

# Missouri River Mainstem System Regulation for Fish and Wildlife

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US Army Corps of Engineers  
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# Missouri River Basin Water Management Regulation for Fish and Wildlife

- Fisheries – reservoir and river
  - ▶ Rising pools during forage fish spawn
  - ▶ Oahe 2010 outlet tunnel releases
  - ▶ Garrison cold water habitat
  - ▶ Minimum project releases
- Reservoir unbalancing
- Regulation for least terns and piping plovers
- Spring pulses from Gavins Point Dam for pallid sturgeon

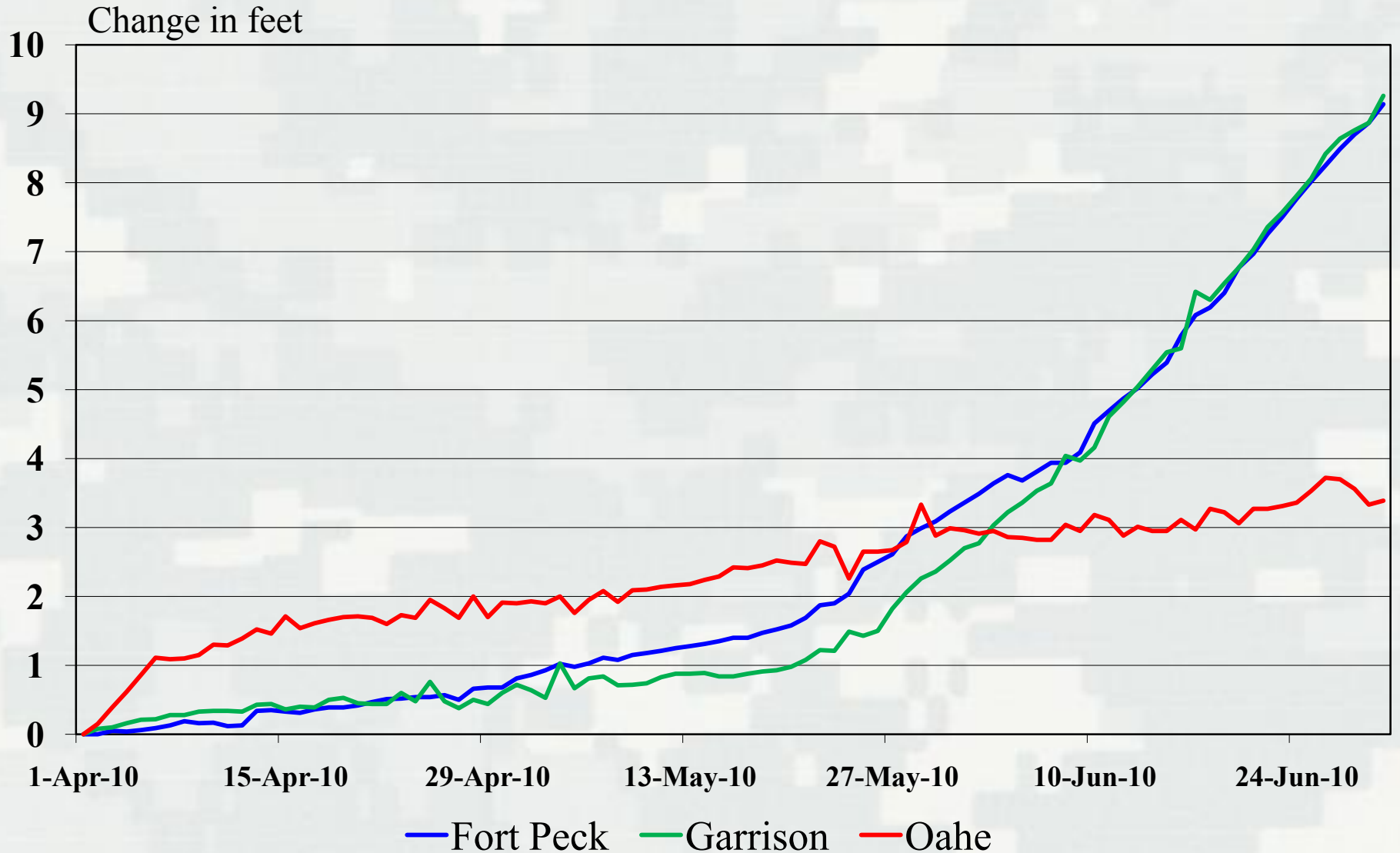


# Rising Pools During Forage Fish Spawn

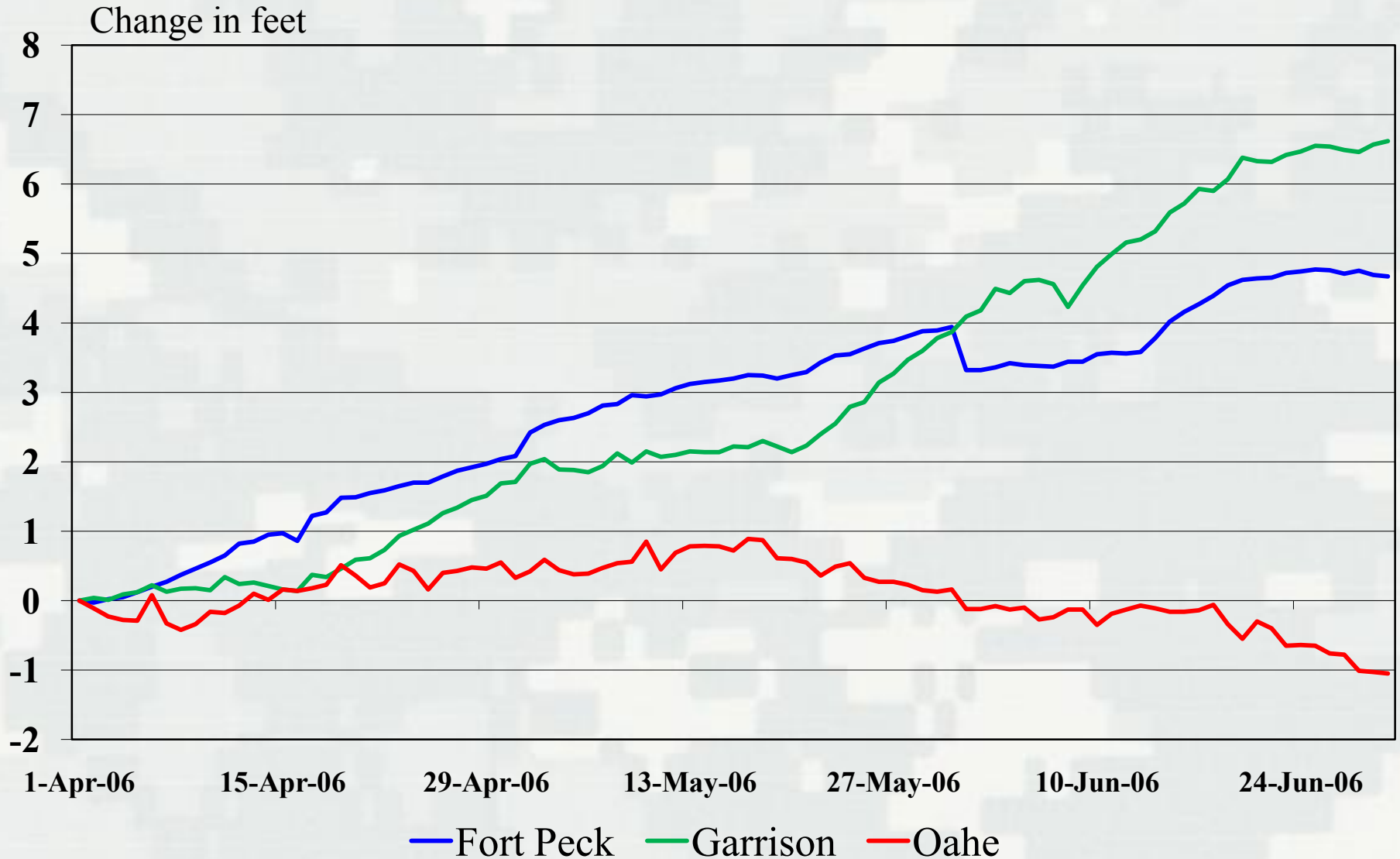
- Rainbow smelt are primary forage species in Garrison and Oahe
- Successful reproduction dependent on many factors including stable reservoir levels
- Goal: Steady to rising levels at upper three reservoirs during forage fish spawn
  - ▶ If runoff not sufficient – rotate favoring of Garrison or Fort Peck/Oahe
- 2011 – Favor Garrison if runoff below normal



