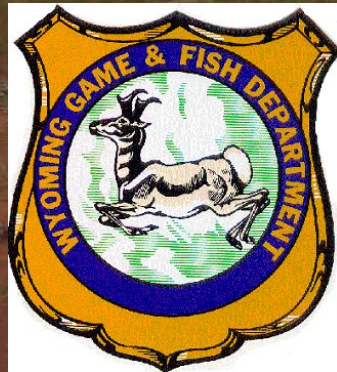
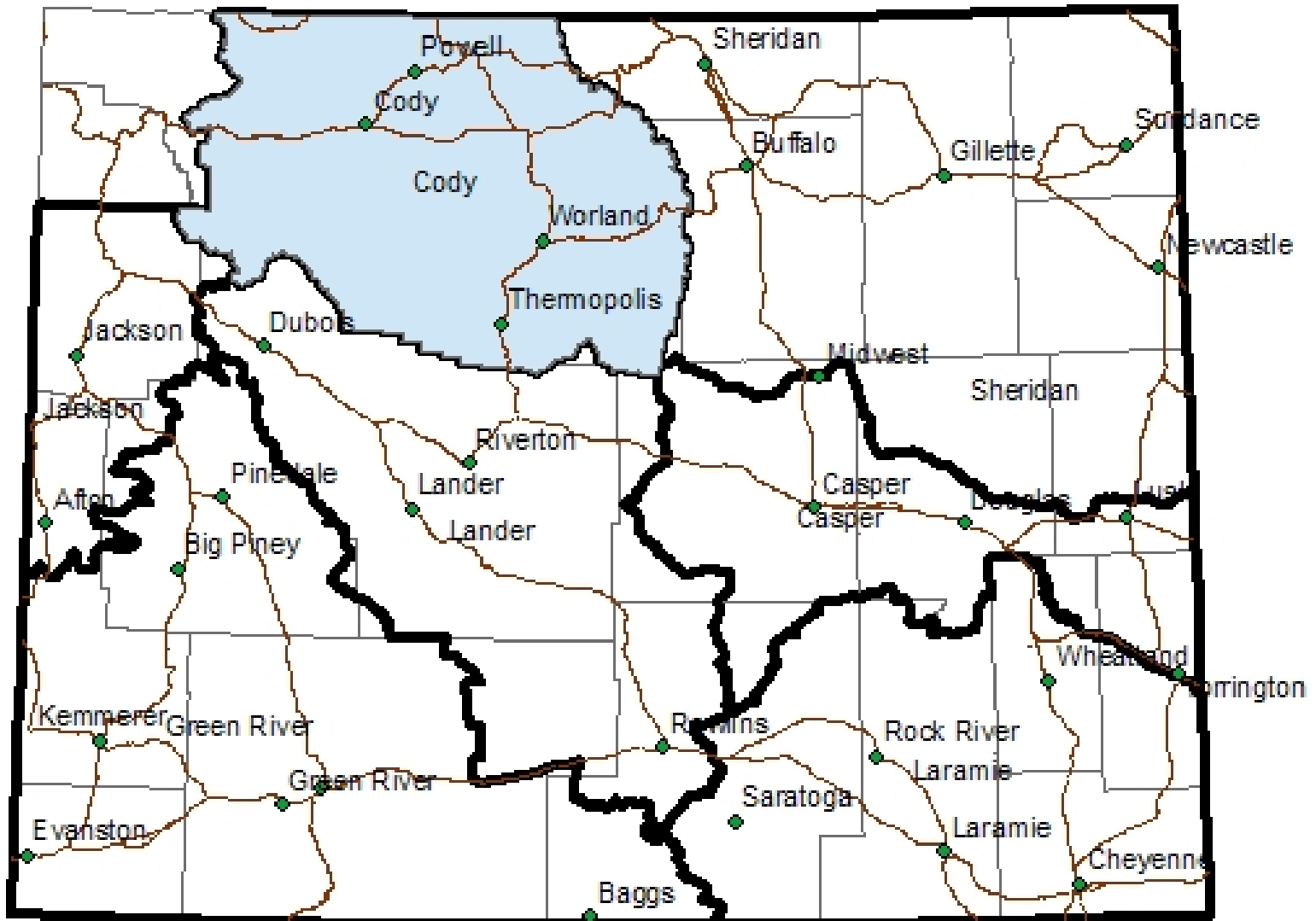


Big Horn Lake

Wyoming Fisheries Management



Cody Management Region



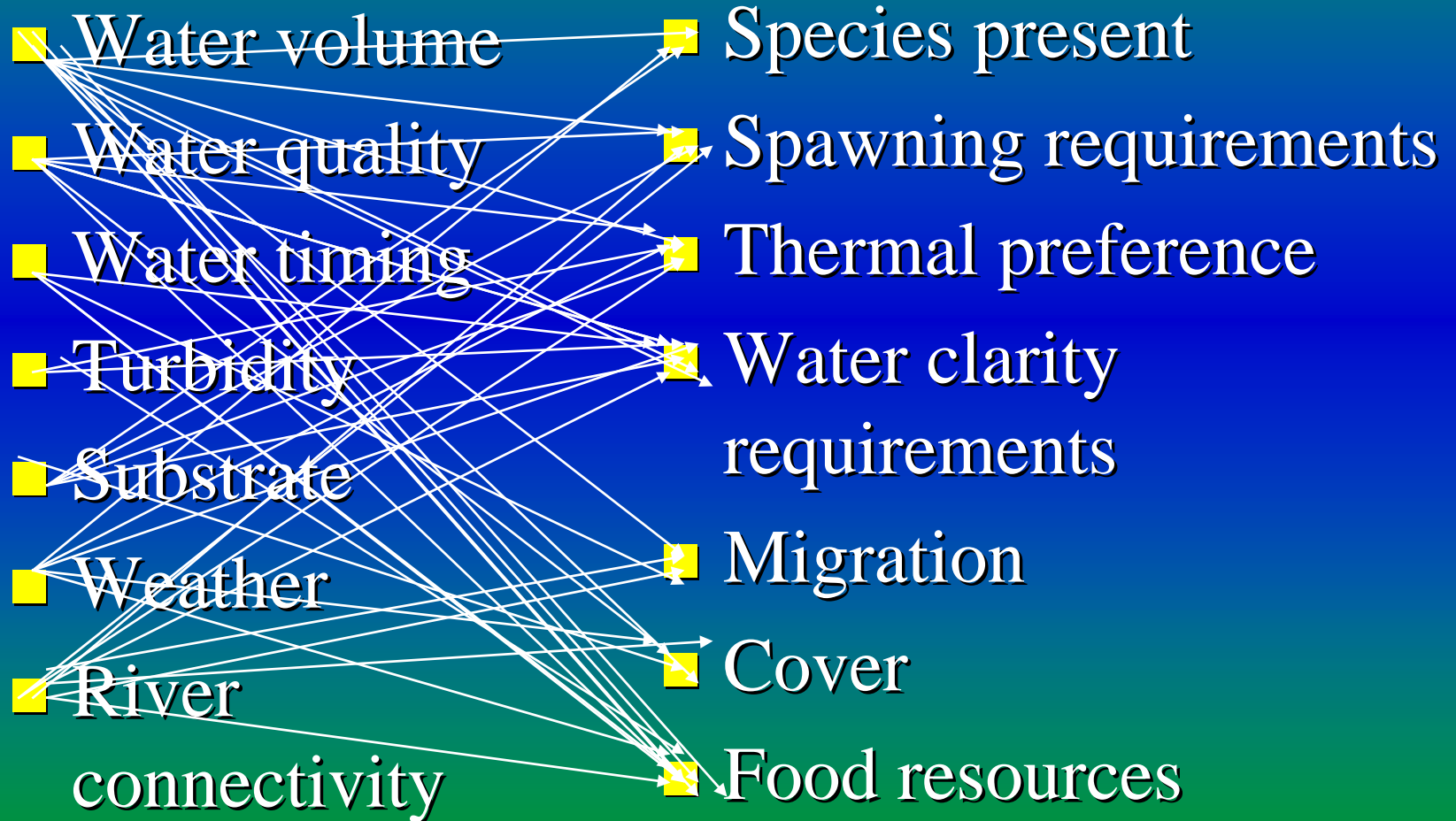
Outline

- Reservoir Management
- Biology of reservoir fishes
- History of fish management by WYGF
- Importance of river connectivity
- Reservoir elevation and fish habitat
- Preferred reservoir operation for Wyoming fishery

Reservoir Fisheries Management

- Water volume
- Water quality
- Water timing
- Turbidity
- Substrate
- Weather
- River connectivity
- Species present
- Spawning requirements
- Thermal preference
- Water clarity requirements
- Migration
- Cover
- Food resources

COMPLEX!



