

Organochlorine Pesticides (OCPs) in Fish on the North Shore Restoration Area at Lake Apopka

Harris Chain of Lakes Restoration Council
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Michael F. Coveney PhD

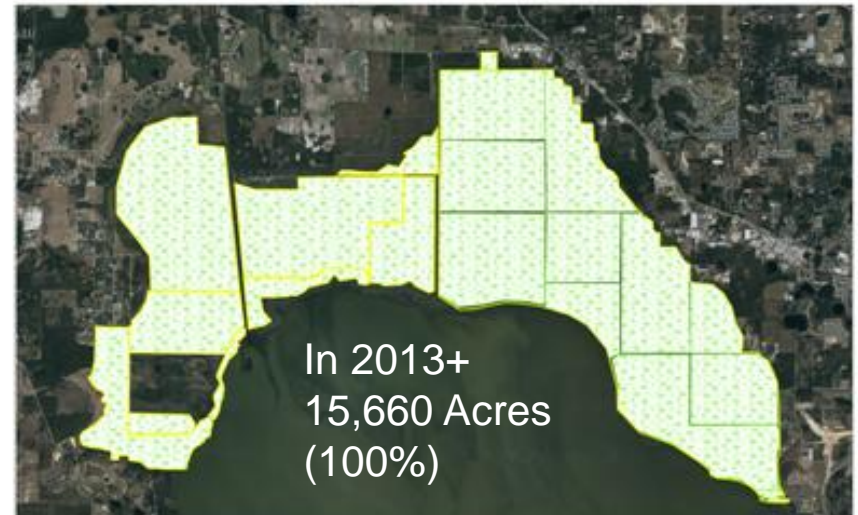
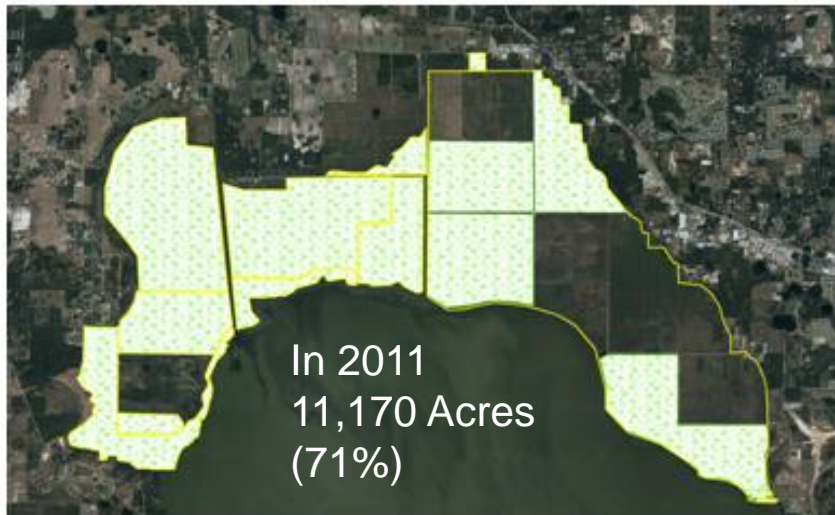
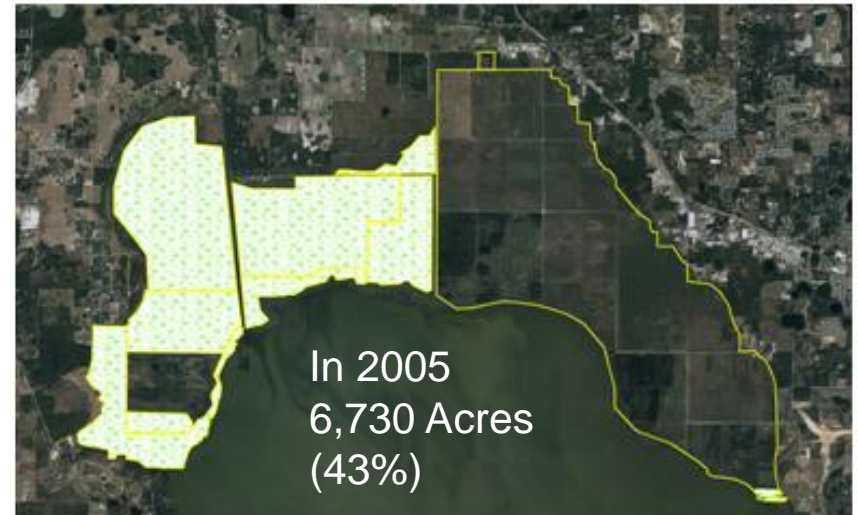
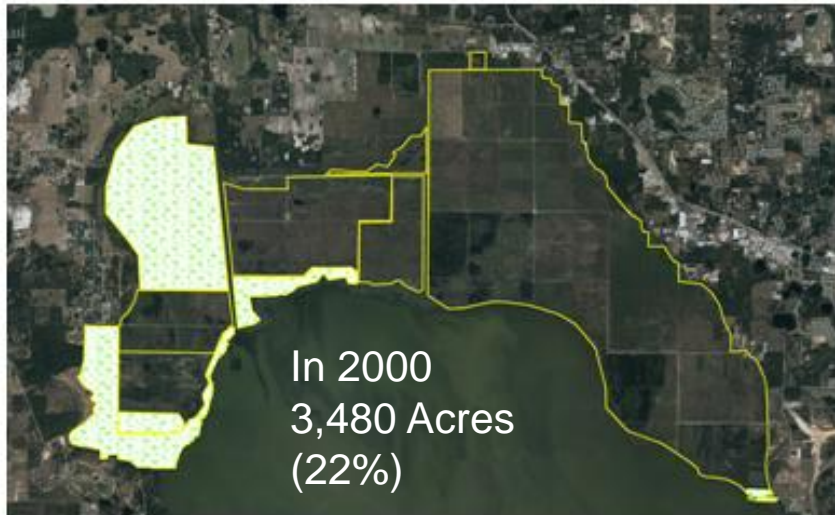
Bureau of Environmental Sciences