# 2010 Spring Reservoir Level Change



# 2006 Spring Reservoir Level Change

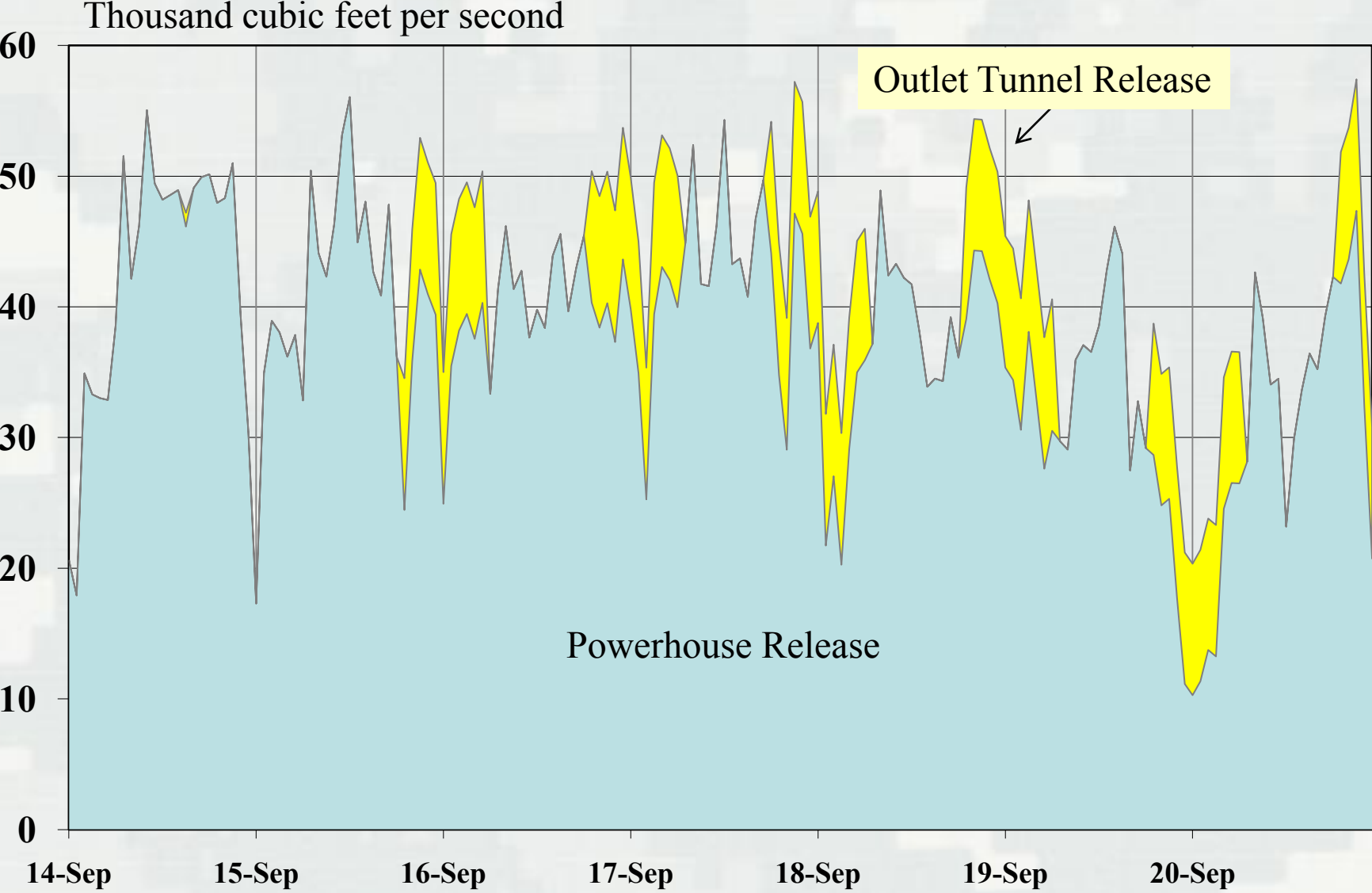


# Oahe Outlet Tunnel Releases

- Why we spilled
  - ▶ 2010 – 38.8 MAF of runoff, 3<sup>rd</sup> highest since 1898
  - ▶ Low energy demand and transmission restrictions limited powerplant releases
- Releases during evening hours
  - ▶ Minimize impacts to smelt and other forage fish
  - ▶ Draw water from near bottom
  - ▶ Smelt remain near bottom during day (light sensitive)
- Coordination
  - ▶ South Dakota Game Fish and Parks
  - ▶ Western Area Power Administration