Reservoir Management Tools

- Stocking
- Regulations and enforcement
- Habitat enhancement/manipulation
 - Reservoir operations
- Chemical removal (small reservoirs)

Native River Fishes

- Present prior to impoundment
- Adapted to large, warm, turbid river systems

Current Reservoir Fishery

- Sauger



Current Reservoir Fishery

■ Sauger

- Native to Bighorn River
- Spawn in May in river above Greybull
- Fry drift into backwaters, sloughs, reservoir
- Consume invertebrates for first year gradually switch to piscivory (small fish)
- Prefer relatively deep, slow, turbid water with fine substrate and abundant forage
- Move great distances to spawn in rivers
- Many river resident fish over winter in reservoir
- Live to 4 or 5 on average

Current Reservoir Fishery

- Channel Catfish



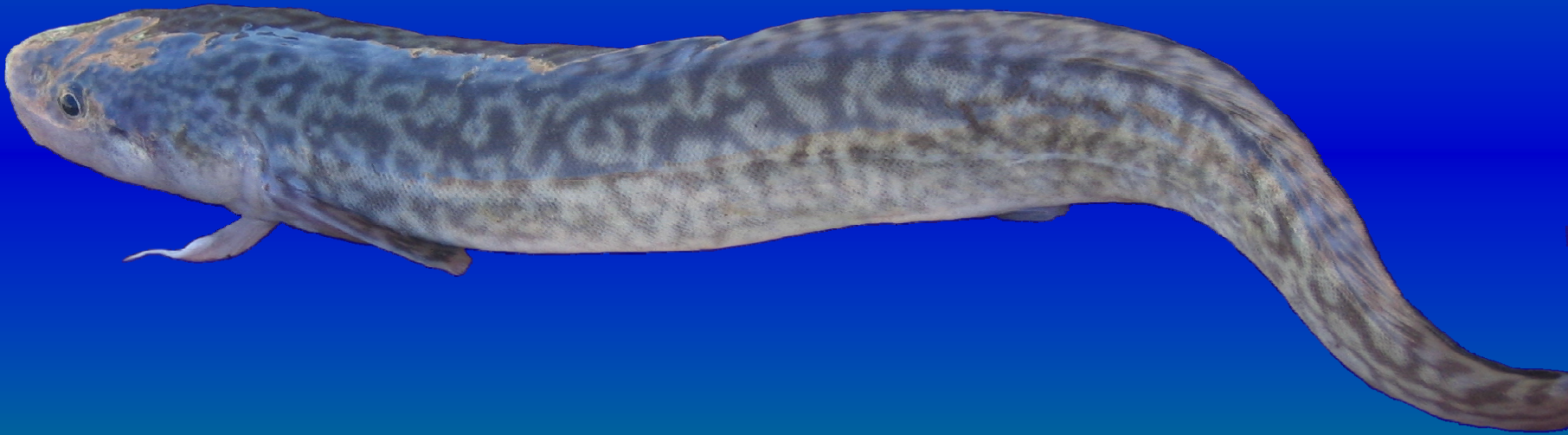
Current Reservoir Fishery

■ Channel Catfish

- Native to Bighorn River
- Spawn in July in river and reservoir?
- Consume invertebrates for first 2-3 years, with progressively more fish in diet as they age
- Prefer relatively deep, slow, turbid water with abundant forage fish
- Spawn at 6+ years of age
- Spawning migrations and locations not well understood
- Some river resident fish may over winter in reservoir
- Live to 8 or 9 years

Current Reservoir Fishery

- Burbot



Current Reservoir Fishery

■ Burbot

- Native to Bighorn River
- Spawn in February and March
- Adults are piscivores
- Prefer very deep, slow, water with large substrates and abundant forage fish
- Circumpolar fish that are poor swimmers and most active during coldest water temperatures
- Broadcast spawn in large congregations
- Unknown if river resident fish occupy reservoir
- Rarely captured in warmer months

Non-native Reservoir Fishes

- Introduced to occupy “artificial” habitat created by impoundment that was not conducive to native game fishes
- Generally prefer deeper, clearer, colder water than native fishes
- Lentic (lake loving) rather than Lotic (river loving)

Current Reservoir Fishery

- Smallmouth Bass



Current Reservoir Fishery

■ Smallmouth Bass

- Not native
- Spawn in May (60F)
- Juveniles eat small invertebrates, larger fish rely primarily on crayfish and/or forage fish
- Prefer cool, clear (low turbidity) water with rocky substrate and abundant forage
- In reservoirs fish occupy shorelines
- Build nests to spawn in gravel/cobble
- Unintentionally introduced to the reservoir in mid 1990's
- Prolific in lower reservoir

Current Reservoir Fishery

- Walleye



Current Reservoir Fishery

■ Walleye

- Not native
- Spawn in April in Bighorn River and Reservoir*
- Consume invertebrates for first year, gradually switch to piscivory (other fish)
- Prefer cool, clear (low turbidity) lake water with rocky substrate and abundant forage
- Broadcast spawn over clean cobbles along windswept shorelines in lakes
- Young are vulnerable to predation and prefer rocky shelter
- Notorious for inconsistent year-class strength
- Potential genetic threat to native sauger

Current Reservoir Fishery

- Crappie and Yellow Perch



Current Reservoir Fishery

■ Crappie and Yellow Perch

- Not native
- Spawn in April and May
- Consume invertebrates and small fishes
- Prefer cool, clear (low turbidity) lake water with large substrate, vegetation and abundant forage
- Typically spawn on or near vegetation in lakes
- Young are vulnerable to predation and seek out vegetated areas
- Notorious for inconsistent year-class strength

Current Reservoir Fishery

- Forage Fish



Current Reservoir Fishery

- Carp, River Carpsucker
 - Important forage when small
- Emerald Shiners
 - Came from Boysen Reservoir in late 1990's
 - Open water planktivore
 - Sight feeder, prefers increased water clarity
 - Prefers large lakes and reservoirs with abundant plankton production
 - Live in large schools in open water
 - Spawn at night during summer in shallow water over sand or mud
 - Sexually mature at age-1

Pre-impoundment

- 1961 Pechacek and Viox



Pre-impoundment

- Objective: “...make preliminary recommendations for the management of the fisheries in Yellowtail Reservoir and Bighorn River”



Pre-impoundment

- Recommendation.... “it is recommended that no fish be stocked. The expected siltation will create a situation suitable only for carp and other undesirable species.”



Pre-impoundment

- Recommendation.... “If this agreement (reciprocity) can be secured, it is recommended that Wyoming enter into a rainbow trout, mackinaw, and walleye pike planting program.”