St. Johns River Water Management District

Fish OCP Levels on the NSRA

- OCP levels in fish in the NSRA can present risk to wildlife and to humans via consumption
- We have projected future OCP levels and associated risk to help plan management actions

Re-Flooding Sequence for NSRA

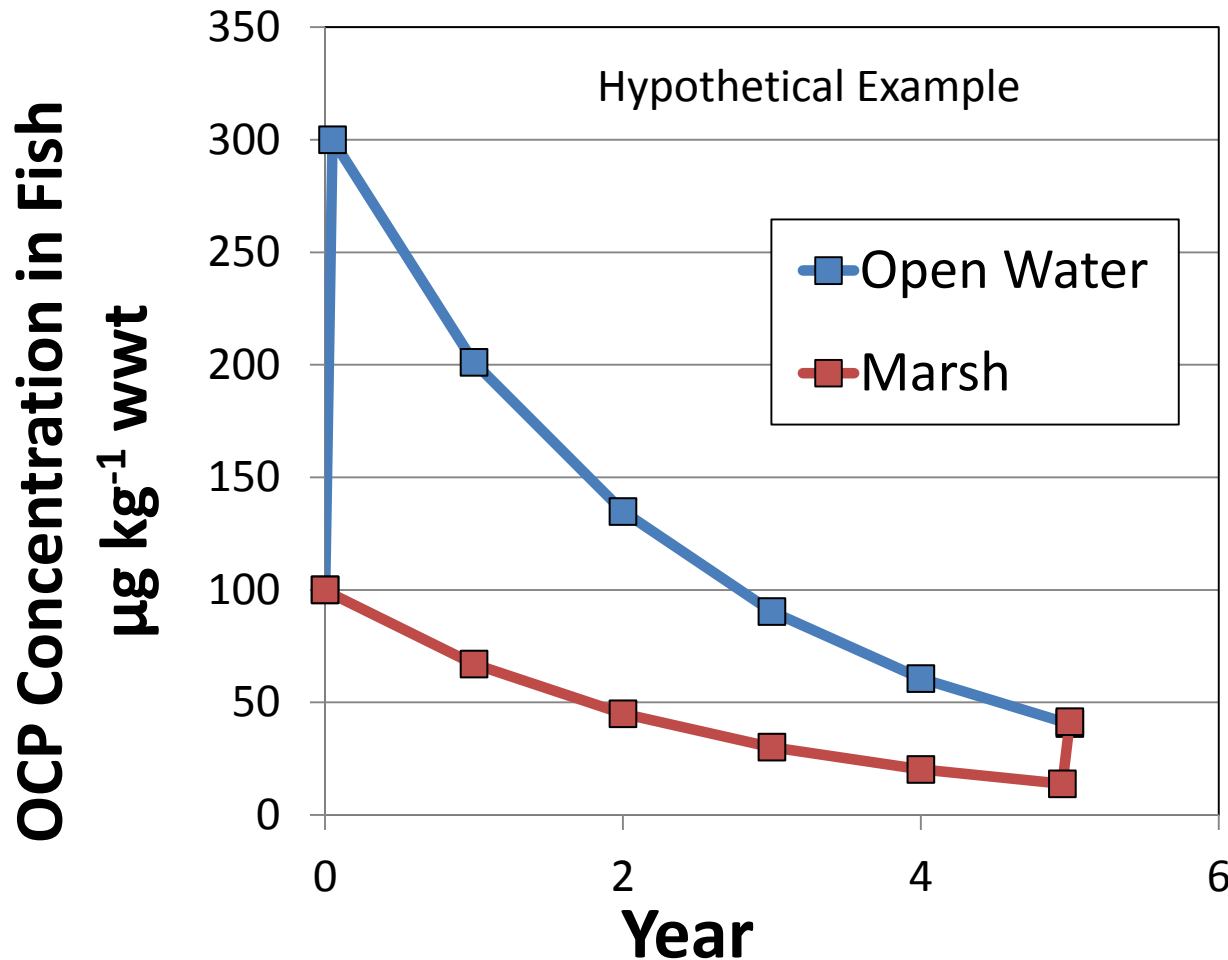


Fish OCP Levels on the NSRA

- Habitat goal right after flooding is shallow marsh with dense vegetation
 - Minimize bioaccumulation of OCPs to fish
 - Minimize foraging by fish-eating birds
- Desirable future condition is low risk from consumption of fish by animals or humans
- Important processes that affect OCP levels in fish
 - Shift in habitat from marsh to open water
 - Decline in ecosystem OCPs (measured in fish tissue) through time

Fish OCP Levels on the NSRA

Areas must be managed as shallow marsh until OCPs decline to safe levels



$$C_t = C_0 * e^{(-kT)} * F$$

Fish OCP Levels on the NSRA DATA

- OCP measurements on 452 whole fish (all species pooled) from nine sites over several years
- Measurements of bioaccumulation of OCPs in both open water and marsh habitats in mesocosms
- Measurements of first-order rate constants for decline of each OCP in fish in open water mesocosms
- Toxicity reference values (TRVs) for each OCP in fish-eating birds (SJRWMD) and for human health (provided by FDOH, **screening values only**)

OCPs Measured in Fish from the NSRA

**Ecological
Health HQ**

4,4'-DDT

alpha-Chlordane

4,4'-DDD

cis-Nonachlor

4,4'-DDE

gamma-Chlordane

Heptachlor

Dieldrin

Heptachlor epoxide

**Ecological
Health HI**

Oxychlordane

Toxaphene

trans-Nonachlor

- Hazard Quotient (HQ) = (concentration in fish) ÷ (TRV)
- Hazard Index (HI) = Sum of HQs for multiple OCPs where toxic effects may be additive
- HQ or HI > 1 indicates increasing risk

