



**NOAA
FISHERIES**

Stock assessments options to support fisheries management, with examples from the United States

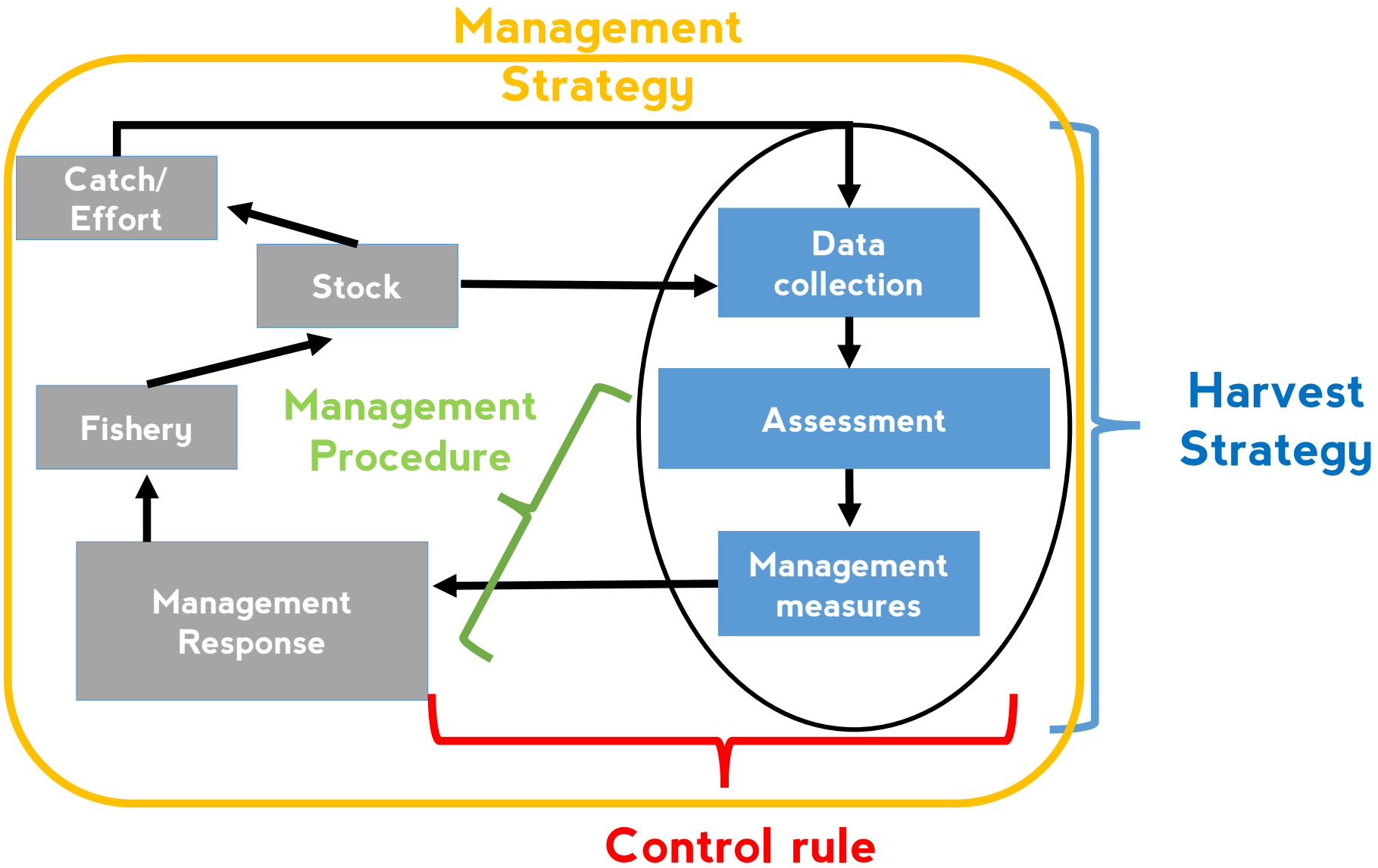
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Components of a fisheries management system



Basics of stock assessment

Data

- **Removals (Catch + Discards)**
- **Abundance indices**
- **Biological compositions**
 - **Lengths**
 - **Ages**

