



# Genetic Interactions Between Cultured and Wild Fish Stocks



## Considerations for the Genetic Management of Offshore Aquaculture

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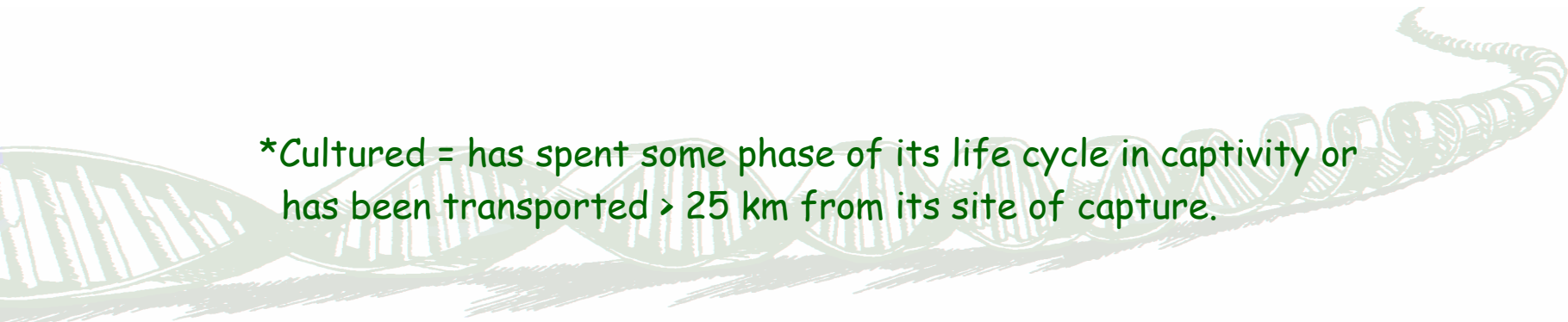
## ***FWC Mission :***

*Managing fish and wildlife resources for their long-term well-being and the benefit of people.*

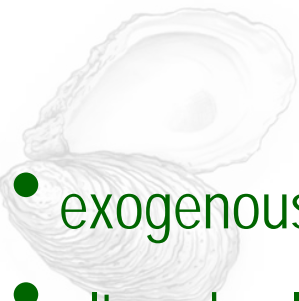

## ***FWC Policy for the Release of \*Cultured Finfishes :***

*...all activities involving the release of organisms shall be undertaken with full consideration of their impact on natural biological diversity and in ways that do not threaten the state's natural biological heritage...*

*\*Cultured = has spent some phase of its life cycle in captivity or has been transported > 25 km from its site of capture.*



# Genetic Concerns

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- exogenous (inter-stock) gene transfer
  - altered selection/drift dynamic
  - maladapted alleles or traits
  - genetically modified organisms (GMOs)
  - inbreeding depression
  - mutational meltdown
  - diversity loss
  - introgressive hybridization
  - family size variance
  - domestication
  - founder effects
  - outbreeding depression
  - artificial selection
  - genetic swamping
  - allelic replacement
  - reduced effective size ( $N_e$ )
  - hybrid swarms
  - disrupted genomic coadaptation