OCPs Measured in Fish from the NSRA

Human Health Screening HQ

4,4'-DDT

4,4'-DDD

4,4'-DDE

Dieldrin

alpha-Chlordane

cis-Nonachlor

gamma-Chlordane

Heptachlor

Heptachlor epoxide

Oxychlordane

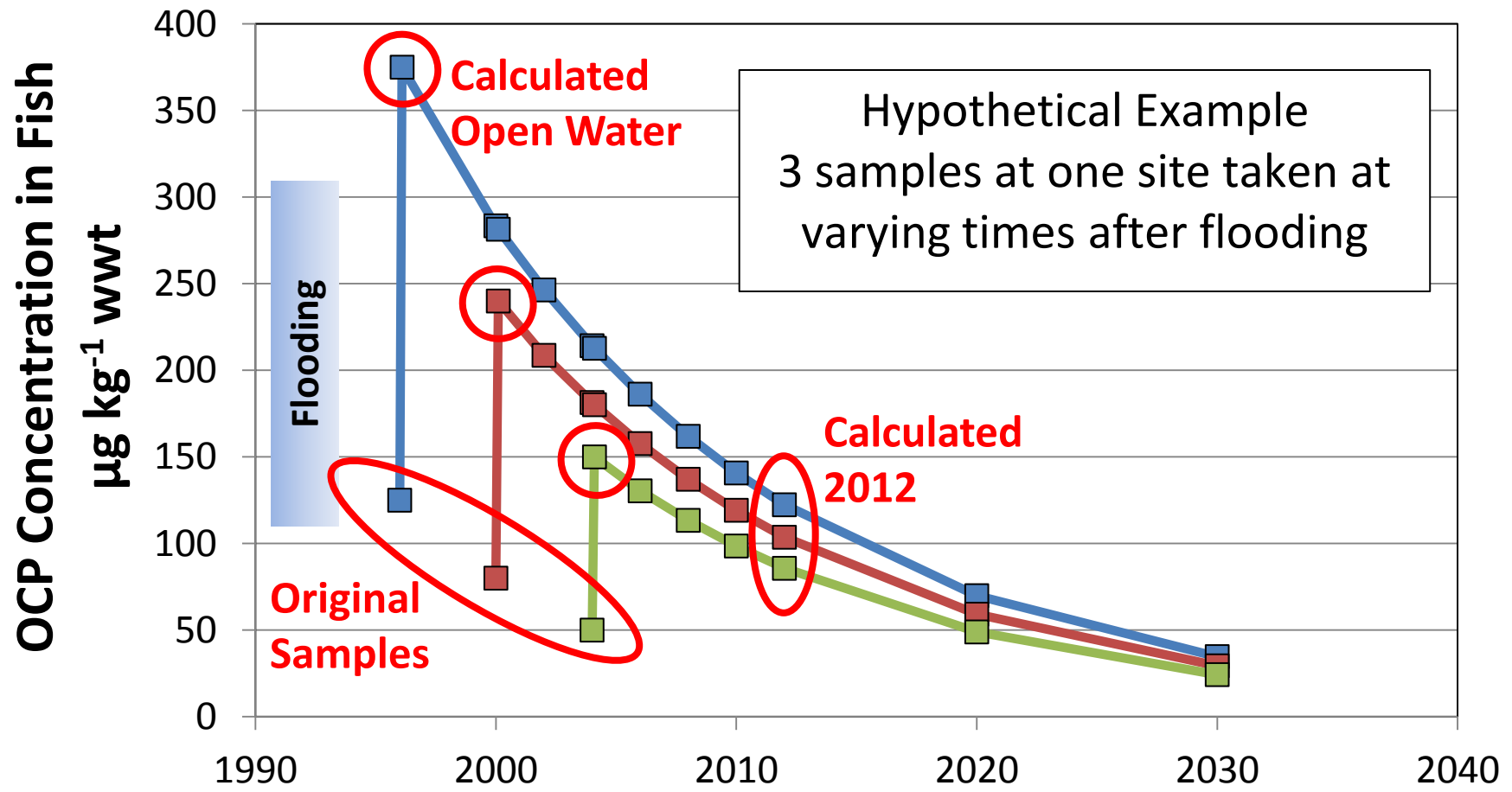
trans-Nonachlor

Toxaphene

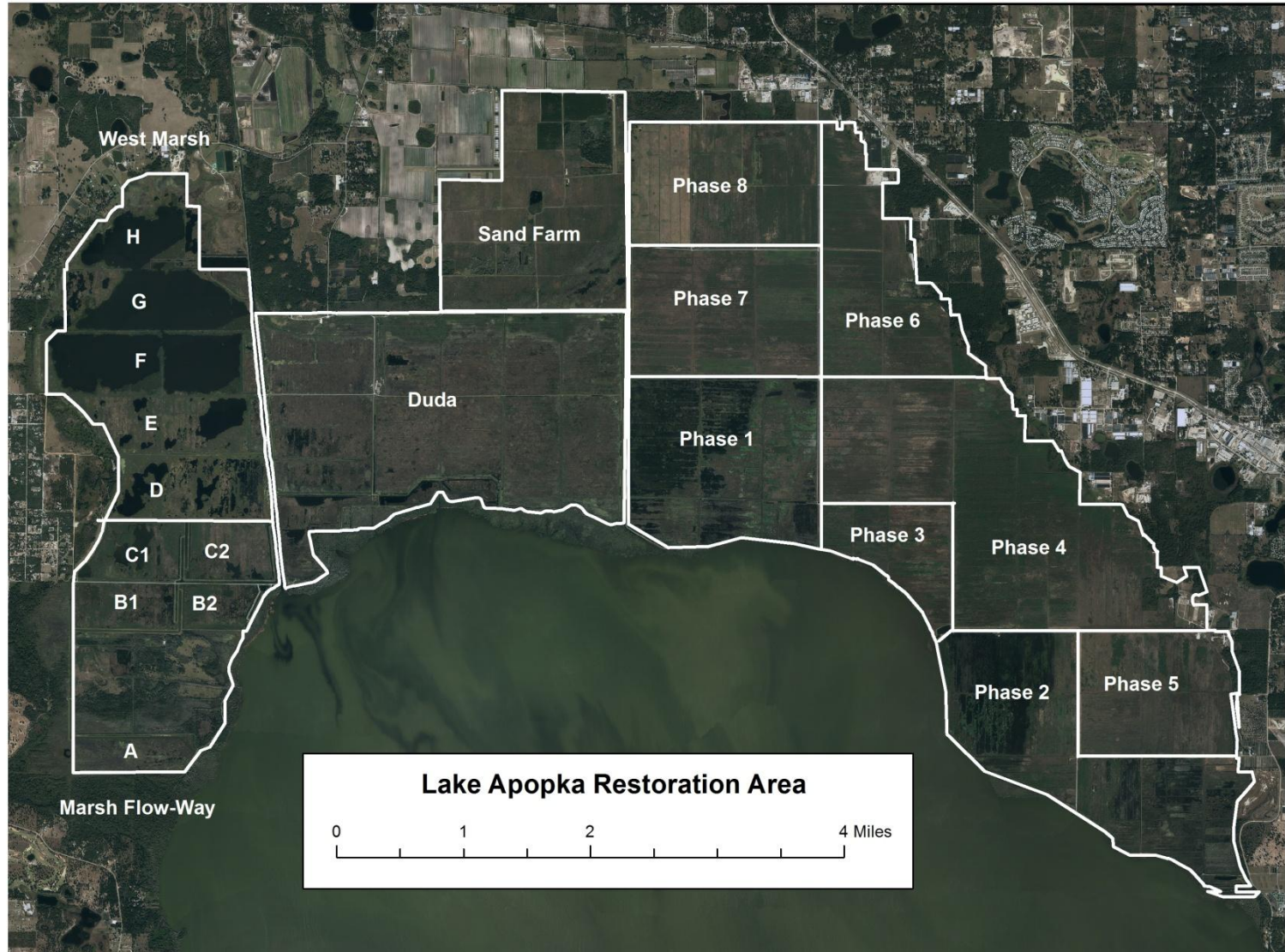