Stock assessment

Parameters

- **Mortality**
- **Maturity**
- **Age and growth**
- **Productivity**
- **Selectivity**

Model output

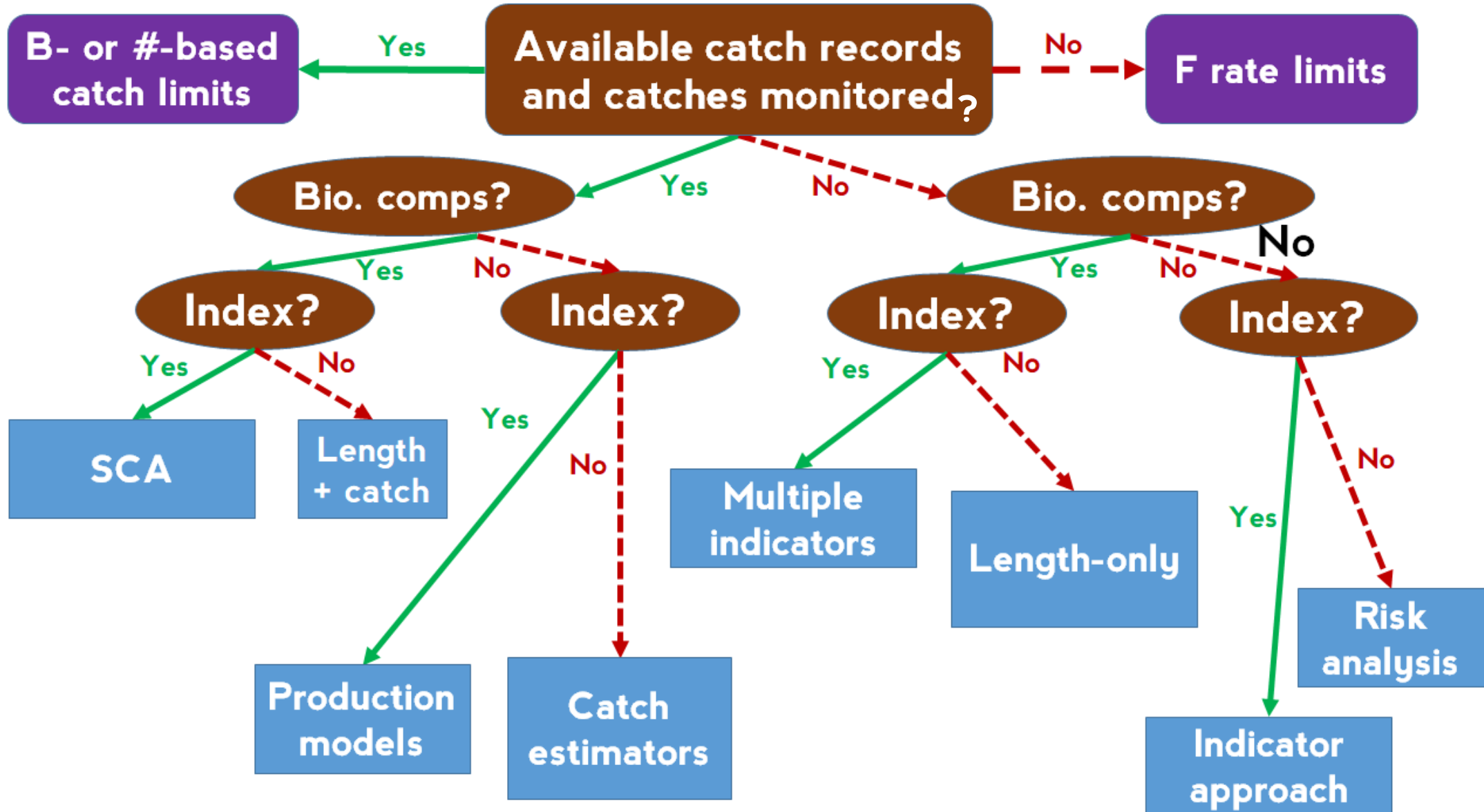
Ref. Pt.