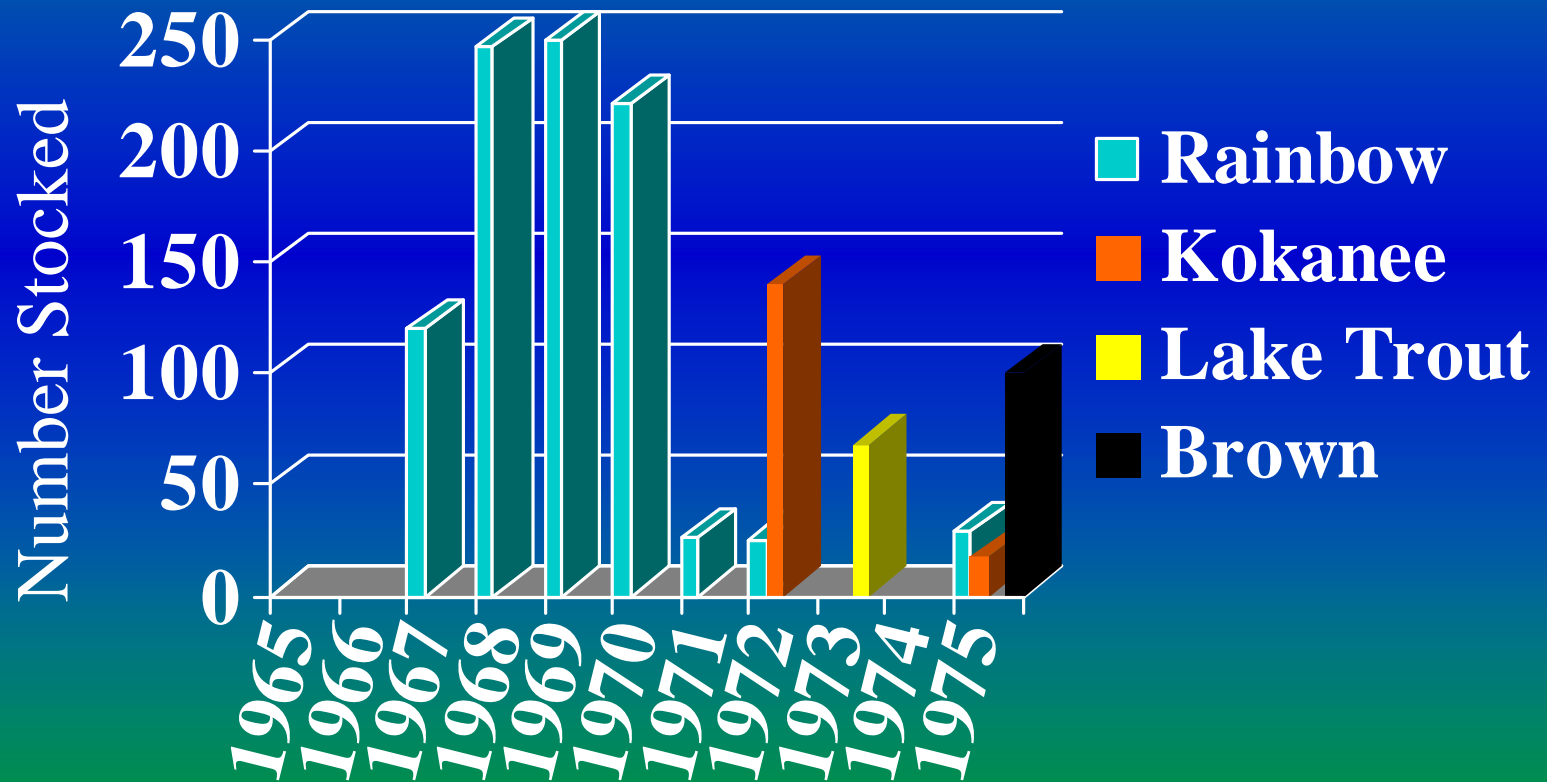


Early Impoundment

- 1965-1975
- Management philosophy: basic yield for stocked trout and walleye

Early Impoundment Stocking

Thousands

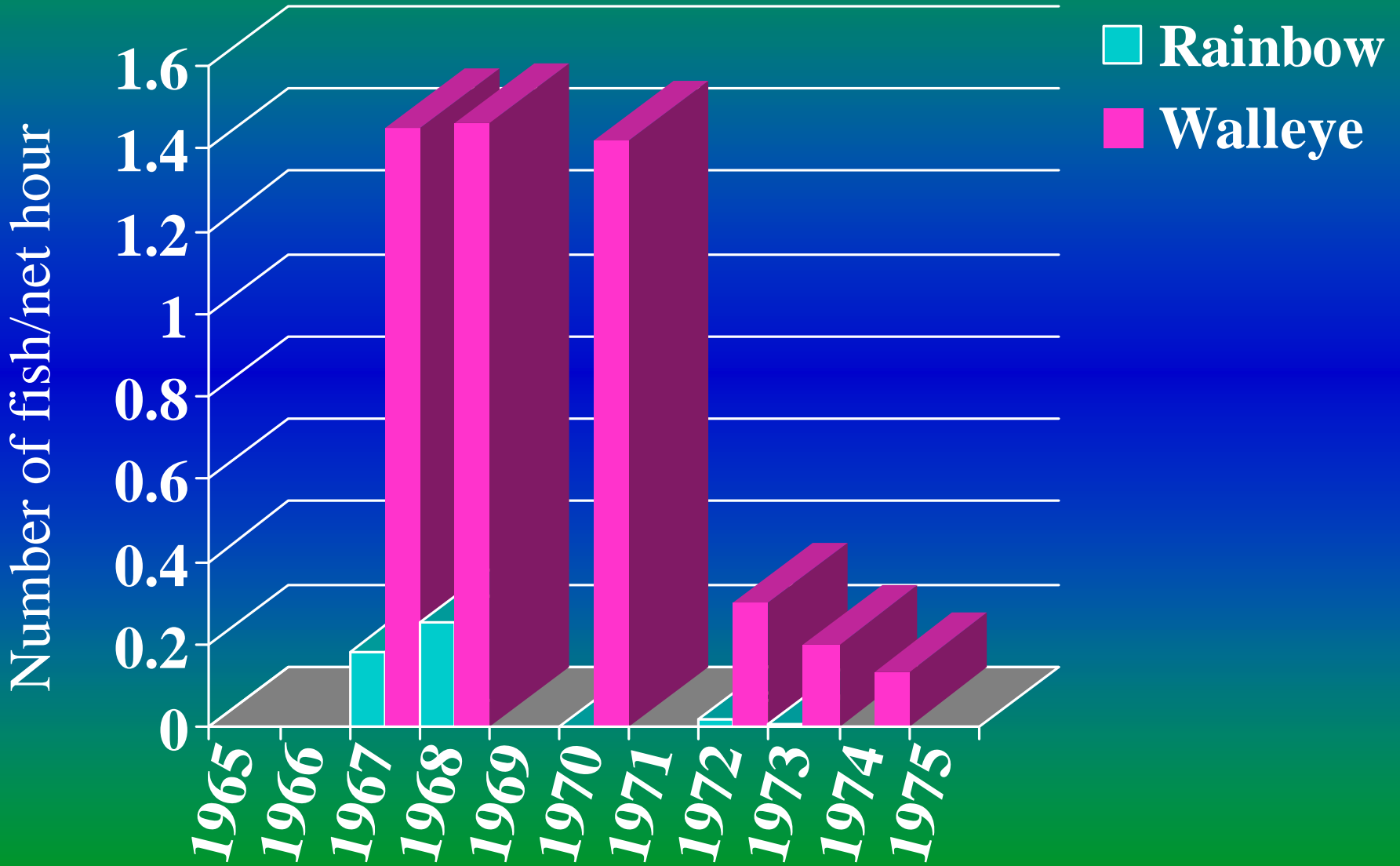


Early Impoundment Angler Catch

- In 1967 96% of angler catch were trout
- In 1974 11% of angler catch were trout