Human Health Screening HQ

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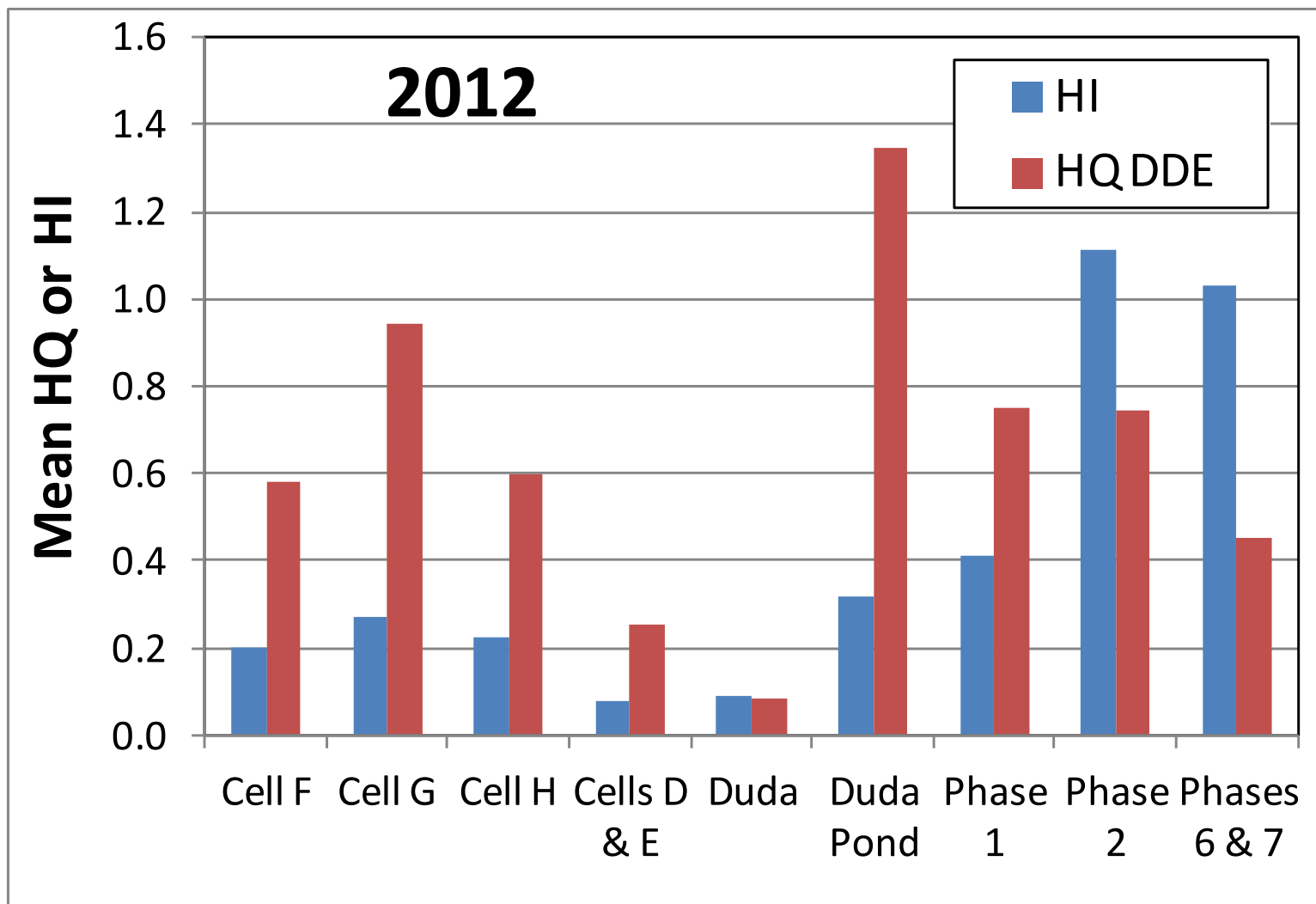
Fish OCP Levels on the NSRA Calculation Example