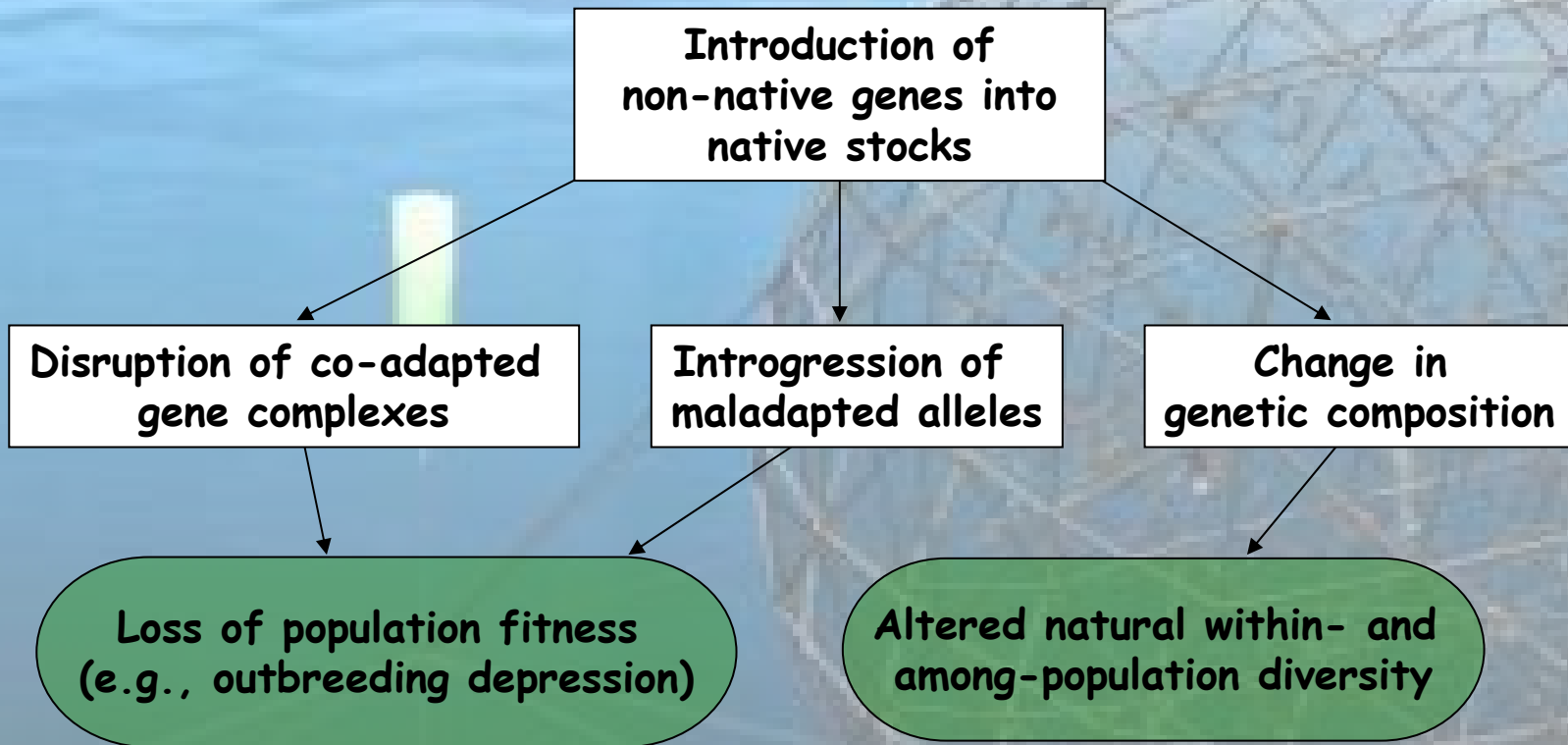
# Grouping the Genetic Concerns

- Impacts from Translocations of Non-Indigenous Genes
- Impacts from Propagation-related Genetic Changes in the Cultured Organisms
- Impacts from Excessive Genetic Input into Natural Stocks

