

Controlling Bighead and Silver Carps



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Destructive Bighead and Silver Carps



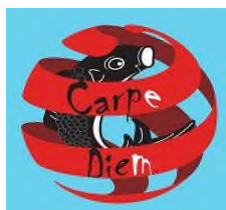
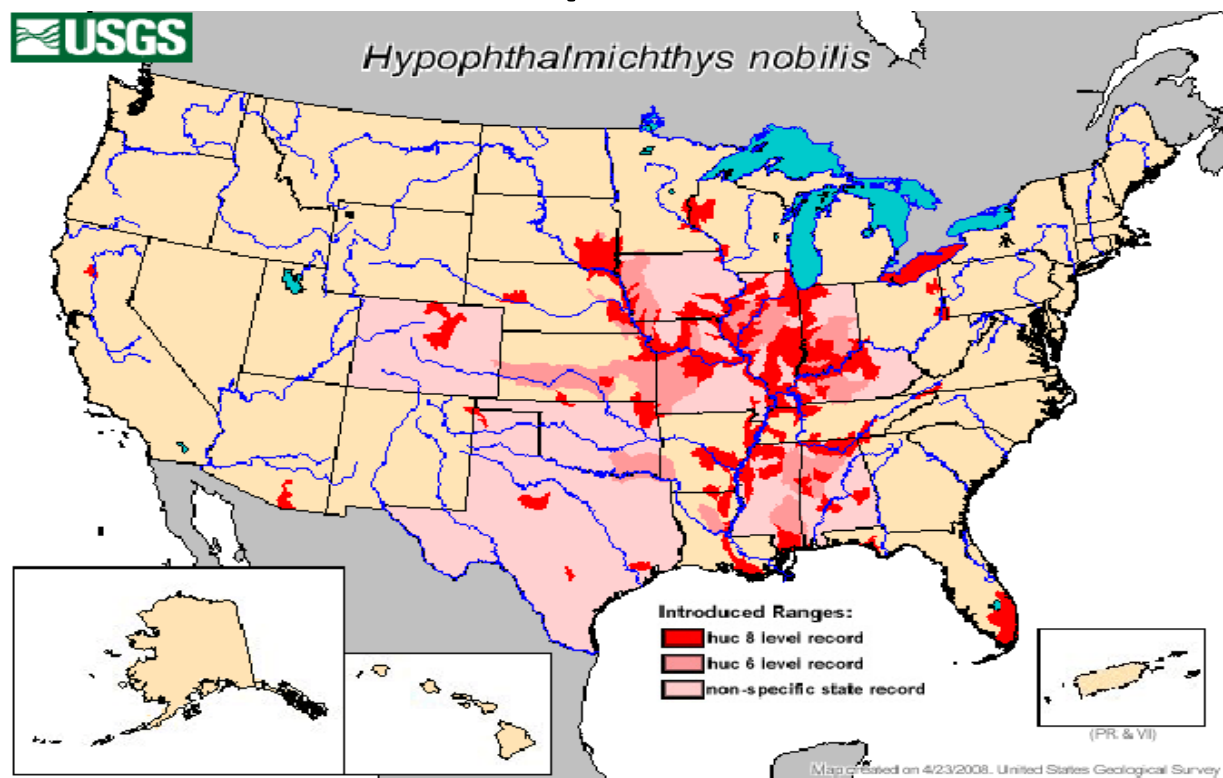
Threatens \$7 B rec. fishing & \$16 B boating industries in Great Lakes

United States Geological Survey



2012 Bighead Carp US habitat

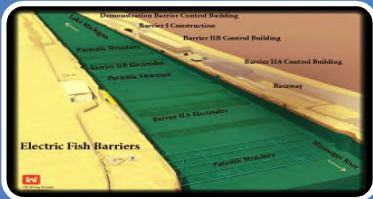
Escaped from Arkansas fish ponds to wild estimated early 1980's



Where the bighead carp are the silver carp will most likely follow



Federal Government Solutions for Controlling Asian Carp



Barriers

- Electric water fences, dams, water falls, other
- Flood barriers (Eagle Marsh)



