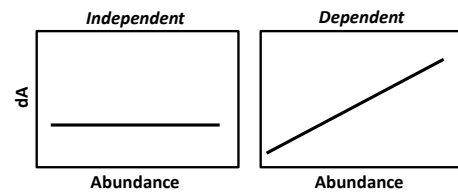
Year = 2016





Revisiting gains and losses

Change in abundance ($dA = \text{gains} - \text{losses}$) can be independent or dependent of population abundance

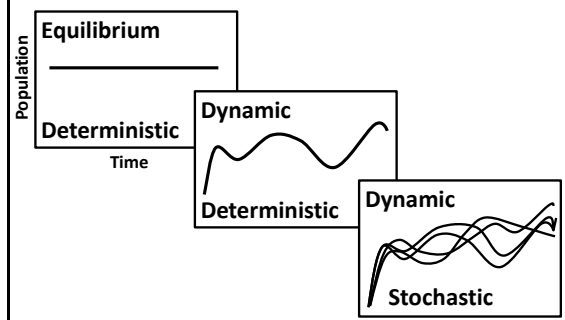


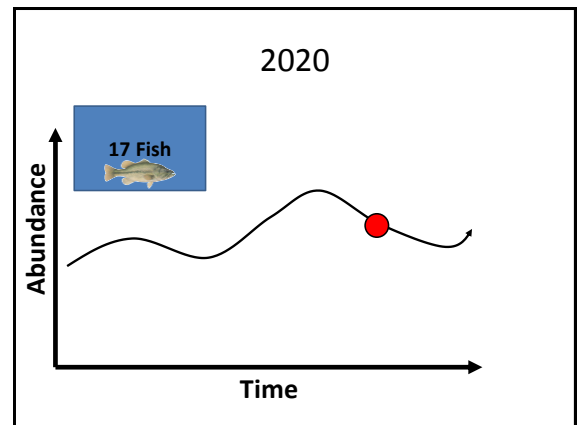
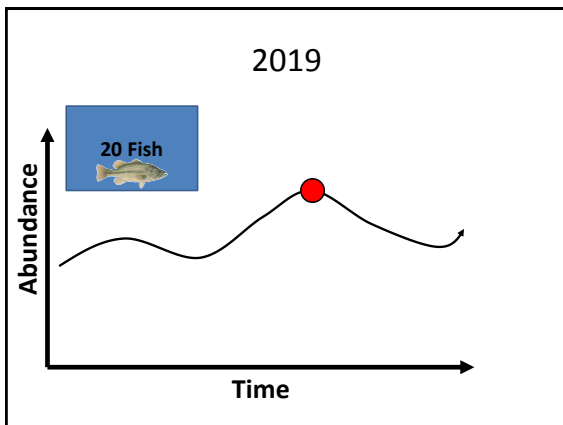
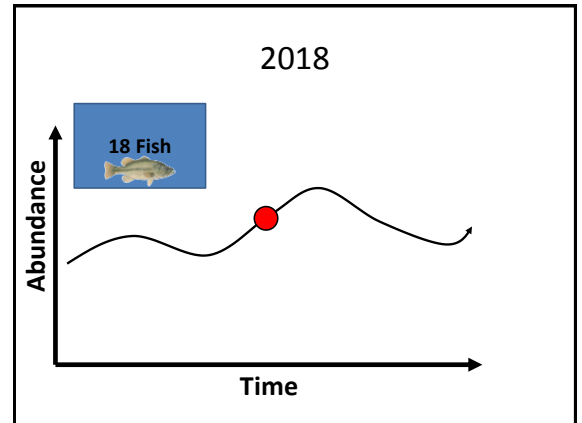
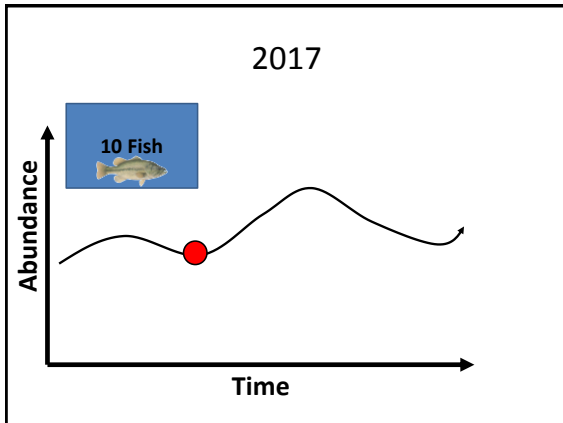
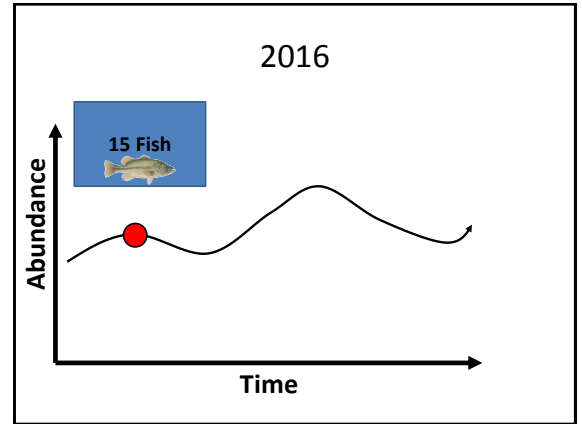
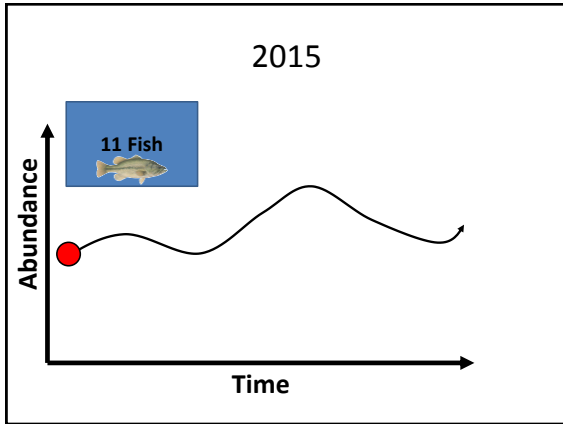
Population dynamics