Early Impoundment Netting

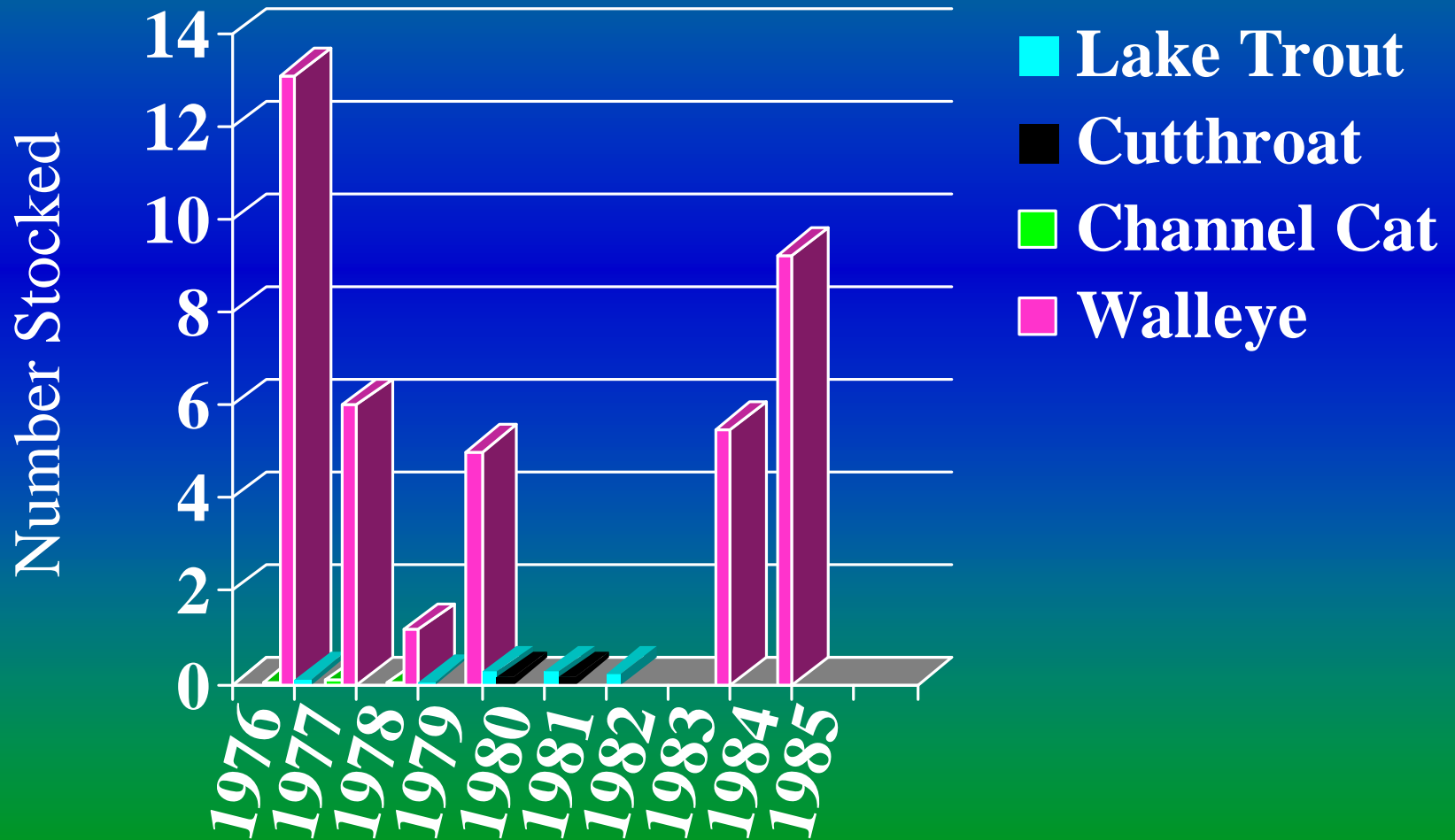


Changing Philosophy

- 1976-1985
- Management philosophy: Wild walleye, lake trout, yellow perch, crappie, channel catfish fishery supported by supplemental stocking

1976-1985 Stocking

Millions

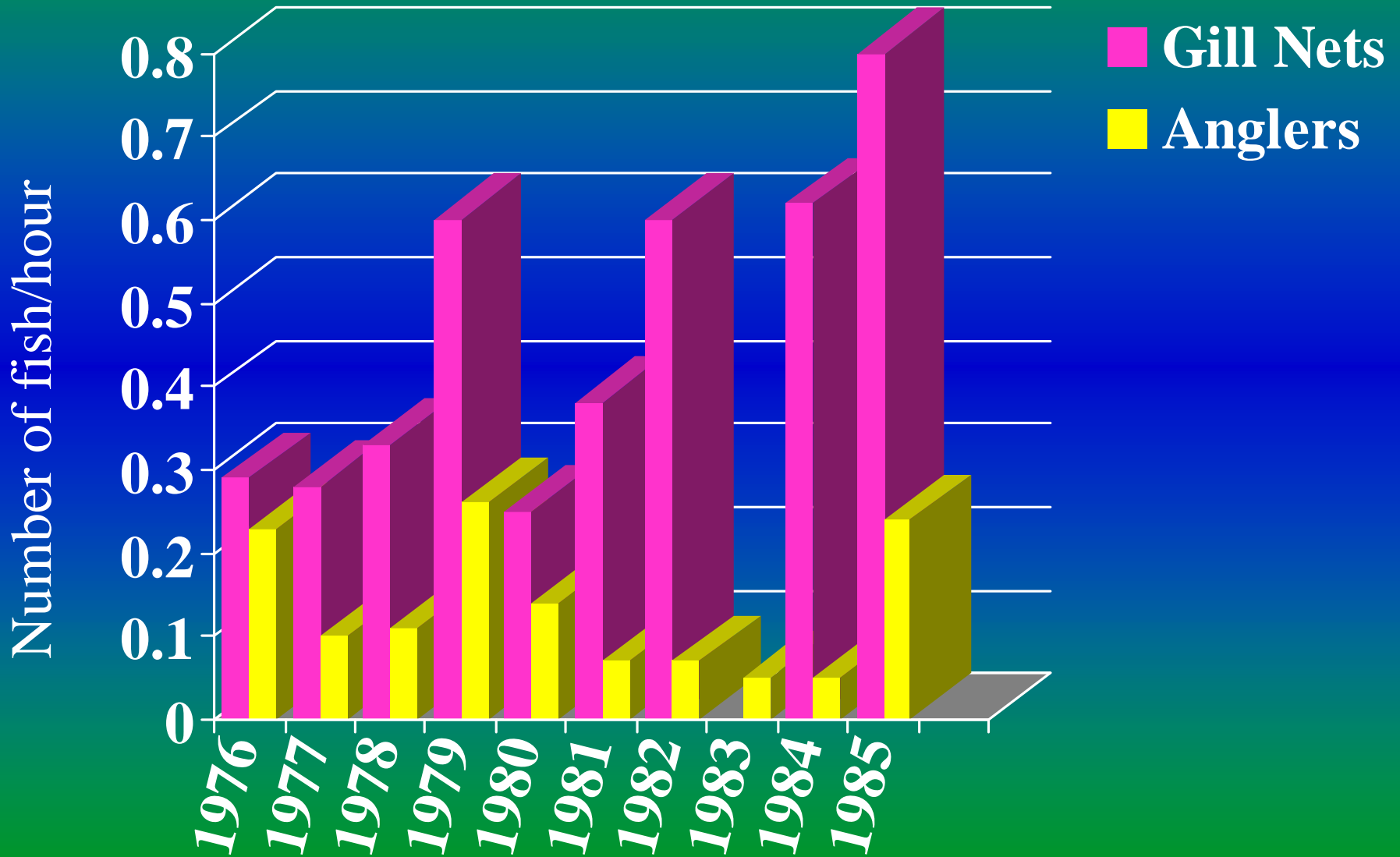


1976-1985 Angler Catch

- Angler catch dominated by walleye followed by channel catfish
- Walleye catch decreased significantly when not stocked



1976-1985 Walleye Catch



How do we make more walleye?