allows for the development of management practices



# • Impacts from Translocations of Non-Indigenous Genes ...





# Hybrids - Who Cares ?







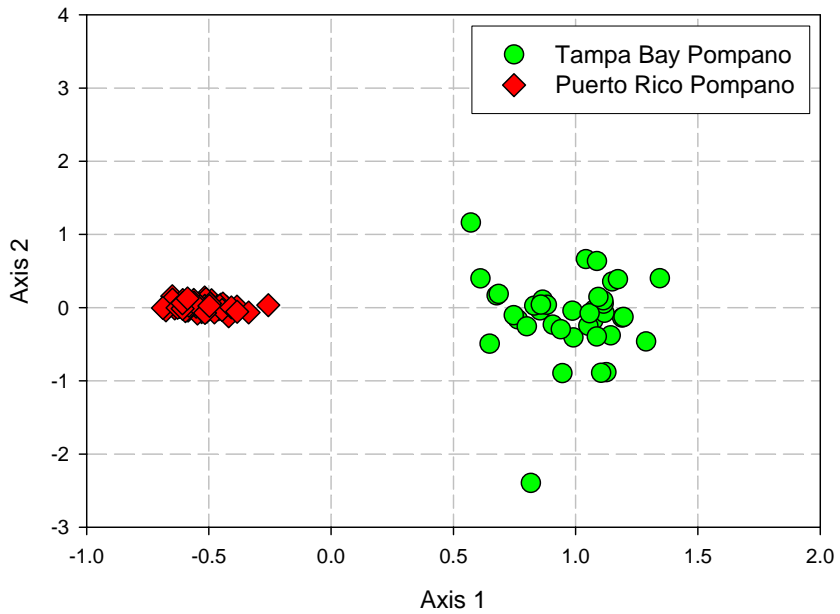
**Gulf of Mexico  
Pompano**



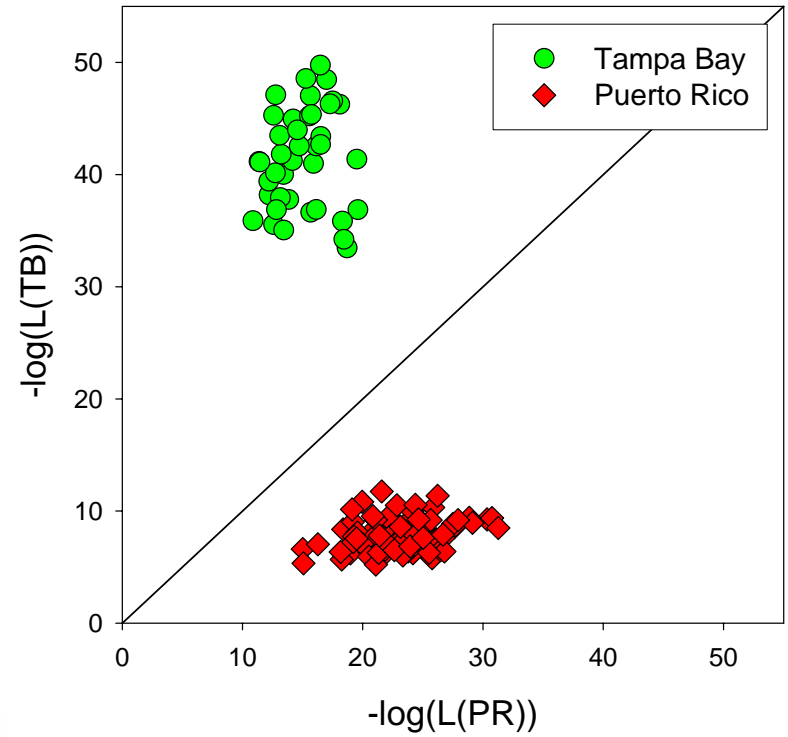
**Puerto Rican  
Pompano**



## Genotypic Heterogeneity

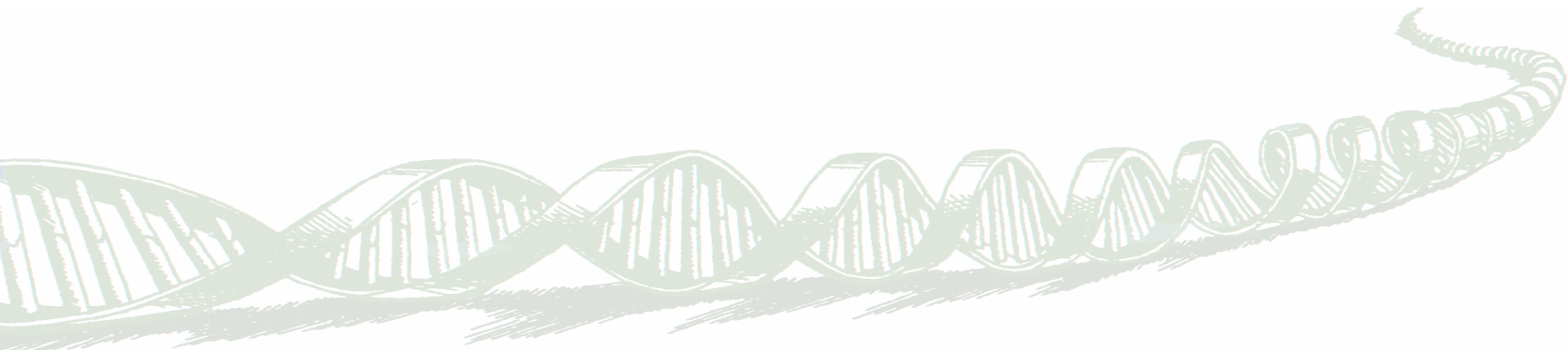