Management Control rule

Output control (catch)

Input control (effort)

Assessment options



Magnuson-Stevens Fishery Conservation and Management Act: The US Fisheries Law

2007: All stocks need annual catch limits (ACLs)

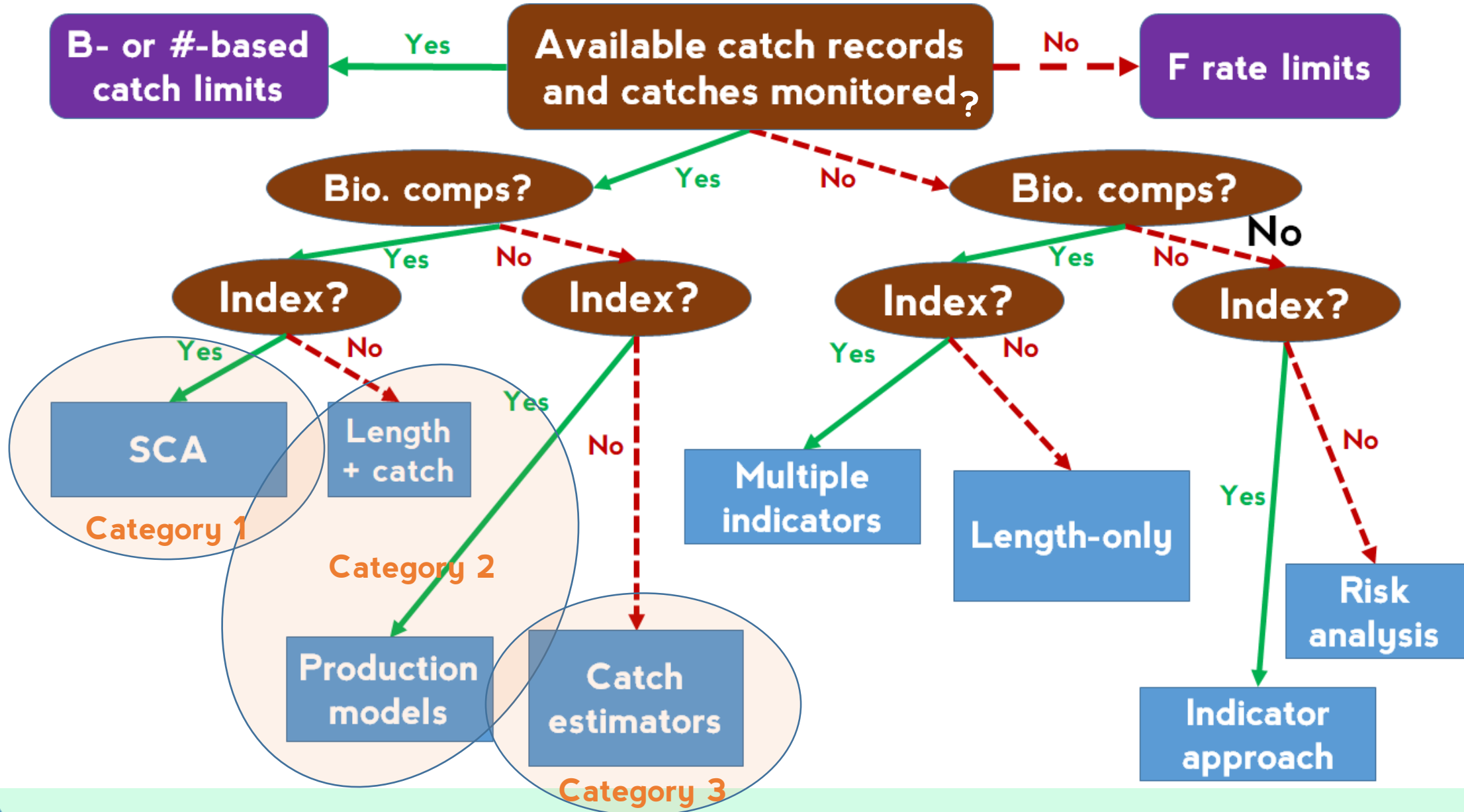
- Few exceptions
- ACLs required for stocks subject to overfishing by 2010
- For stocks “in the fishery” by 2011
- Created need for a variety of analytical methods to meet ACL mandates