# Oahe Hourly Releases



# Conservation of Coldwater Habitat at Garrison Dam



- Plywood installed over lower 50 feet of three trash racks
- Lowered head gates on additional units to increase velocity of water drawn into penstocks
- Adjusted peaking pattern to maximize warm water released from reservoir





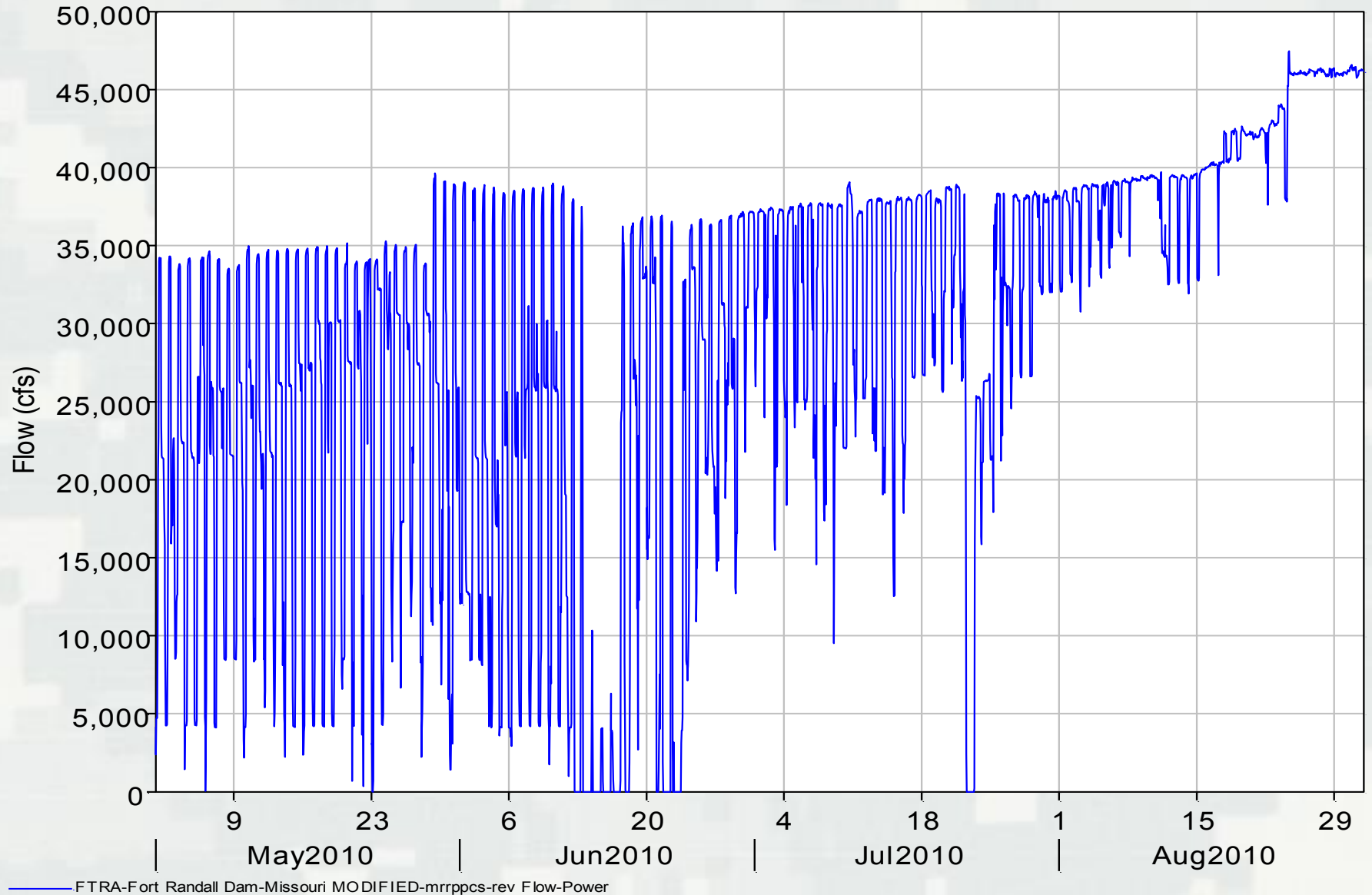
# Mainstem Minimum Releases

- Fort Peck
  - ▶ Minimum hourly release of 3,000 cfs for downstream fisheries
- Garrison
  - ▶ Minimum daily releases for downstream intakes
  - ▶ Project standing order limits hours of zero
- Fort Randall
  - ▶ Minimize zero releases to the extent reasonably possible during nesting season