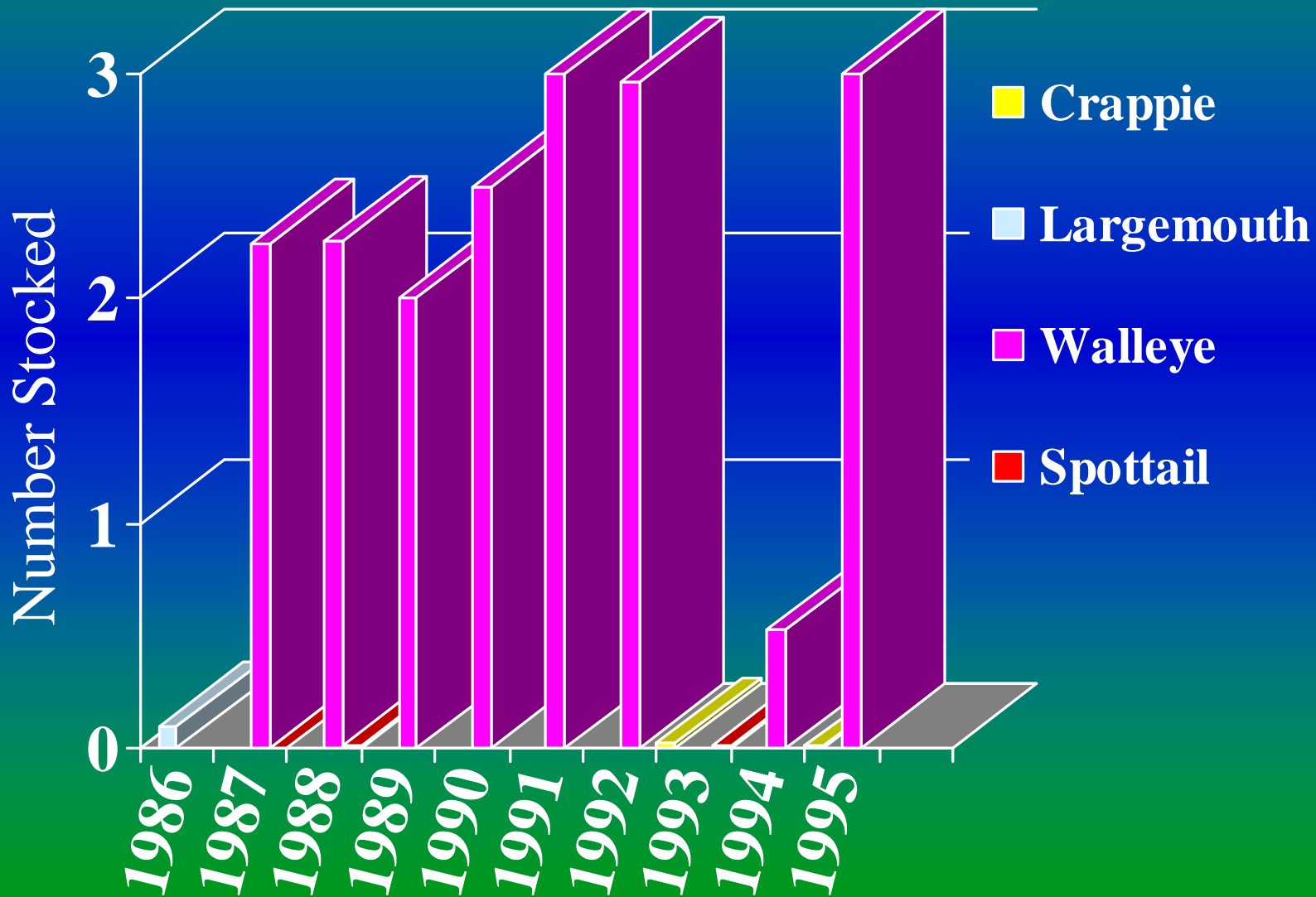
- 1986-1995
- Management philosophy: Basic yield for stocked walleye and naturally occurring native game fish
 - need for forage
- Study found only confirmed spawning congregation of walleye's was in Bighorn River

1992 Creel Survey

- Extensive survey of angler catch and preferences
- Angler use estimated at 21,982
- 71% fished from boats
- Sauger (68%) and walleye (26%) dominated WY catch while walleye (43%) were most common in MT
- WY anglers preferred walleye* (45%) followed by catfish and sauger (both 26%)