Assessment categories: US west coast

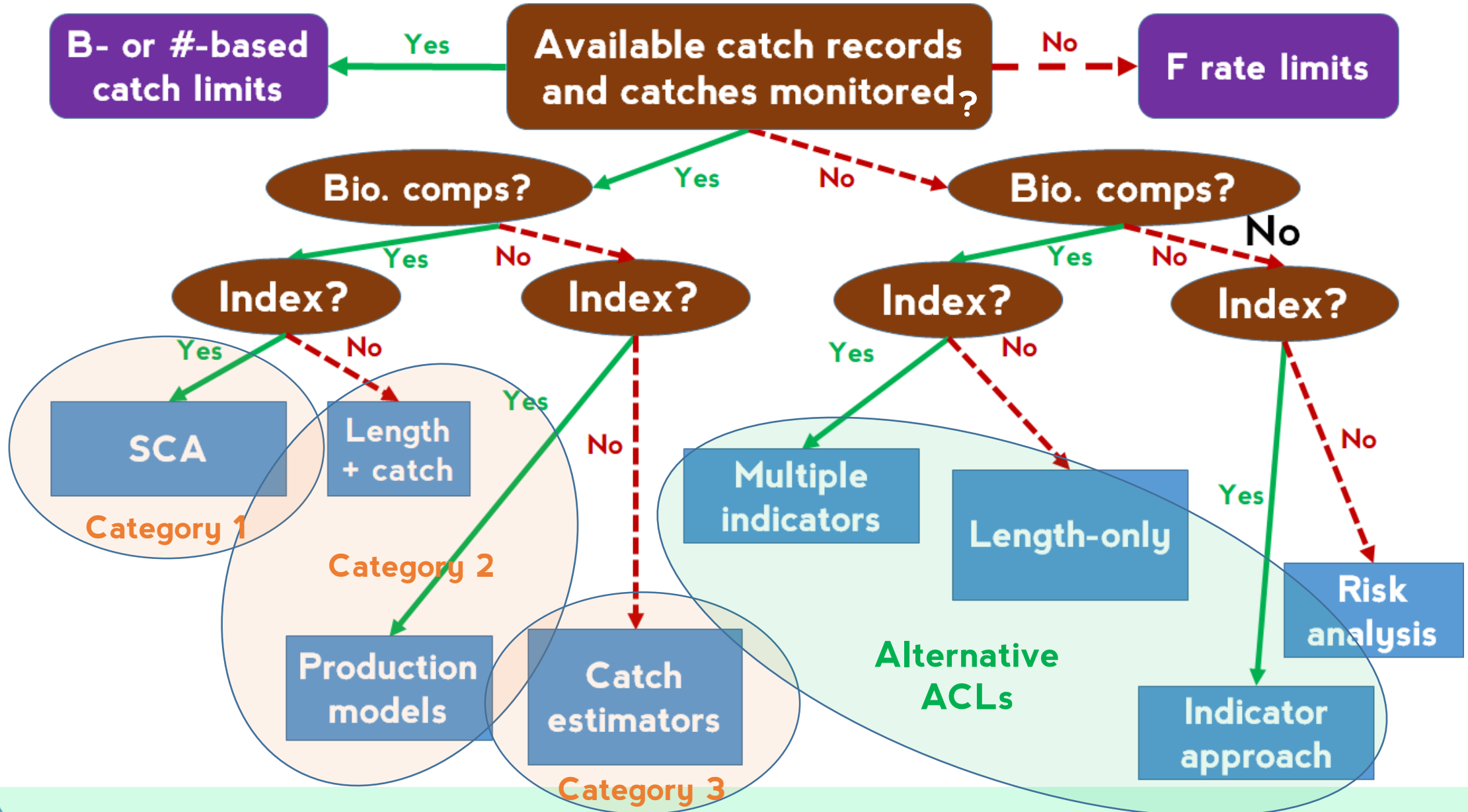
- Based mostly on data availability
- Model category and uncertainty contribute to the application of risk tolerance