Date	Amount/Species	Where	Details
Feb. 28, 2012	14,000 lbs. bighead carp	Windsor/Detroit border crossing	April 25 court date
Jan. 25, 2012	8,600 lbs. grass carp, 8,500 lbs. bighead carp	Windsor/Detroit border crossing	April 25 court date
Jan. 9, 2012	700 lbs. bighead, 1,000 lbs. grass carp	Windsor/Detroit border crossing	Case currently in court system
Feb. 18, 2011	6,000 lbs. bighead carp	Windsor/Detroit border crossing	Sweetwater Springs Fish Farm, Penn., Ind., paid \$20,000 fine for possessing live invasive fish
Jan. 20, 2011	3,200 lbs. bighead carp	Sarnia/Fort Huron border crossing	Fine July 18, 2012, in Sarnia
Nov. 4, 2010	2,500 lbs. bighead, 1,000 lbs. grass carp	Windsor/Detroit border crossing	Fang Yang of Wind Fishery, Maryland, Ind., paid \$10,000 fine for possessing live invasive fish, second conviction

Early Detection, Education and Enforcement

- Informing public of their responsibility
- Consequences for being an active vector



Population Reduction

- Commercial fishing (adult population)
- Piscicide, selective harvesting



Product Requirements



Selective

- Destruction of all fish is not an option
- Protection of endangered Species

Safe

- 18 million get water from Mississippi River
- Water recreation
- Application

Low Cost

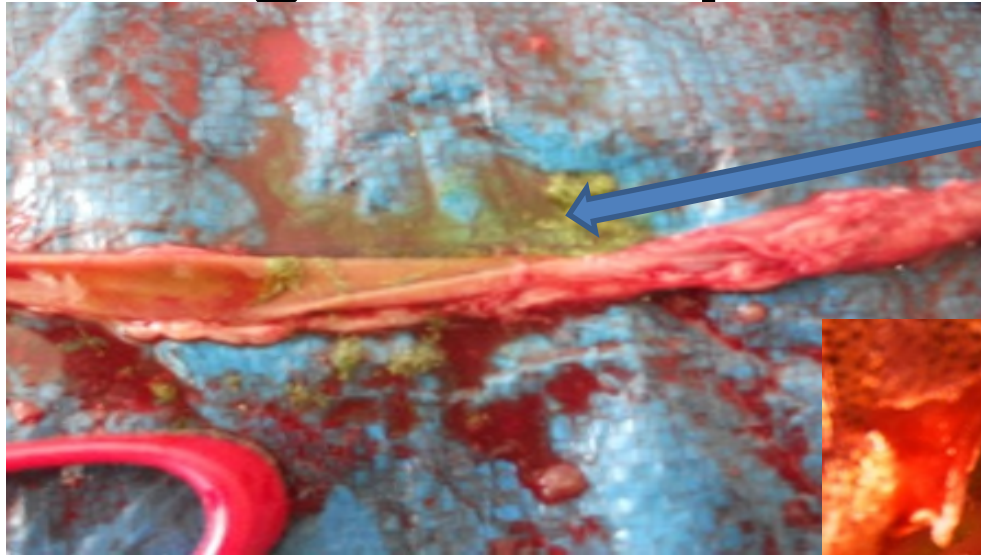
- Mississippi Basin 3rd/4th largest in world
- Government funds are limited
- Development, Registration, Raw Materials, Processing and Use costs