1986-1995 Stocking

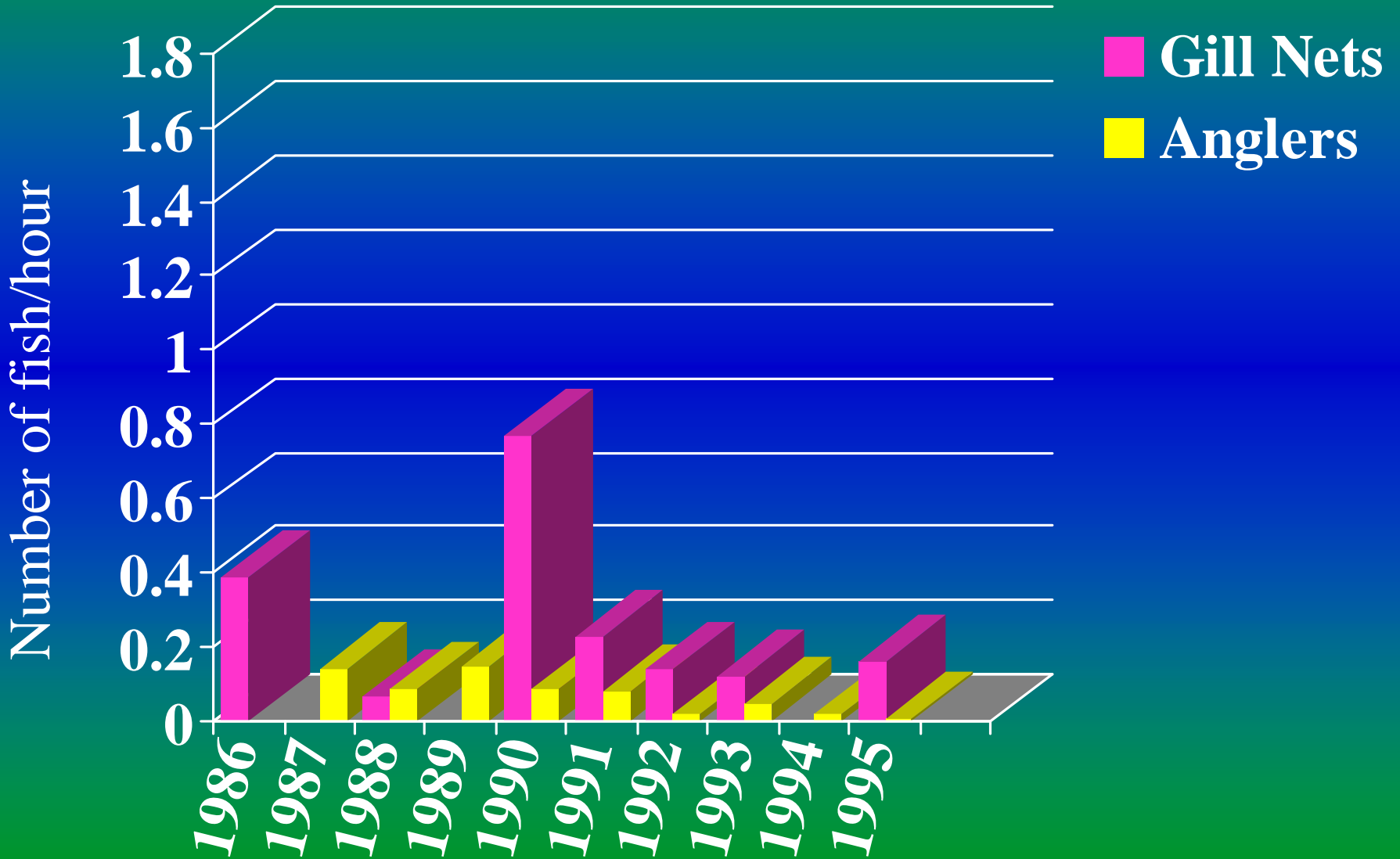
Millions



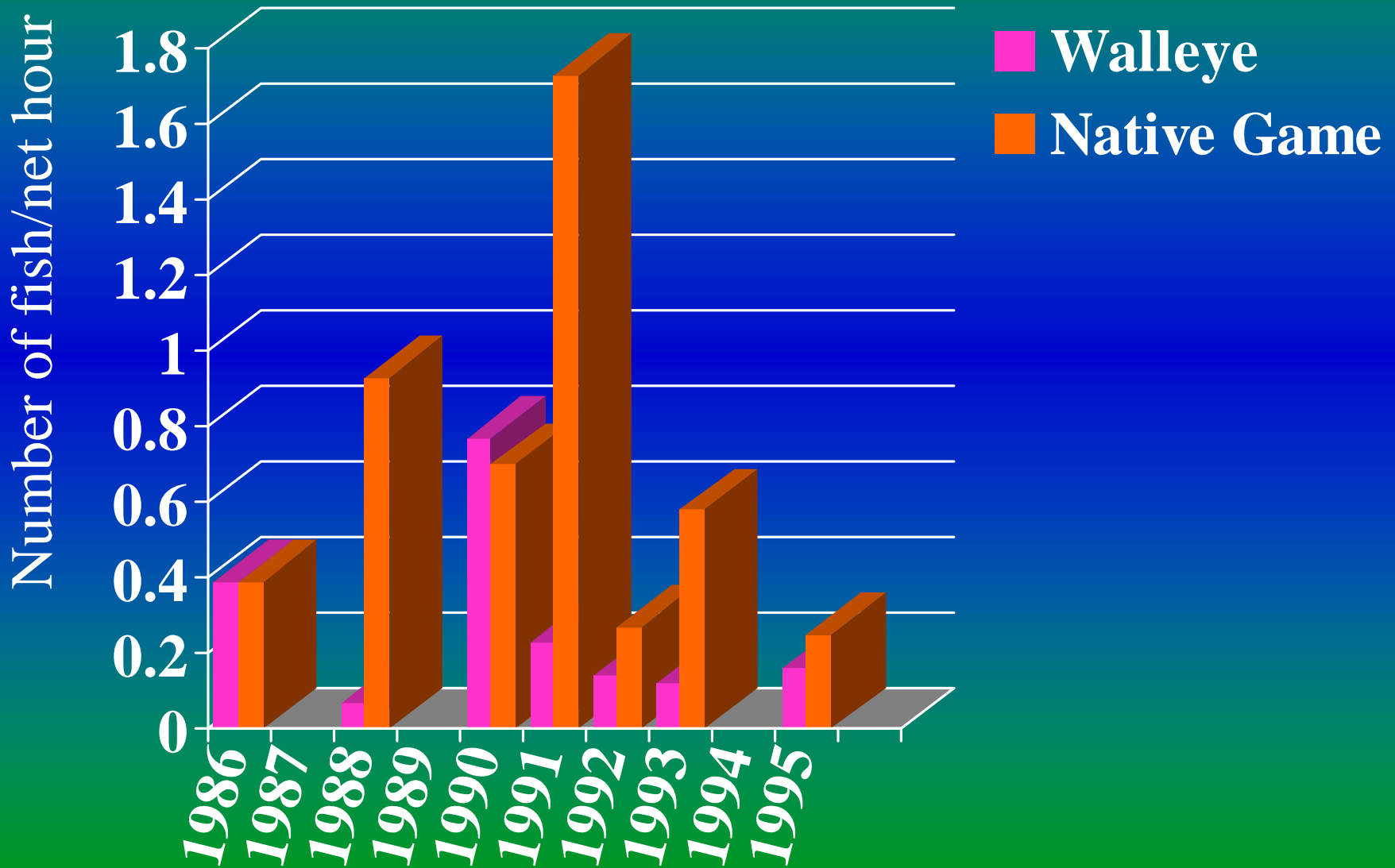
1986-1995 Angler Catch

- Angler catch dominated by sauger and channel catfish
- Walleye catch gradually declining

1986-1995 Walleye Catch



1986-1995 Native Game Fish Catch

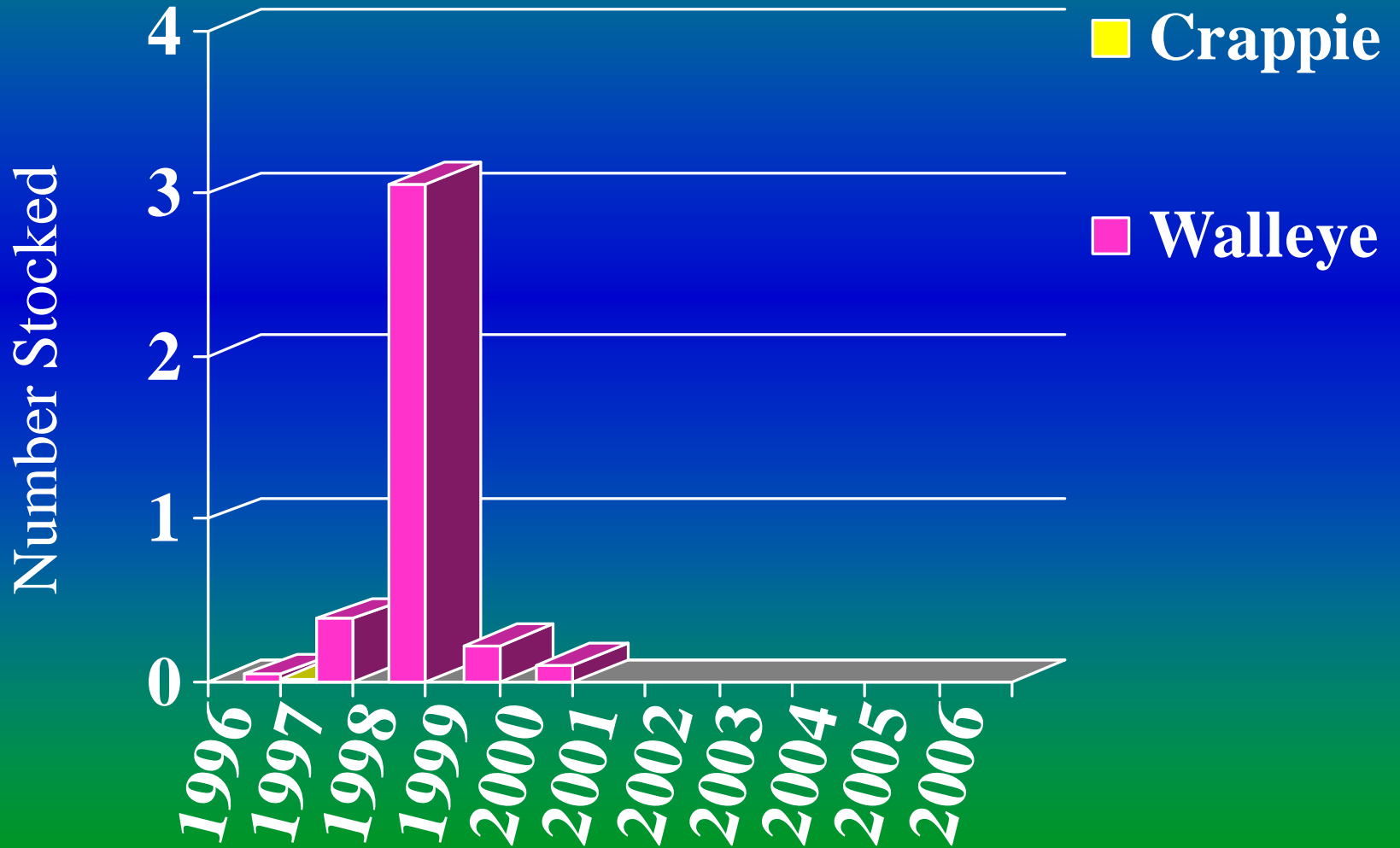


The Best and the Worst

- 1996-2007
- Management philosophy: Manage for native game fish, forage fish and walleye (when/where habitat is suitable)
- Lack of depth due to siltation and drought favor native riverine game fish
- Smallmouth bass increase forage demand
- Emerald shiners provide hope for forage need