<p>Category 3: Data poor. OFL is derived from historical catch.</p> <p>Catch-only</p>	a	No reliable catch history. No basis for establishing OFL.
	b	Reliable catches estimates only for recent years. OFL is average catch during a period when stock is considered to be stable and close to BMSY equilibrium on the basis of expert judgment.
	c	Reliable aggregate catches during period of fishery development and approximate values for natural mortality. Default analytical approach DCAC.
	d	Reliable annual historical catches and approximate values for natural mortality and age at 50% maturity. Default analytical approach DB-SRA.
<p>Category 2: Data moderate. OFL is derived from model output (or natural mortality).</p> <p>Catch + length or indices</p>	a	M*survey biomass assessment (as in Rogers 1996).
	b	Historical catches, fishery-dependent trend information only. An aggregate population model is fit to the available information.
	c	Historical catches, survey trend information, or at least one absolute abundance estimate. An aggregate population model is fit to the available information.
	d	Full age-structured assessment, but results are substantially more uncertain than assessments used in the calculation of the P* buffer. The SSC will provide a rationale for each stock placed in this category. Reasons could include that assessment results are very sensitive to model and data assumptions, or that the assessment has not been updated for many years.
	e	Assessments of a complex of species cannot be designated as a category 1 assessment unless there is good evidence that the component species have very similar life-history characteristics and similar rates of biological productivity.
<p>Category 1: Data rich. OFL is based on F_{MSY} or F_{MSY} proxy from model output. ABC based on P* buffer.</p>	a	Reliable compositional (age and/or size) data sufficient to resolve year-class strength and growth characteristics. Only fishery-dependent trend information available. Age/size structured assessment model.
	b	As in 1a, but trend information also available from surveys. Age/size structured assessment model.
	c	Age/size structured assessment model with reliable estimation of the stock-recruit relationship.