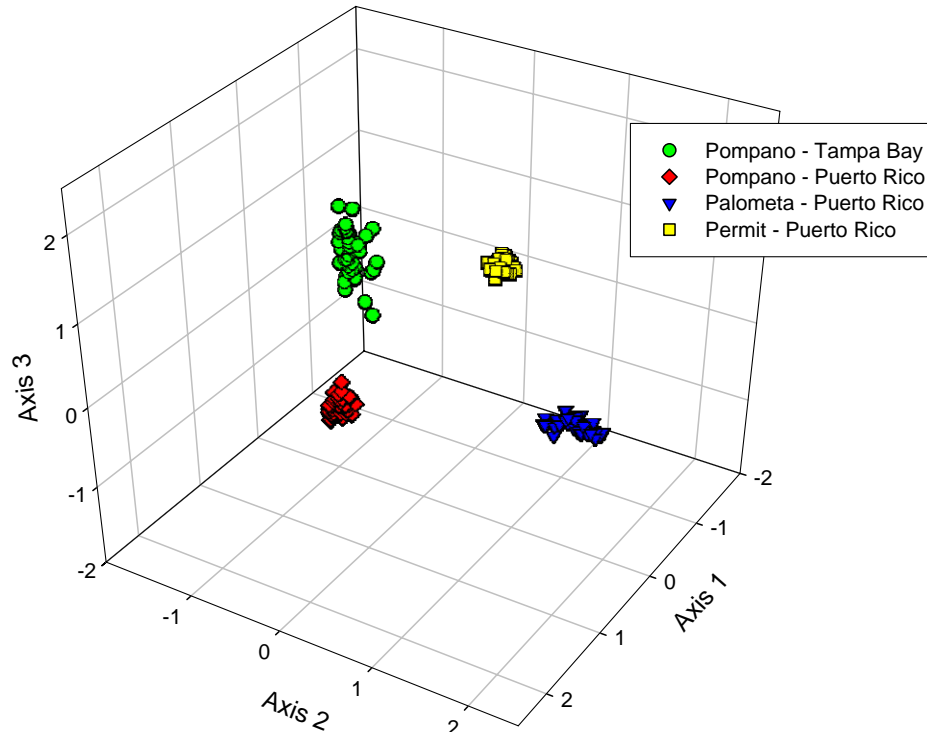


## Population Assignment





# Multi-species Genotypic Heterogeneity



# • Impacts from Propagation-related genetic changes ...

Intentional (trait-specific) selection or genetic modification

Domestication (unintentional selection)

Inbred or related progeny (high inbreeding coefficient,  $f$ , or coancestry coefficient,  $F$ )