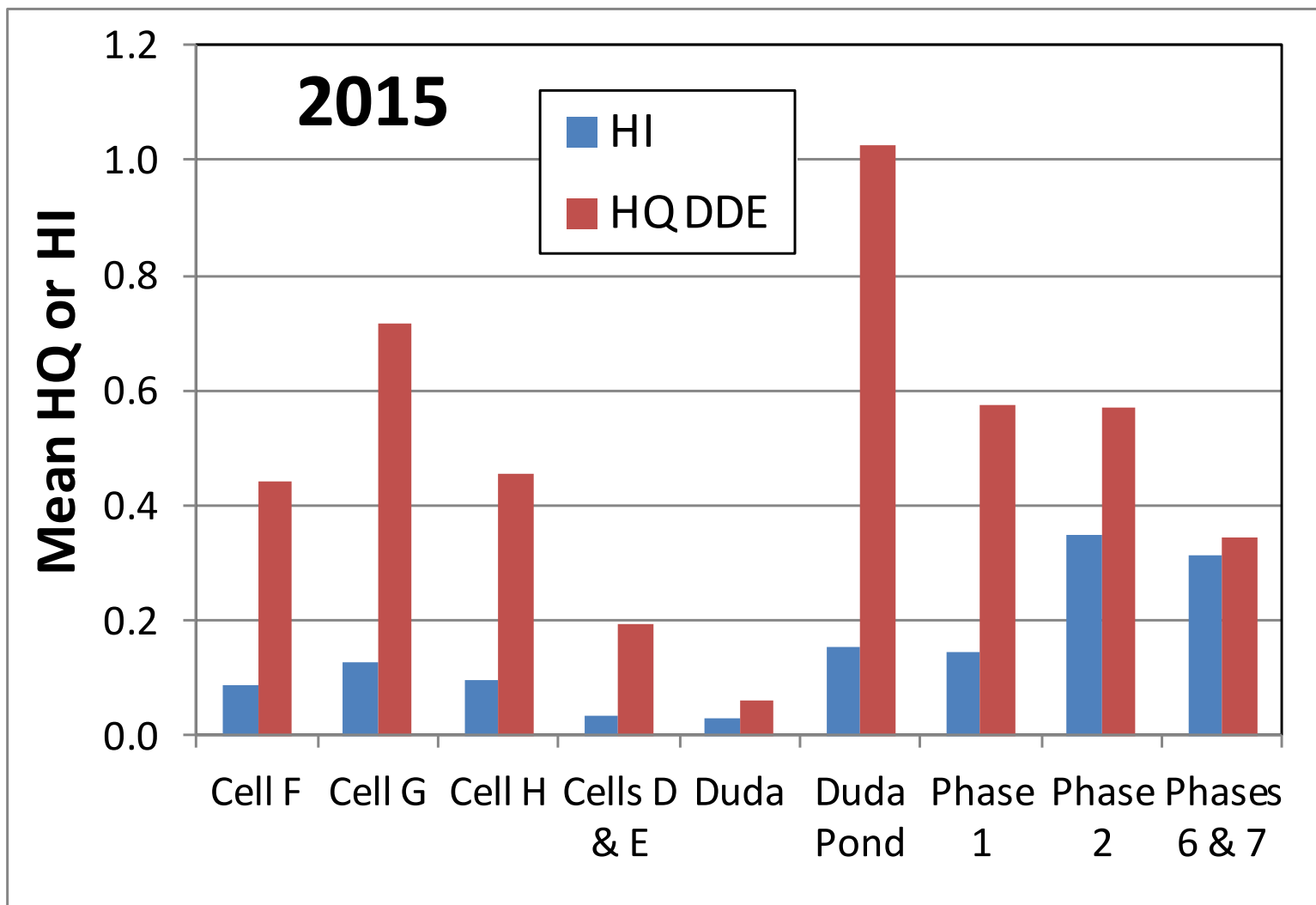
North Shore Restoration Area – Flooding Blocks