Assessment options

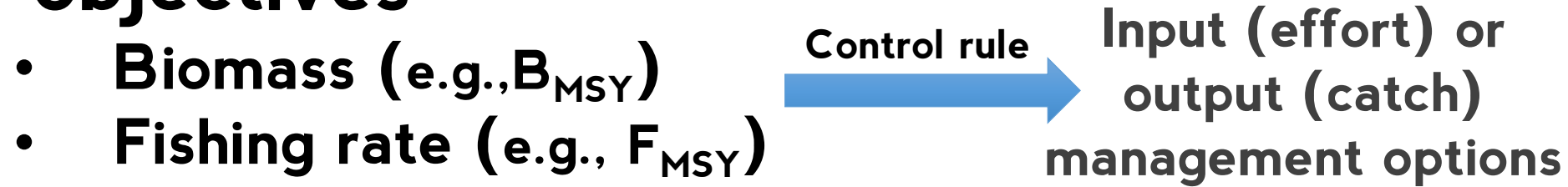


Assessment options



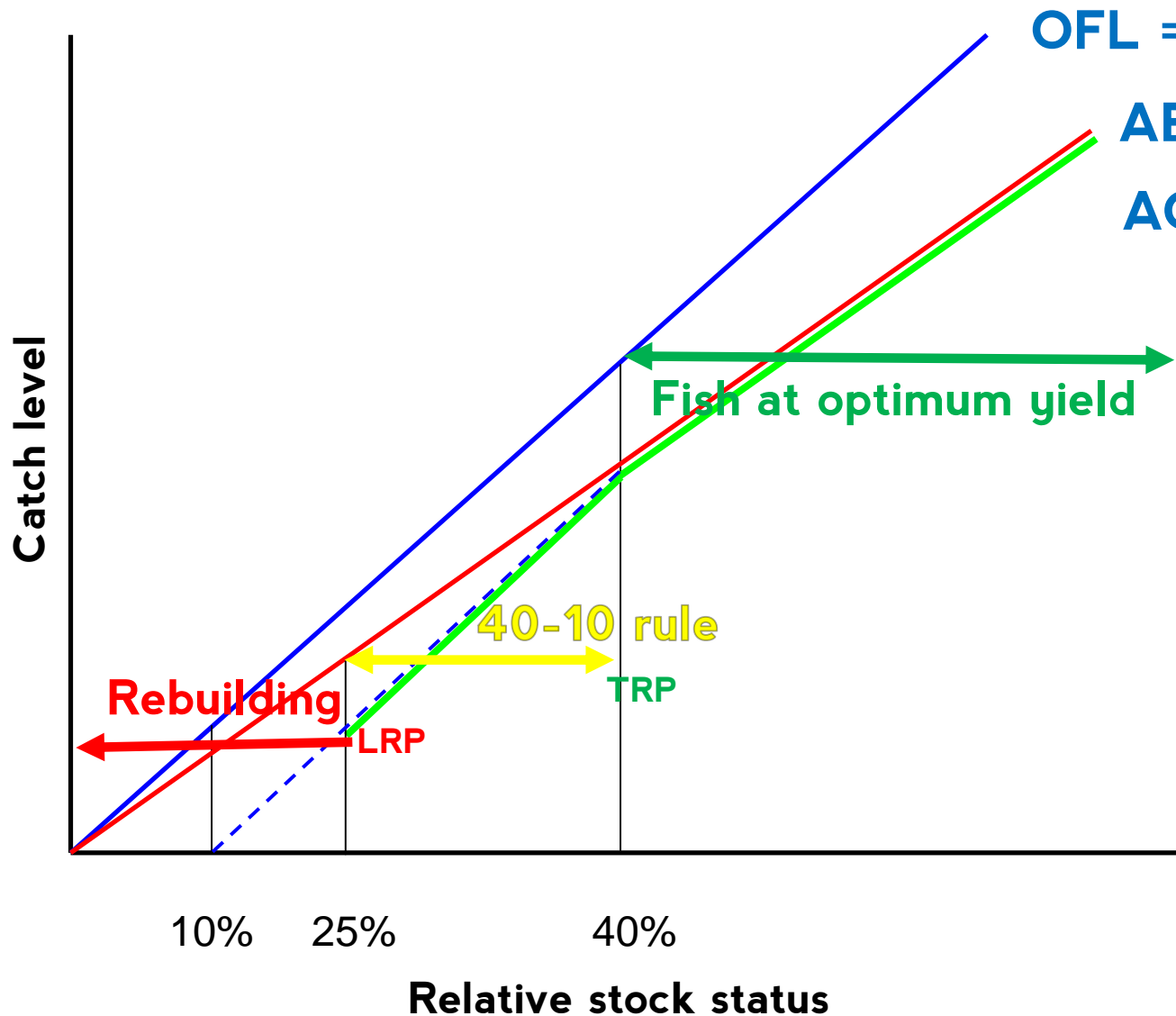
Using assessment output: Reference points for control rules

- RPs embody management objectives



- **Target reference points (TRP):**
where you want to be
- **Limit reference points (LRP):**
where you don't want to go below

US west coast control rule: 40-10



- Buffer based on scientific uncertainty in the OFL
- The OFL quantile (P^*) expresses risk
- Ex: $P^*=0.4$ is the 40th quantile.
- The OFL variance (sigma) defines location of P^* on OFL distribution