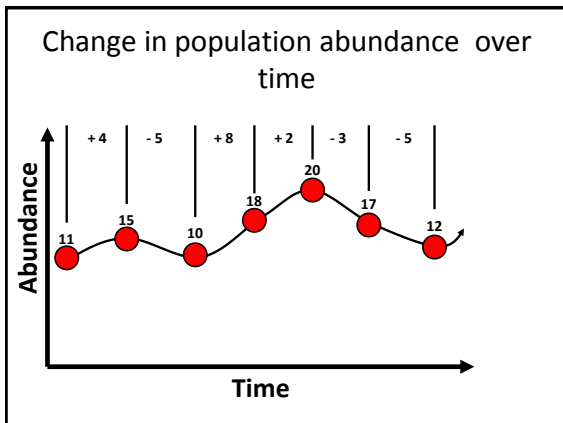
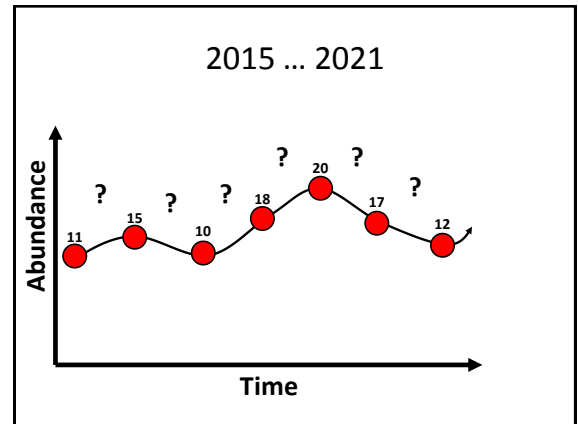
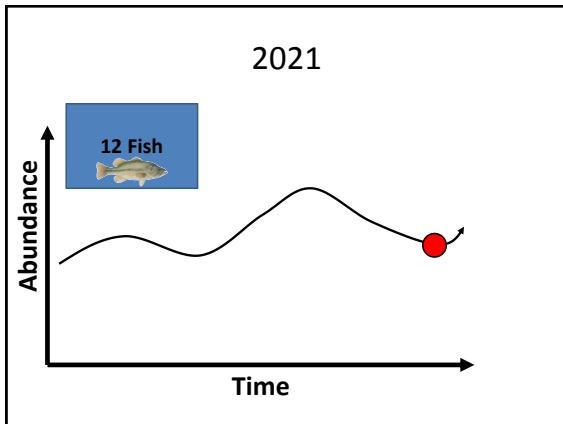
- What are population dynamics?
- Suppose in 2015 we have a pond with 11 Largemouth Bass in it.