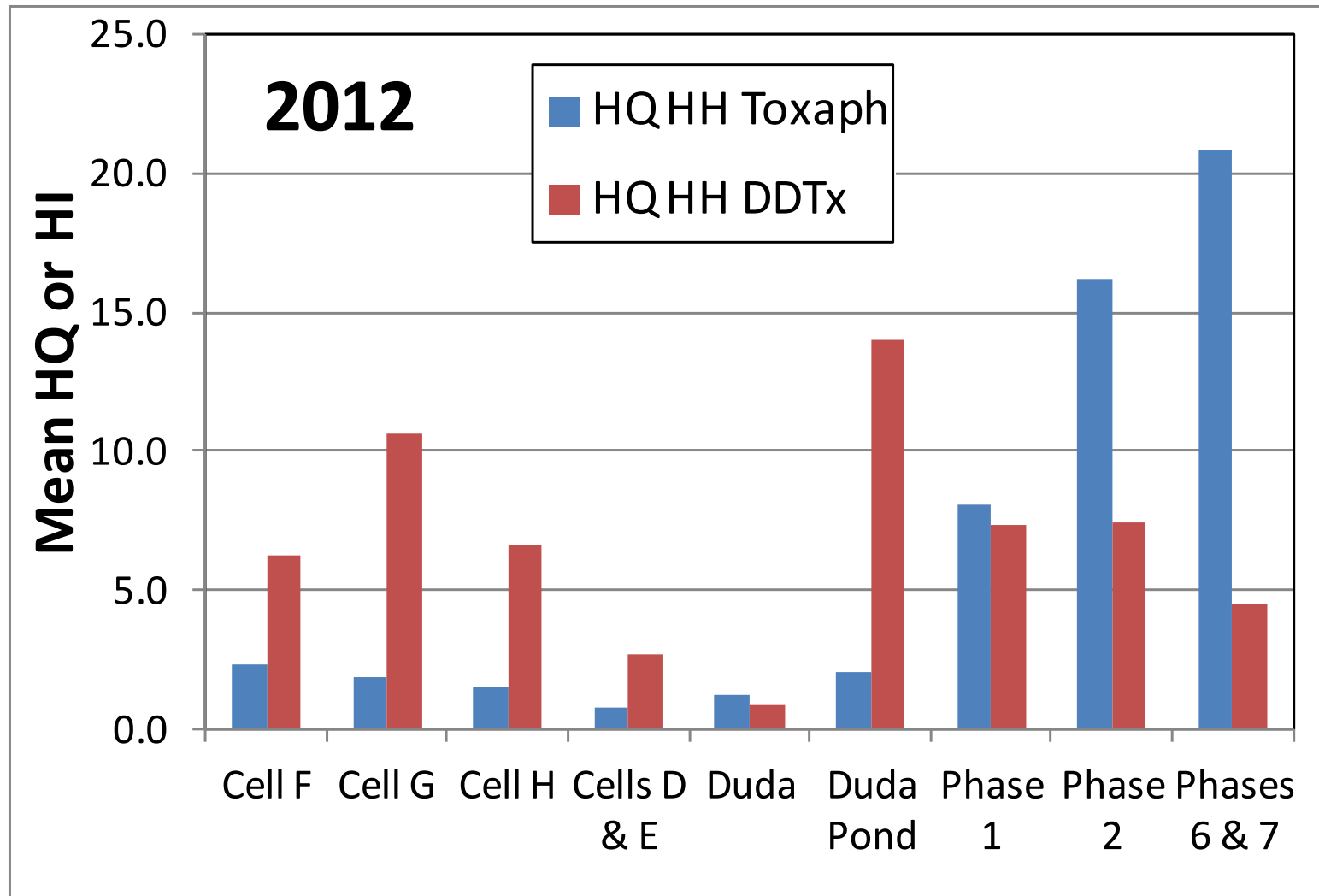
Estimated Ecological Risk to Fish-Eating Birds in Open-Water Scenario