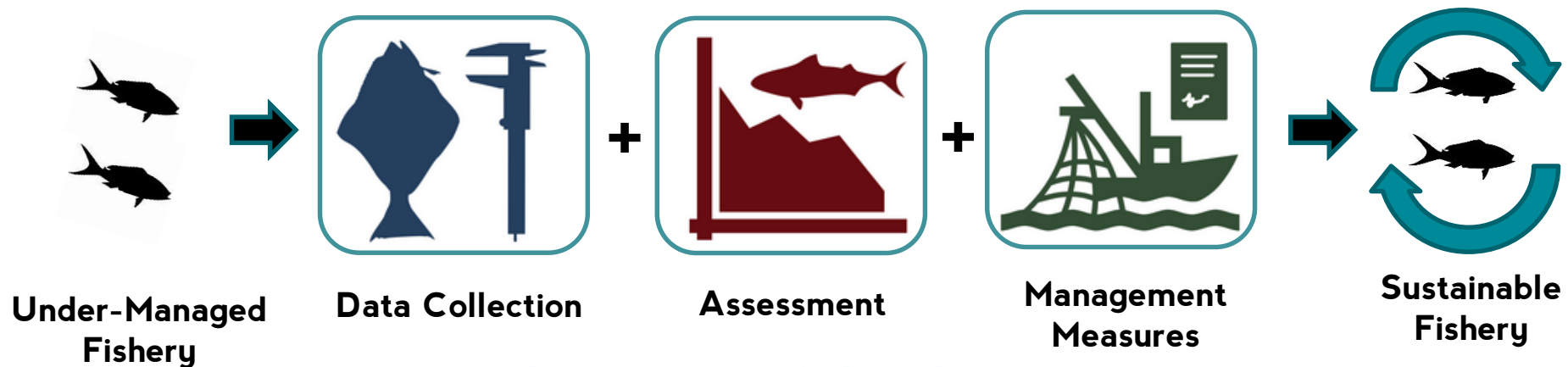
Stock assessment category sigma

- Category 1 = 0.5
- Category 2 = 1.0
- Category 3 = 2.0

FISHPATH : A resource for fisheries management

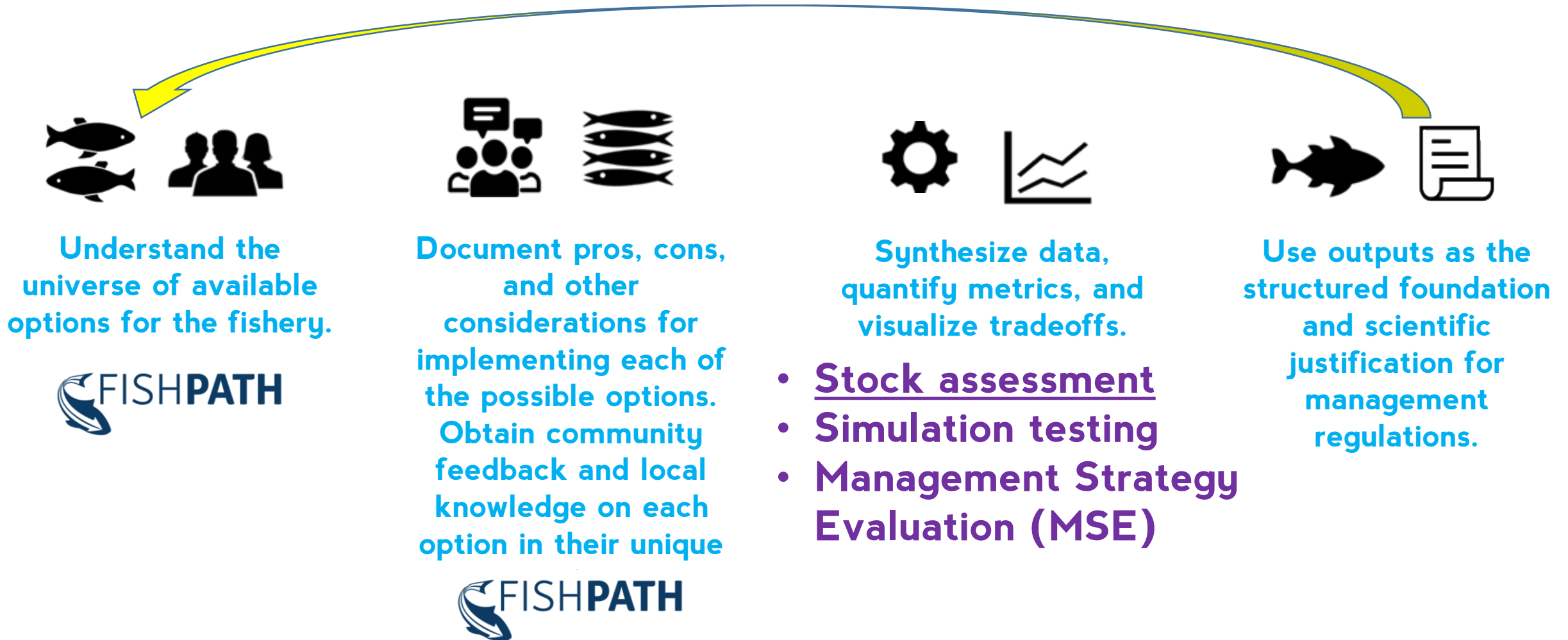


- **A bottom-up, process-based guidance that empowers users to manage their fishery**
- **A web-based decision support tool for guiding the assessment and management of fisheries**



<https://www.fishpath.org/>

How to Develop Scientific Justification for Fisheries Rule Making



Points of consideration

- **Match management measures to assessment type and output**
 - Avoid limiting management options (e.g., only catch limits)
- **Find the “right sized” assessment approach**
 - Based on data, capacity and resources
- **Articulate the management objectives clearly**
 - Include stakeholder input
 - Define risk tolerance and reflect it in the control rules