Population dynamics model types







Year	Abundance	$\text{Abundance}_{\text{year}+1} - \text{Abundance}_{\text{year}}$
2015	11	$4 = 15 - 11$
2016	15	$-5 = 10 - 15$
2017	10	$3 = 18 - 10$
2018	18	$2 = 20 - 18$
2019	20	$3 = 17 - 20$
2020	17	$-5 = 12 - 17$
2021	12	$? = ? - 12$

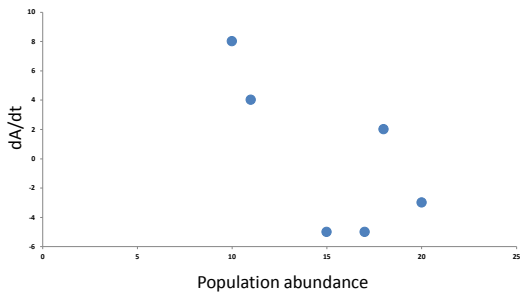
Population changes (gains & losses)

Year	Abundance	$\text{Abundance}_{\text{year}+1} - \text{Abundance}_{\text{year}}$
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$\frac{d\text{Abundance}}{dt} = \text{Abundance}_{\text{year}+1} - \text{Abundance}_{\text{year}}$

Independent or dependent?



These are 'net changes' in the population over time

Year	Abundance	Abundance _{year+1} - Abundance _{year}
2015	11	4 = 15-11
2016	15	-5 = 10 - 15
2017	10	3 = 18-10
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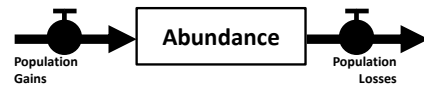
Gains and losses

Reflect the balance of population gains and losses

Year	Abundance	Abundance _{year+1} - Abundance _{year}
2015	11	4 = 15-11
2016	15	-5 = 10 - 15
2017	10	3 = 18-10
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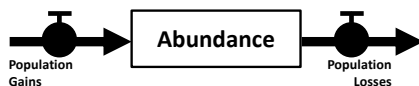
Gains and losses

Population dynamics in a nutshell:



$$\frac{dAbundance}{dt} = gains - losses$$

Fish dynamics



Fish dynamics: state variables

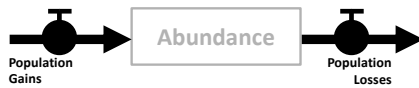
Abundance



State Variable: Something measurable & can stored or lost over time:

- Abundance
- Biomass

Fish dynamics: processes



Fish dynamics: Mechanisms



Fish dynamics: Mechanisms

Gains:	Losses:
Births	Deaths
Immigration	Harvest
Nearby System	Predation
Birds	Other mortality (habitat)
Storms and other events	Disease
Stocking	Emmigration
State agency (legal)	
Illegal stockings	

Fish dynamics: Mechanisms

Gains:	Losses:
1. Recruitment	1. Mortality
2. Immigration	a) Fishing
3. Stocking	a) Commercial
4. Other(s)?	b) Recreational
	b) Natural
	a) Predation
	b) Pathogen
	2. Emigration
	3. Other(s)?

Processes & Mechanisms

$Gains = \text{recruitment} + \text{stocking} + \text{immigration}$

$Losses = \text{mortality} + \text{emigration}$

Fish dynamics: States, Processes, & Mechanisms