1996-2007 Stocking

Millions



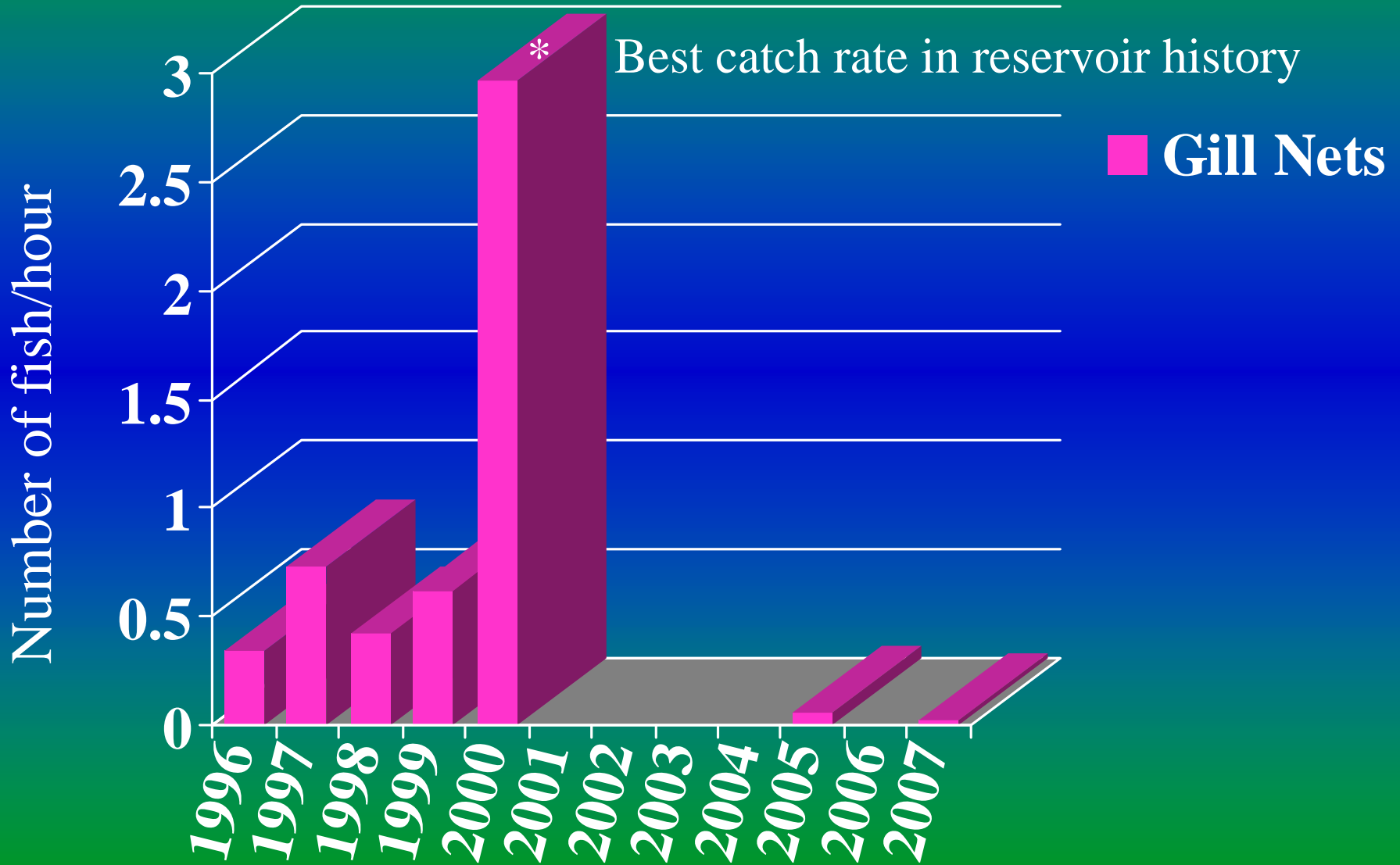
Why no stocking since 2000?

- Poor returns of stocked fish
- Water conditions force us to stock walleye in MT
- Need to be sure walleye stocked are pure or sterile to maintain sauger purity

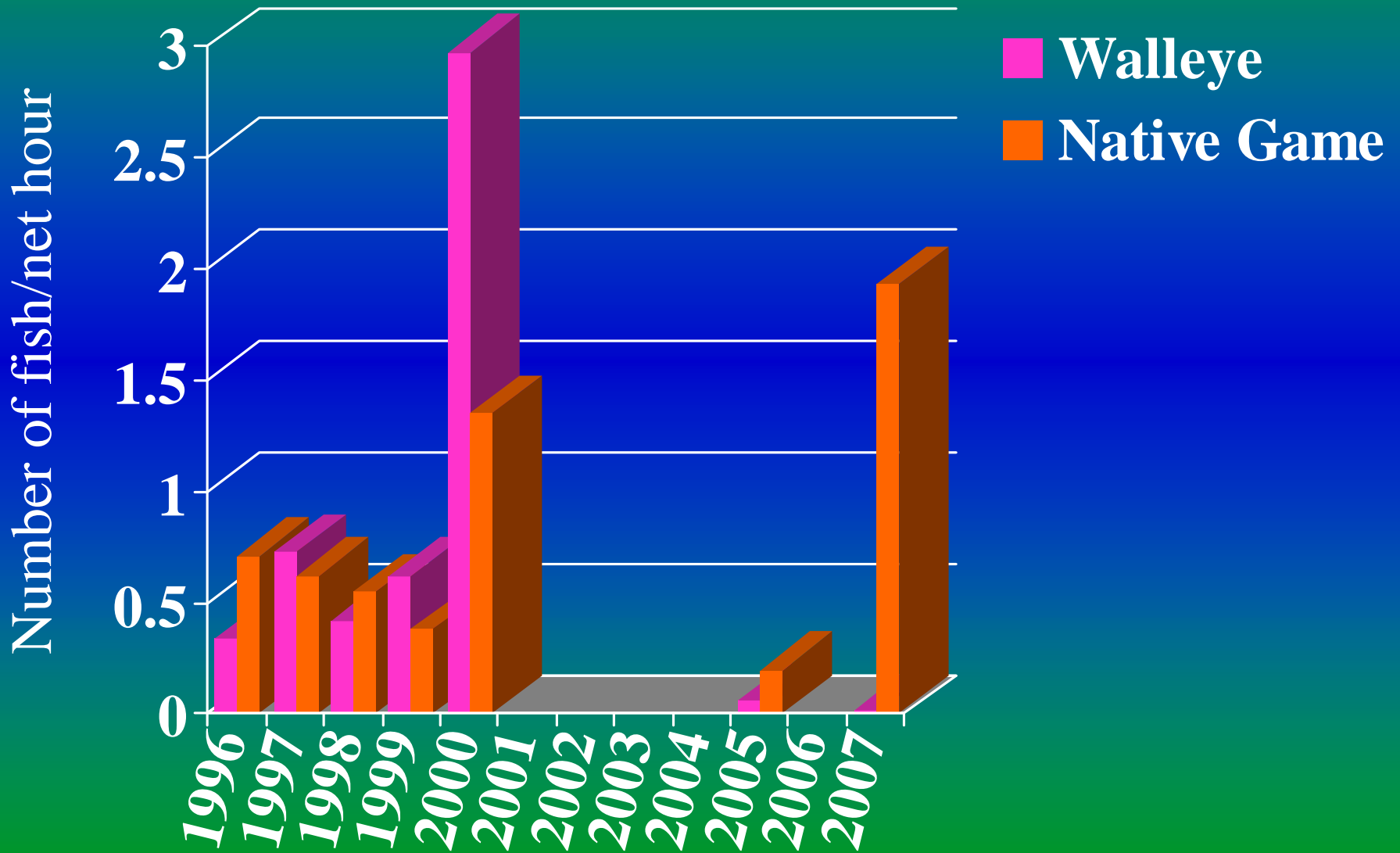
1996-2007 Angler Catch

- Angler catch dominated by channel catfish
- Good walleye catch in 1999 and 2000 followed by dismal catches in drought years from 2001 to present

1996-2007 Walleye Catch



1996-2007 Native Game Fish Catch



Lessons From History

- As the reservoir ages predominant species change reflecting changing habitat conditions
- Introductions of new species alter the condition/abundance of others
- Forage is the most common limiting factor for game fish (too little to eat too often)