# Fort Randall Hourly Releases

## 2010 Nesting Season

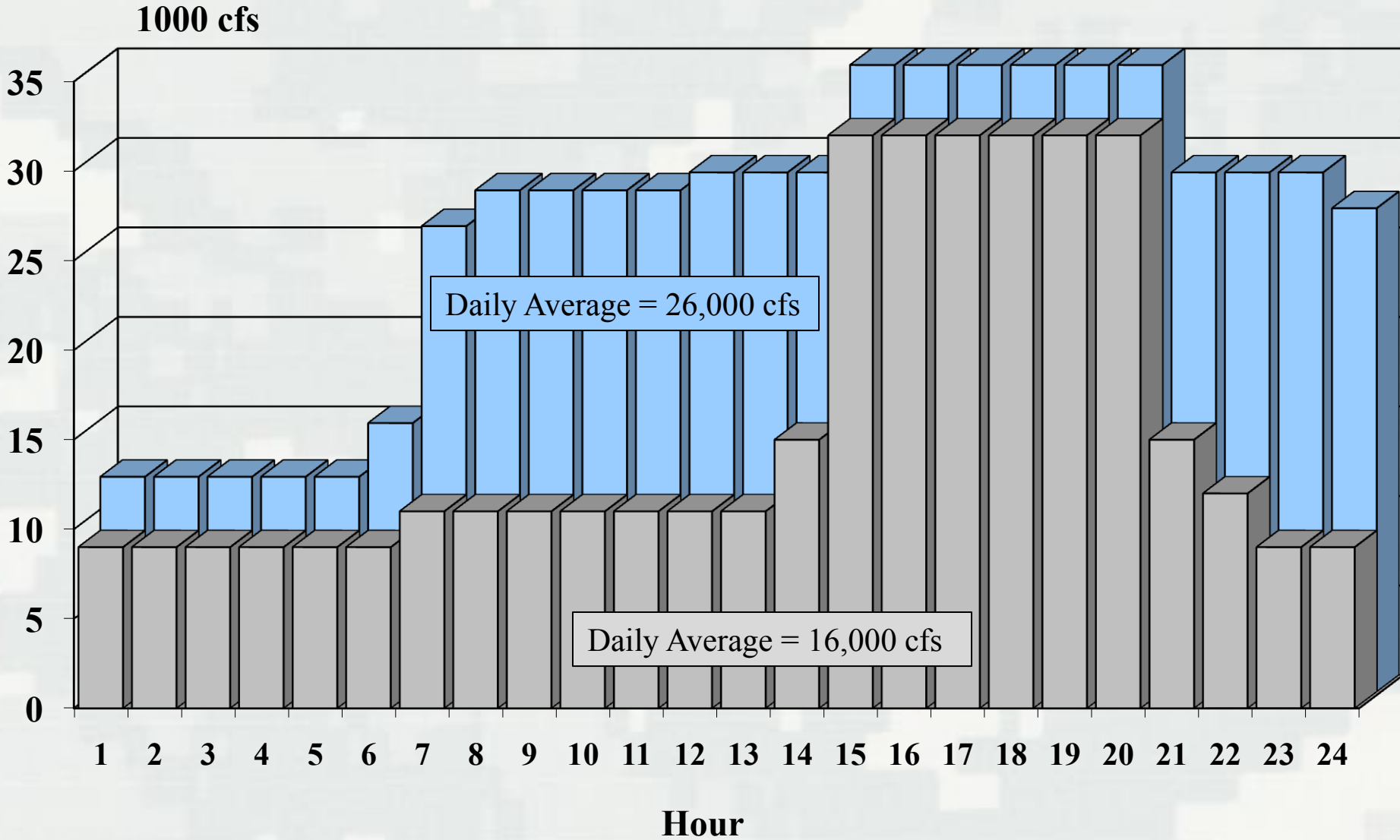


# Threatened and Endangered Species

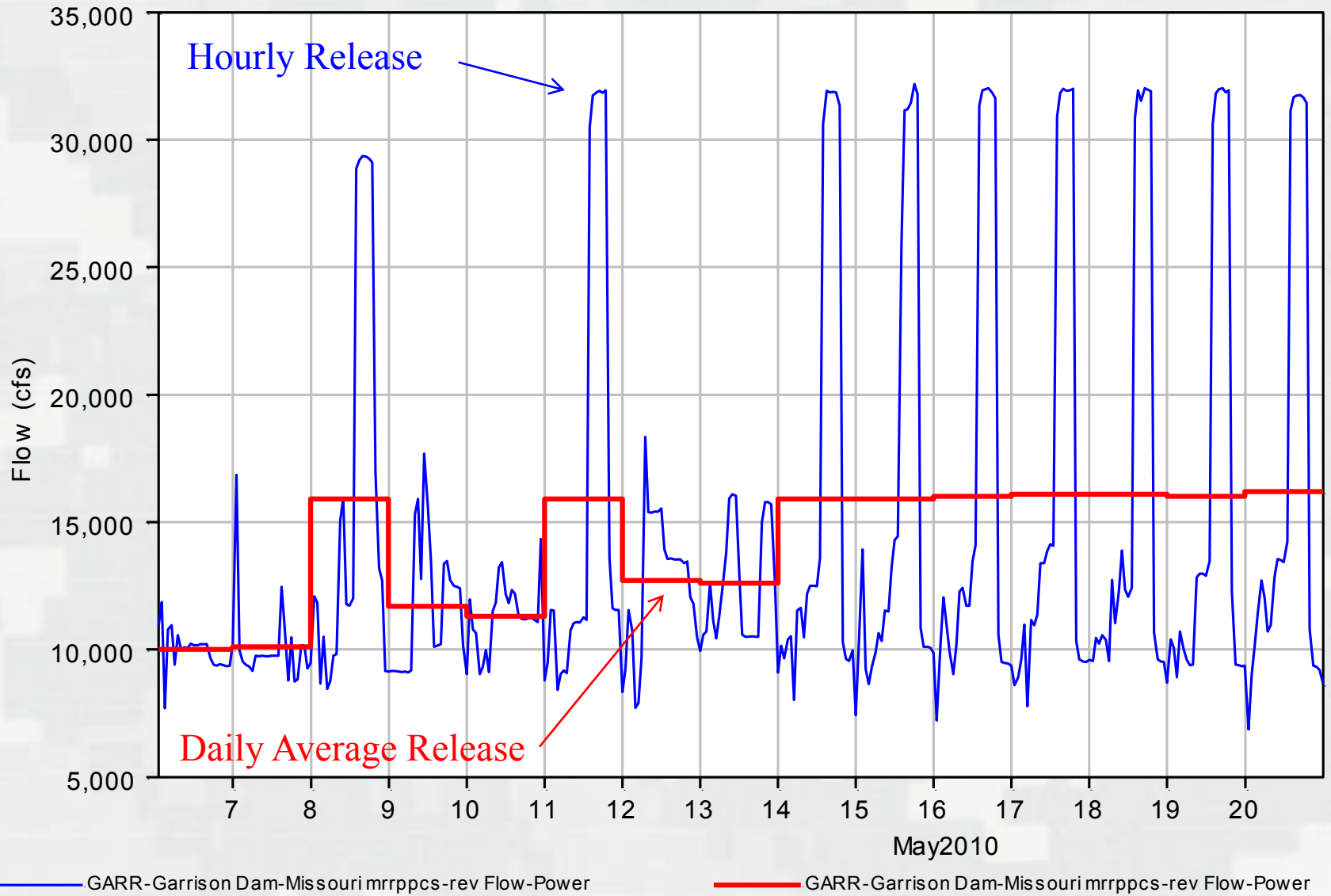
## Piping Plover and Least Tern

- 2011 Gavins Point
  - ▶ Steady release – flow to target
  - ▶ Cycle Gavins Point releases
- Intra-day peaking patterns – Garrison & Fort Randall
- Measures to minimize take
  - ▶ Utilize Kansas River projects for navigation support
  - ▶ Target flows may not be met in reaches without commercial navigation