Competitive Analysis

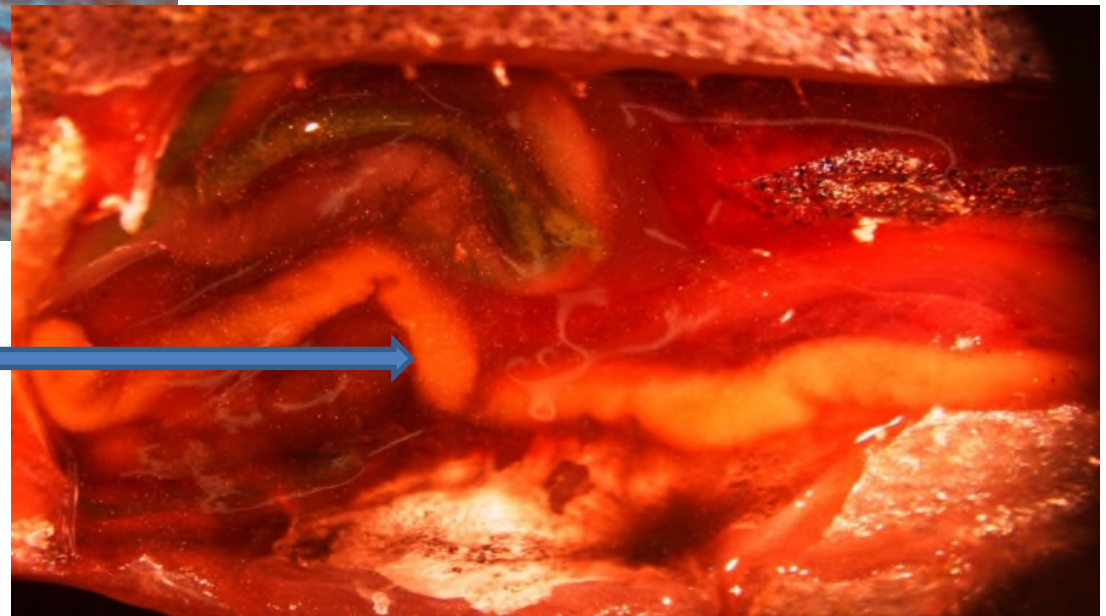
	Selective	EPA Approval	Safety	Efficacy	Cost
MJSTI Carpe Diem, bio-bullet, concept	✓	✓	✓	✓	\$
Rotenone, commercial piscicide	X			✓	\$\$\$\$\$\$
Antimycin A, bio-bullet, USGS	✓			✓	\$\$\$
USGS, 30 compounds identified, 6 screening	?		?	?	?
Carp virus, U of MN	?	X	?	✓	?
YY Males, testing brown trout, U of ID	✓	?	✓	X	?
Barriers	X		✓	✓	\$\$\$\$\$\$\$\$
Commercial Fishing, mass fishing	✓		✓		\$\$\$