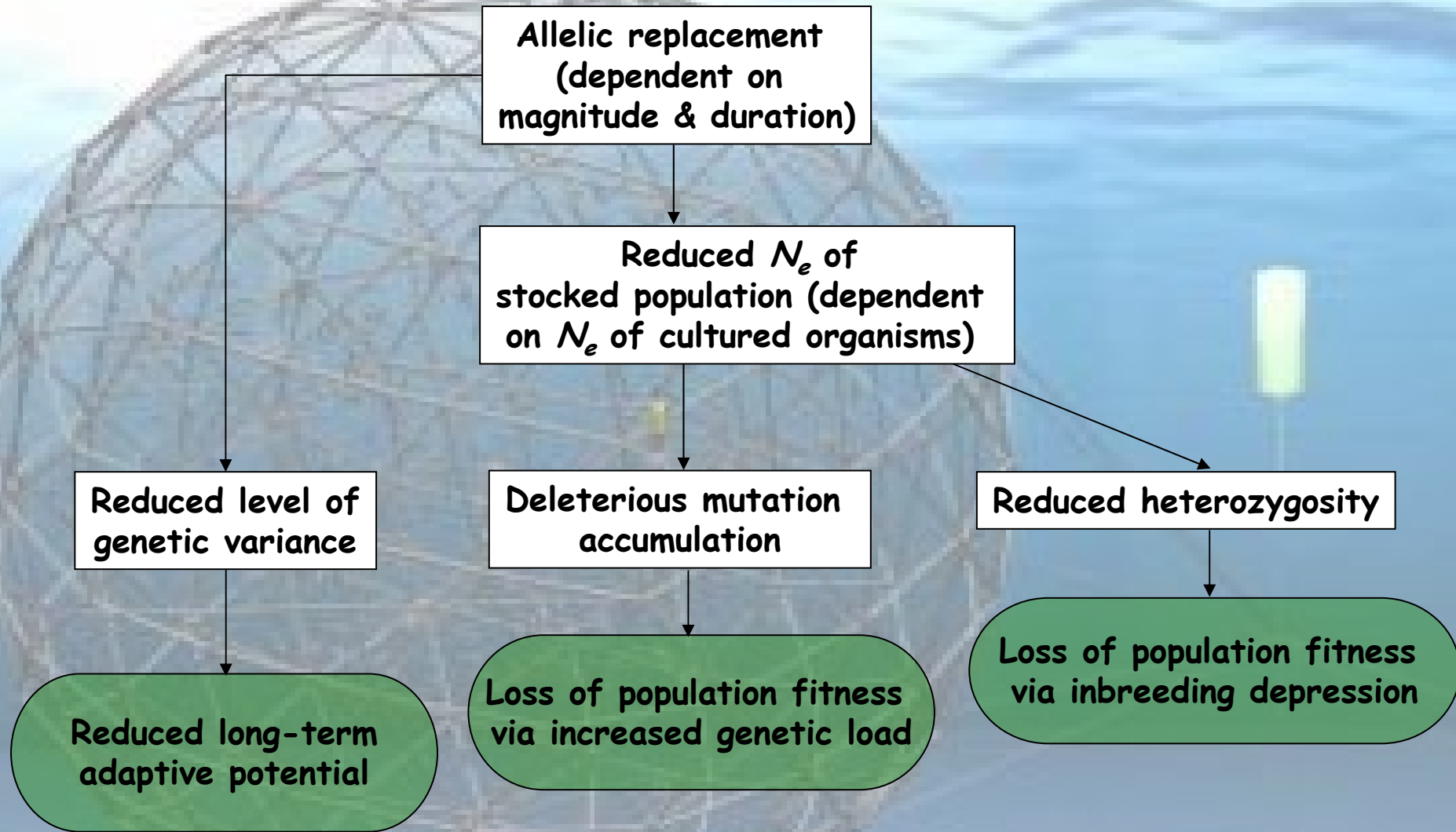
Natural selection compromised by influx of cultured organisms (dependent on selective effects, magnitude, & duration of influx)

Increased relatedness and reduced  $N_e$  in admixed population (dependent on progeny  $f$ ,  $F$ , magnitude, & duration)