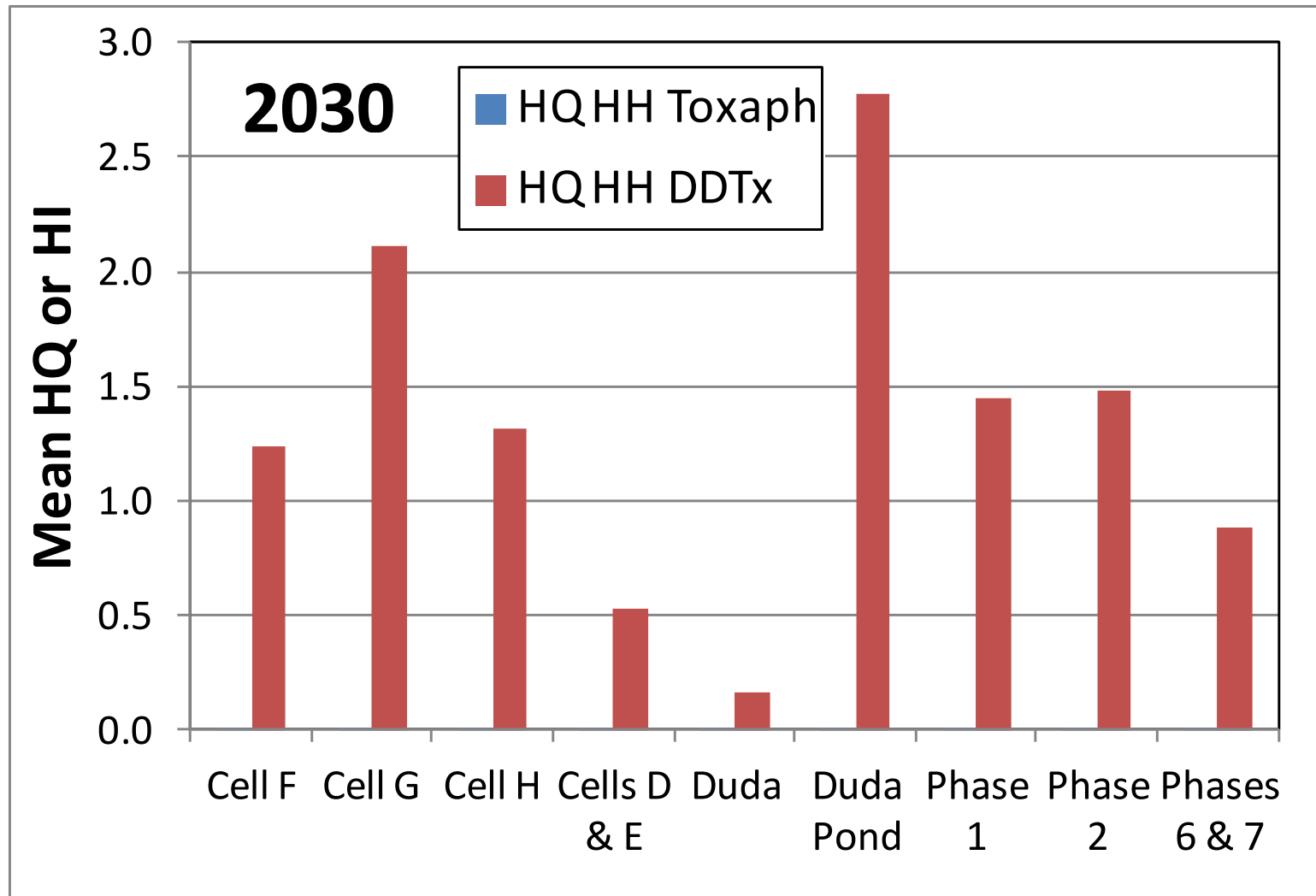
Estimated Ecological Risk to Fish-Eating Birds in Open-Water Scenario



Projected Screening-Level Risk from Human Consumption of Fish in Open-Water Scenario



Projected Screening-Level Risk from Human Consumption of Fish in Open-Water Scenario



Fish OCP Levels on the NSRA - Conclusions

- Shallow flooding is required to manage initial and near-term ecological and human health risks from fish consumption
- OCPs in fish should reach safe levels for consumption by birds approx. 5 y after new flooding in open water habitat
- OCPs in fish might require 2 or more decades to reach safe levels for consumption by humans
- In all cases, DDT-family OCPs determine the time needed to reach safe levels
- For some properties, times will be longer
- In all cases, fish will be analyzed to confirm safe OCP levels before management of restoration areas is changed

Questions?