Bighead Carp Ate Model Pesticides



Adult bighead carp ate fat beads.
White material consistent with
test material

Juvenile bighead carp ate fat
encapsulated salts,
intestines are full





MJSTI Laboratory Procedures



Spray Wax Beads

- Active insoluble in wax
- Under 100 microns

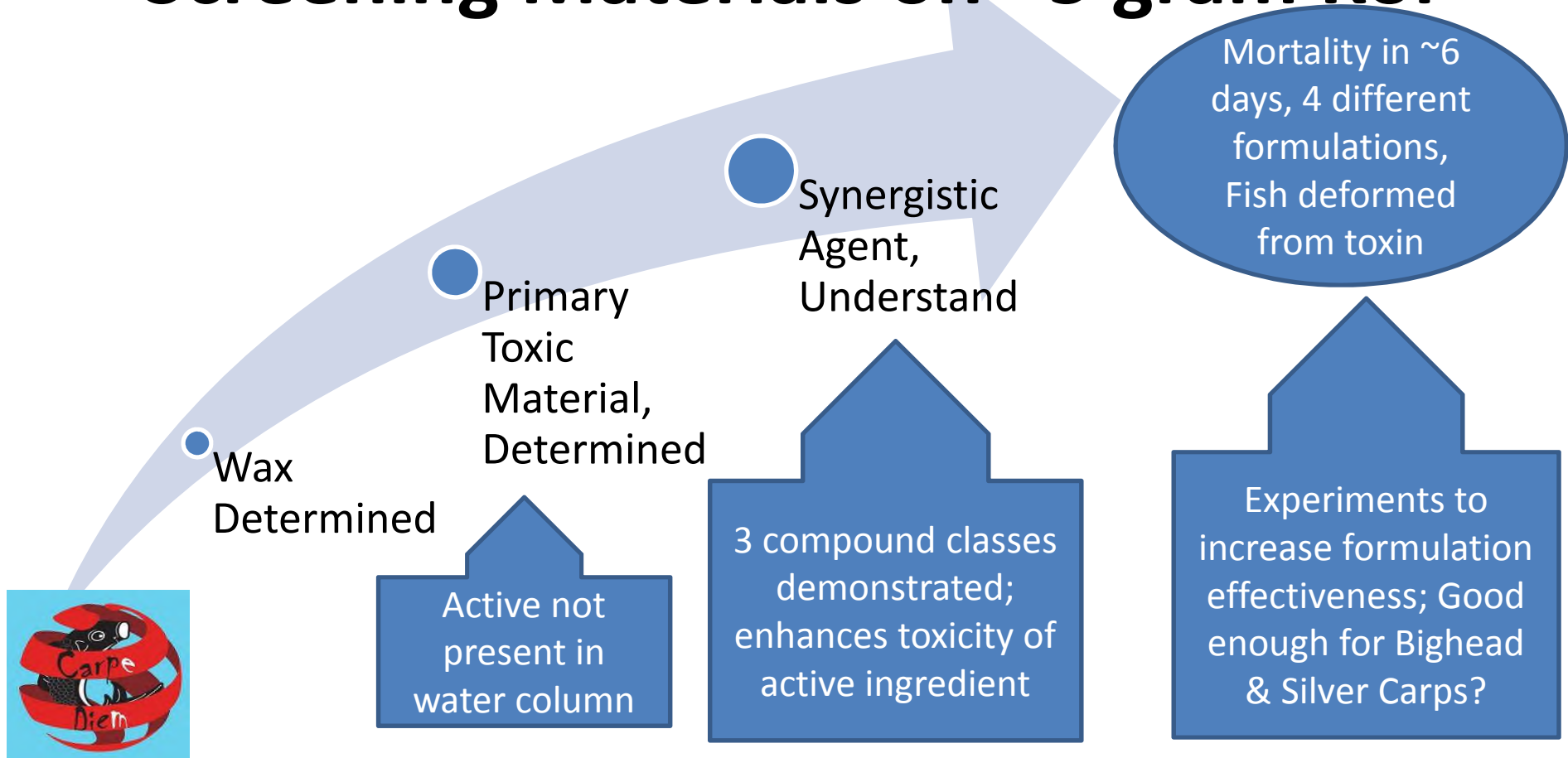
Pellet Formation

- Na Alginate gel

Koi Testing

- Will they eat?
- Will they die?
- How long and how many?

Screening Materials on ~5 gram Koi



Only Formulation meeting Requirements

Selective

- Toxicity demonstrated
- Fish habitat and behavior
- Particle size

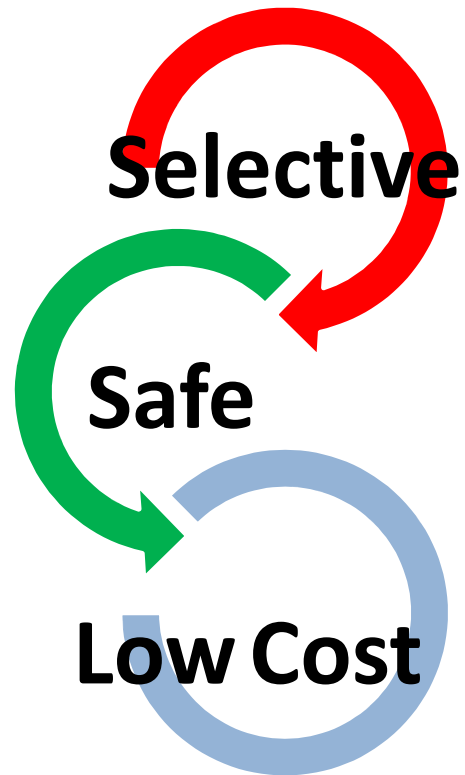
Safe

- Approved FDA food or animal feed ingredients
- Decomposition to safe materials in rivers and lakes
- Chronic not acute poison

Low Cost

- Commodity chemicals
- Practiced process with US excess capacity
- EPA registered aquatic pesticides or inert ingredients





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