Lessons From History

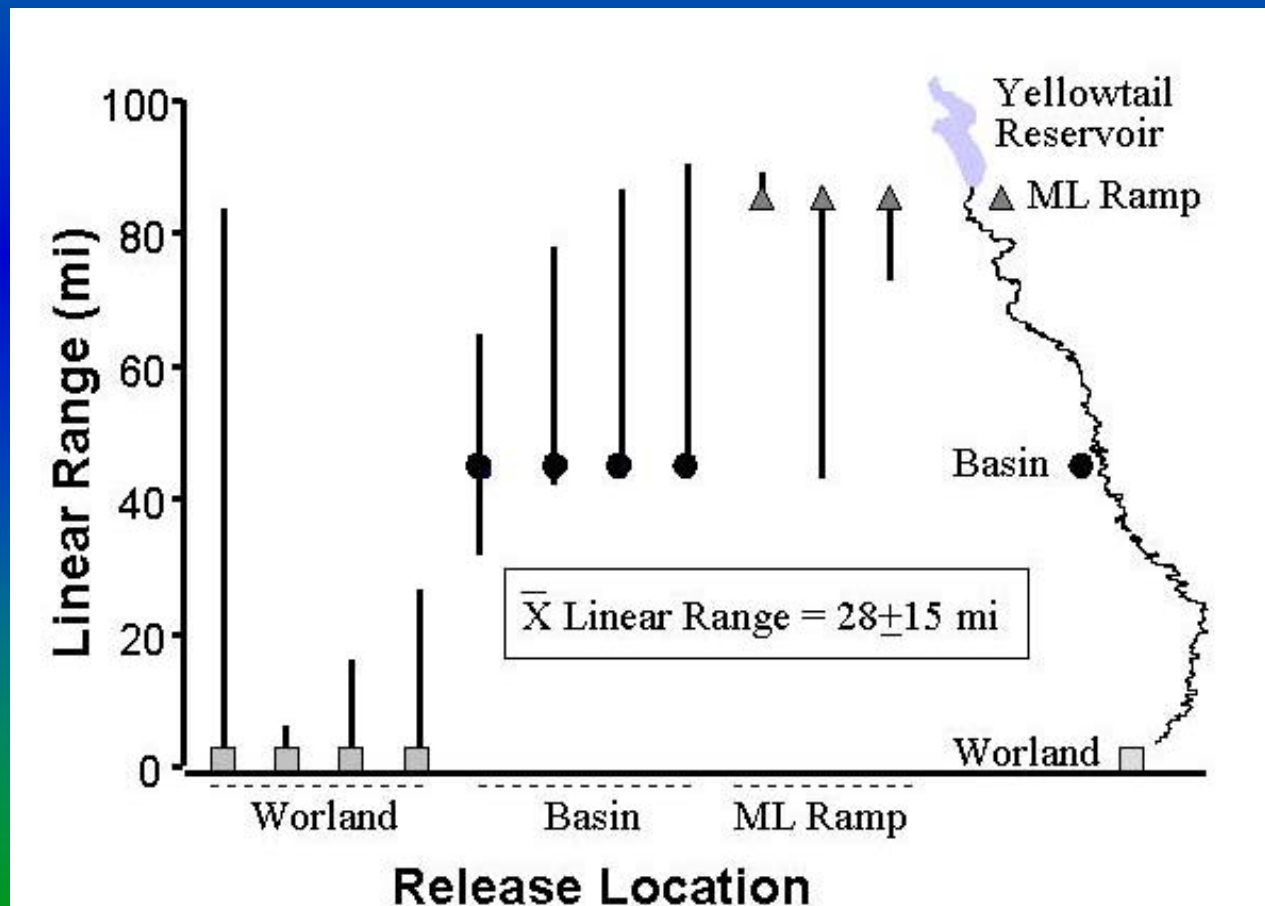
- A weak relationship exists between stocking and walleye abundance
 - Good fishing seems to be more related to habitat conditions than stocking
- Natural reproduction of walleye has been minimal
- Periods of low inflow dramatically influence fishery

Importance of Rivers

- 30 miles of Shoshone River
- 100+ miles of Bighorn River
- More than 15 native species including 5 native game fish
- Important seasonal and year-round habitat
- Reservoir/river utilization is poorly understood

Importance of Rivers

- Sauger migration (Welker 2000)

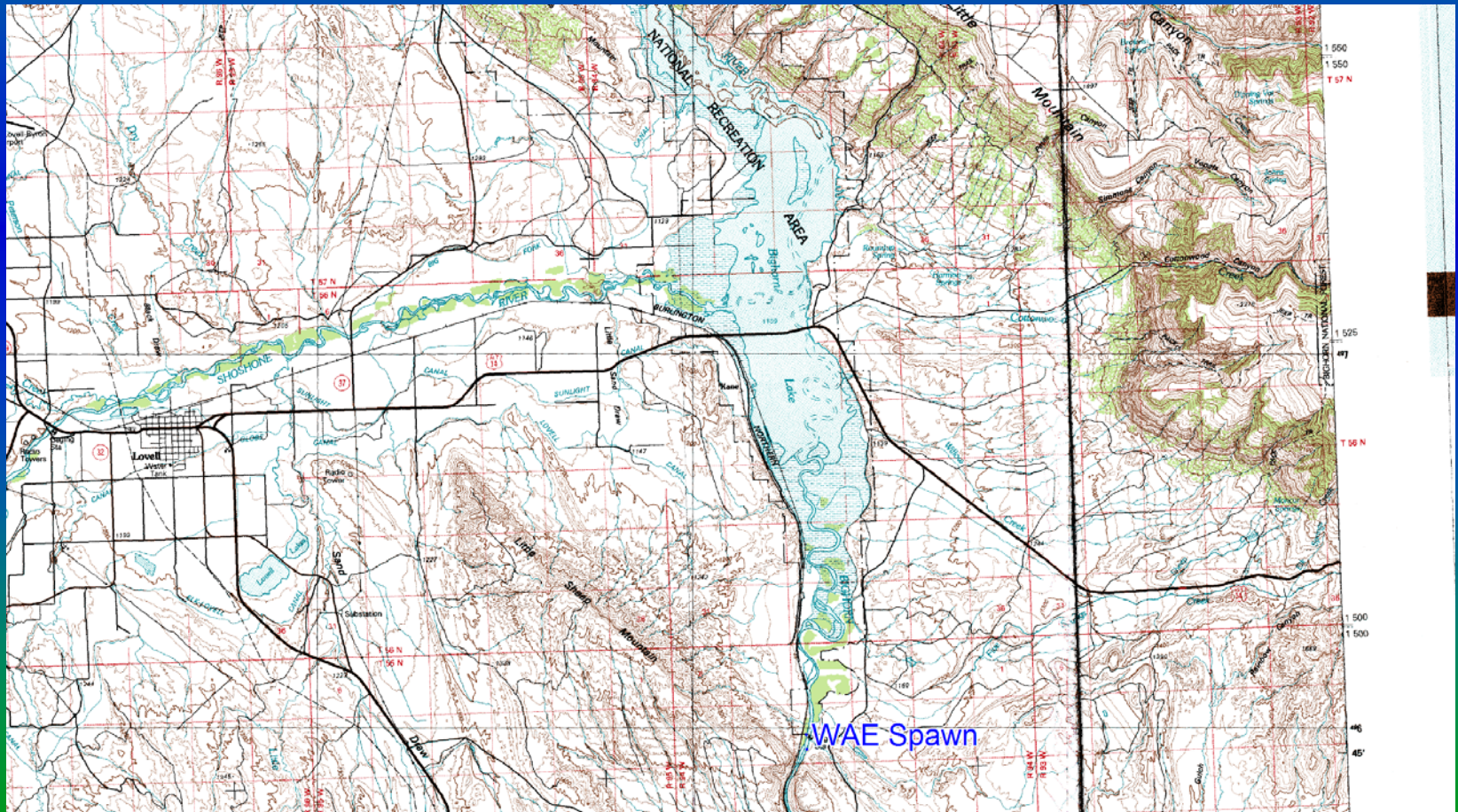


Importance of Rivers

- All reservoir sauger originated in the river and will return to the river to spawn
- Connectivity to river is critical for this species and others

Importance of Rivers

■ Walleye spawn



Reservoir Elevation and Habitat

- Water timing
 - Rapid draw downs are stressful to fishery and create dangerous ice conditions
 - Rapid fill can kill deposited eggs (need wave action)
 - Late summer draw down of upper reservoir allows beneficial revegetation

Reservoir Elevation and Habitat

■ Water timing

- Higher elevation in spring allows maintenance of favorable water clarity in lower reservoir
- Higher elevation in spring distributes sediment over larger area in upper reservoir, preserving depth in lower reservoir
- Full reservoir by mid summer maximizes area, shoreline, submerged vegetation, nutrients during most productive period resulting in good forage fish production

Reservoir Elevation and Habitat

■ Water elevation

- Elevations below 3620' eliminate “reservoir fishery” in WY, greatly reduces shallow water habitat and provides little angler access
- Maximum elevation of 3630' may provide for angler access and fishing on “flat water” for fishes tolerant of turbid conditions
- Maximum elevation of 3640' may provide additional angler access and reservoir fishery for species preferring deep, clear, cooler water

Water Management for WY Fishery

- Best water scenario for WY reservoir fishery would include
 - Reservoir that rarely falls below 3630' and never below 3620'
 - Reservoir that is $>3630'$ by May 15 to allow for increased summer water clarity
 - Reservoir filled to 3640' or higher by mid summer
 - Reservoir draw down to 3635' by Sept 1