Loss of population fitness via outbreeding depression

Loss of population fitness via inbreeding depression

# • Impacts from Excessive Genetic Input into Natural Stocks ...



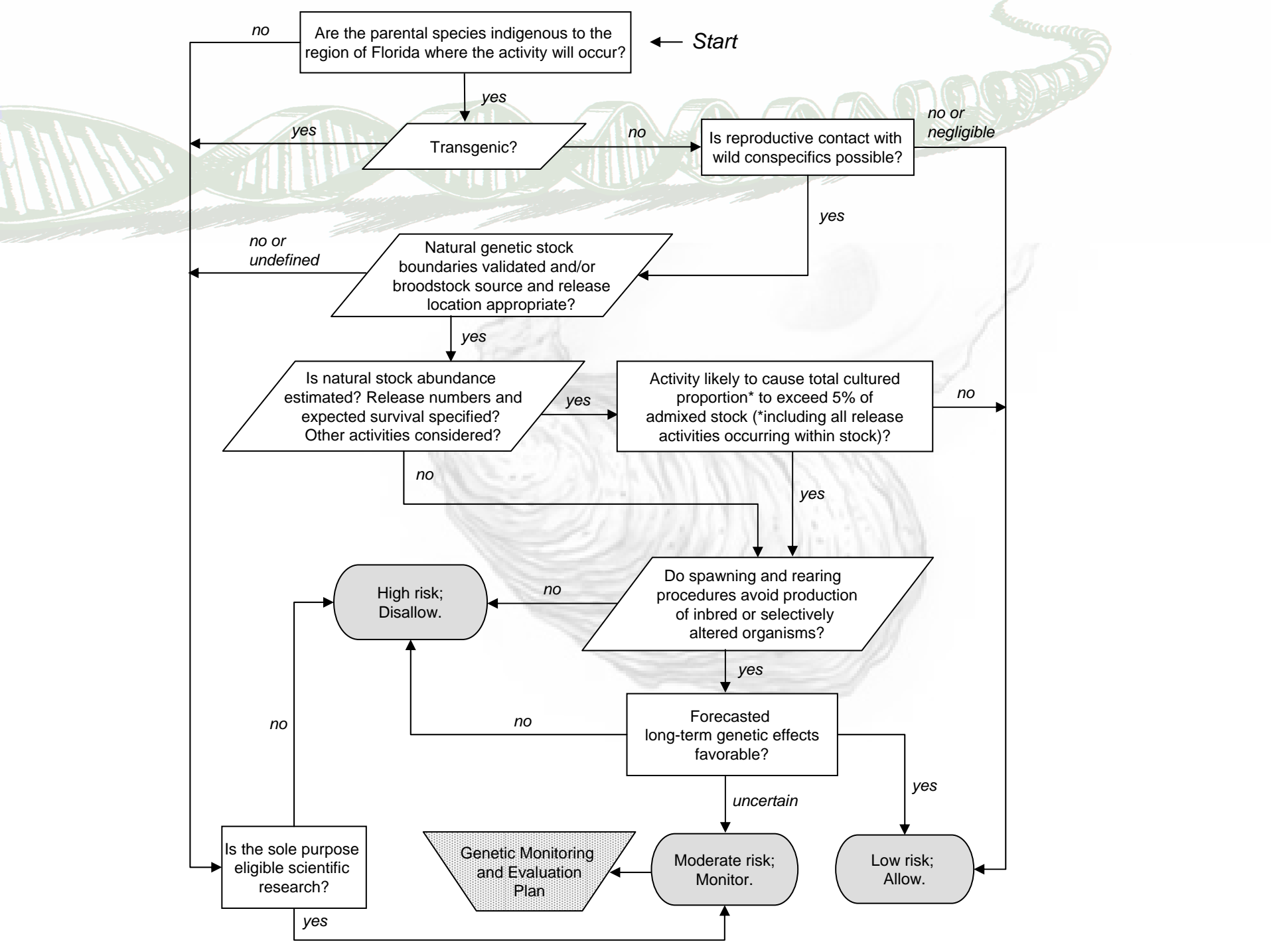
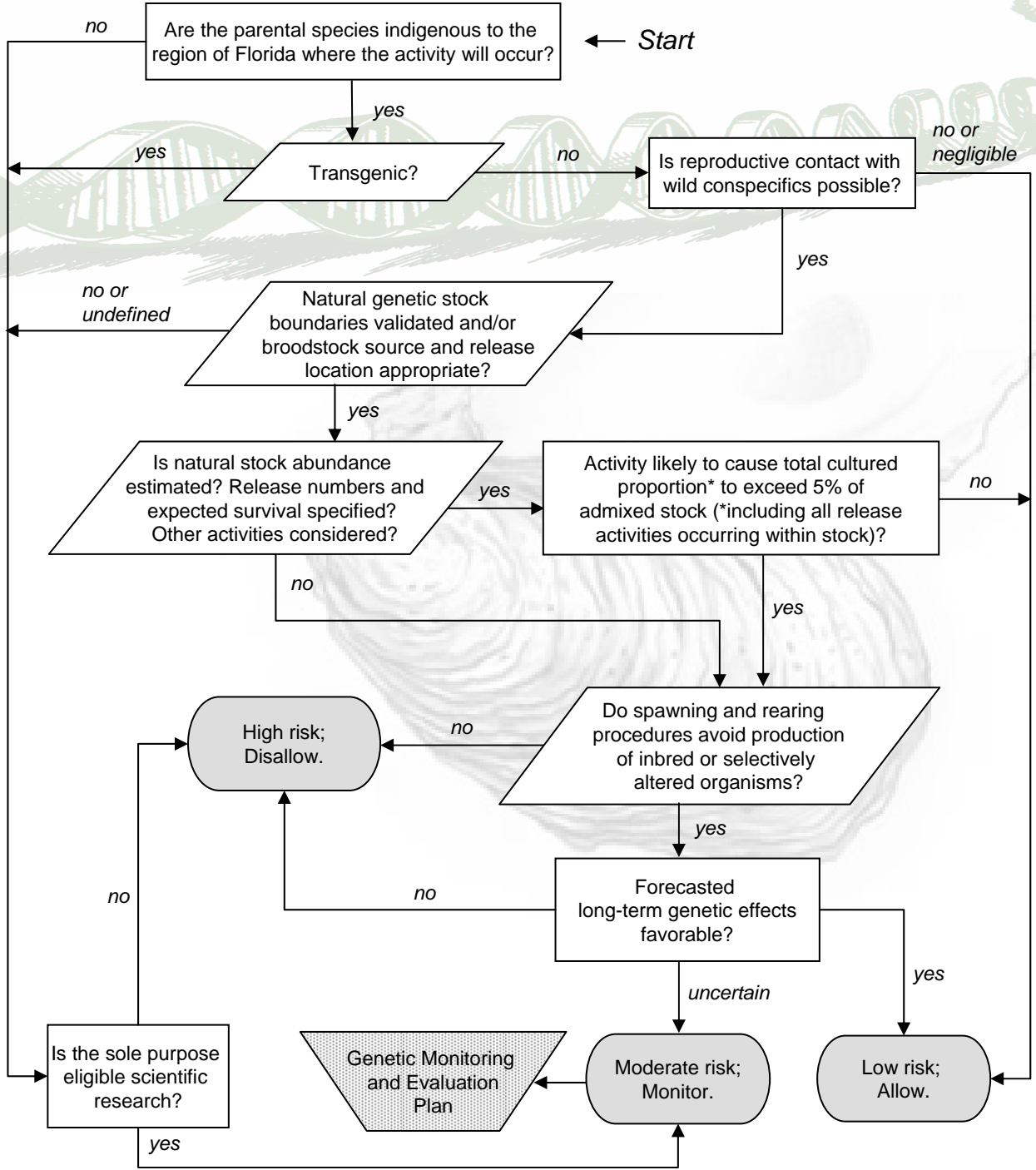
## *Genetic Risk Assessment*

- Case by case
- Natural stock boundaries
- Develop a plan for genetic management

## *Policy Standards*

- Prevent translocation of non-indigenous genomes
- Minimize impacts from propagation-related genetic changes
- Manage cultured proportion in cultured + wild admixtures
- Monitor potentially impacted wild populations





- Restoration/Enhancement/Mariculture activities have a potential to impact wild marine populations.
- Risk of genetic impact can be greatly reduced or negated by adopting management practices that adhere to standards set in Florida's policy.
- Minimizing the risk depends on:
  1. the participation of scientists who study population biology and population genetics of the species,
  2. user-group awareness and sensitivity to the importance of preserving the genetic integrity and diversity of stocks,
  3. and the ability of fishery managers to establish rules and practices that ensure the preservation of genetic resources.