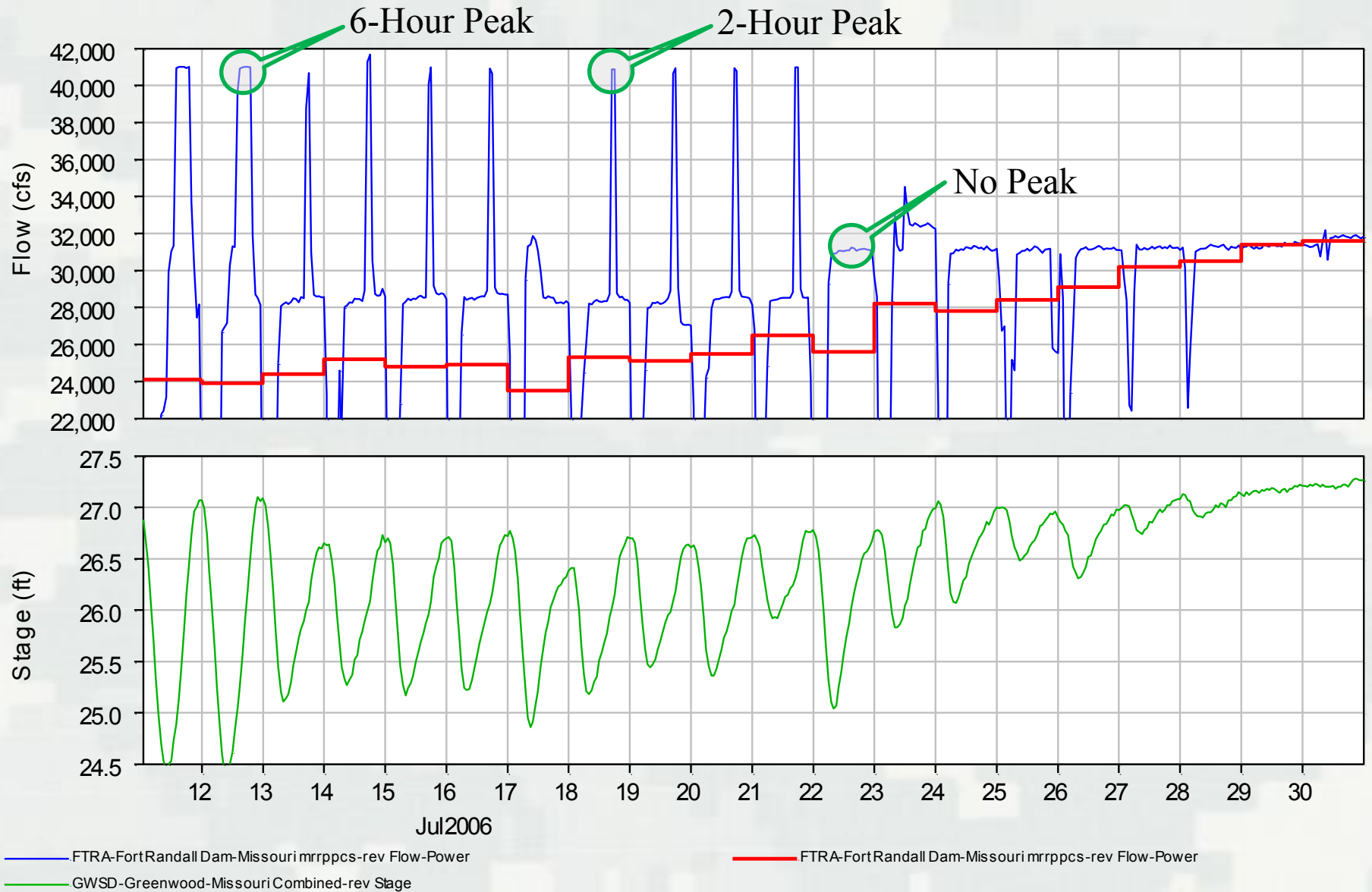
# Garrison Hourly Peaking Pattern



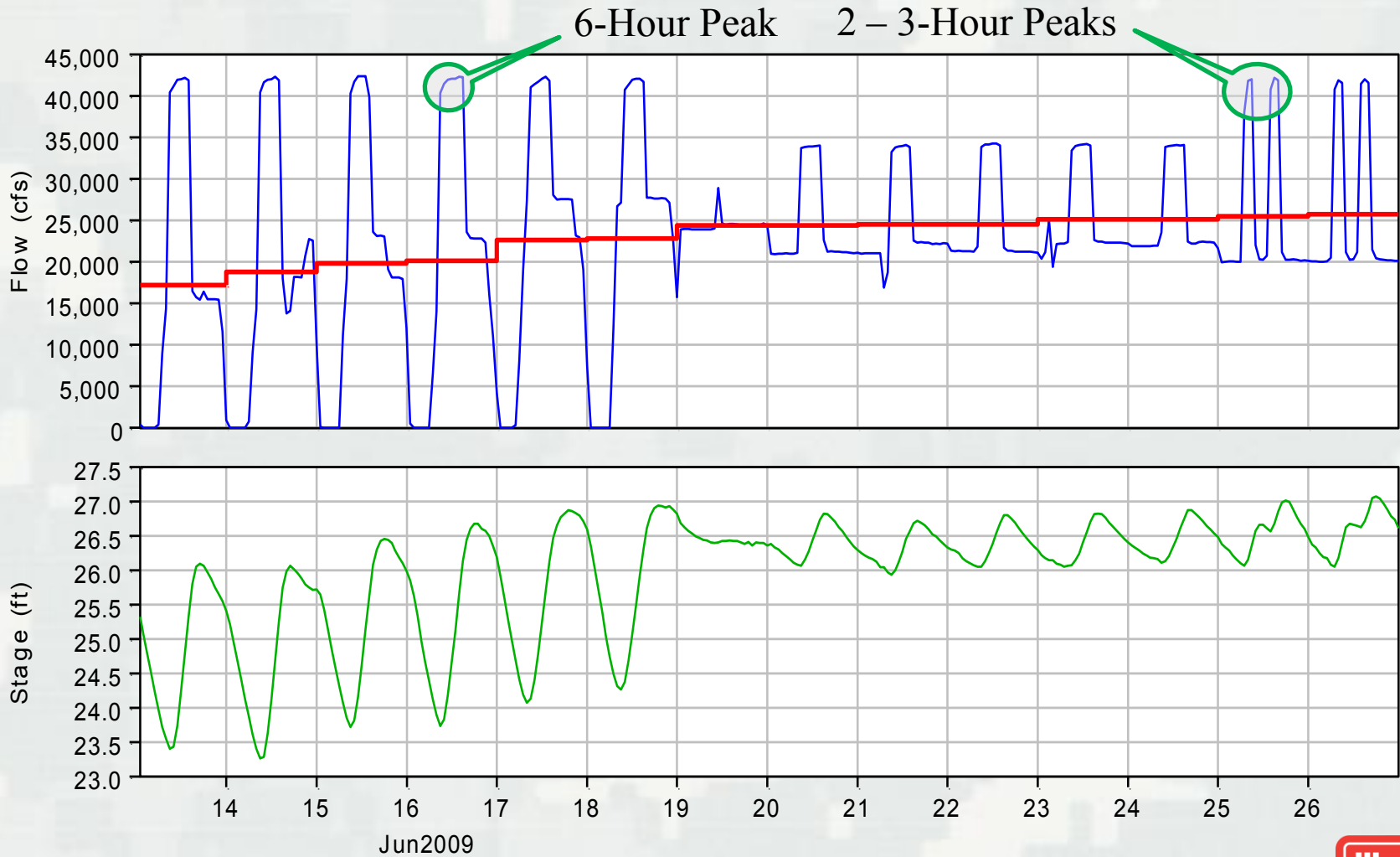
# 2010 Peaking at Garrison



# 2006 Peaking at Fort Randall



# 2009 Peaking at Fort Randall



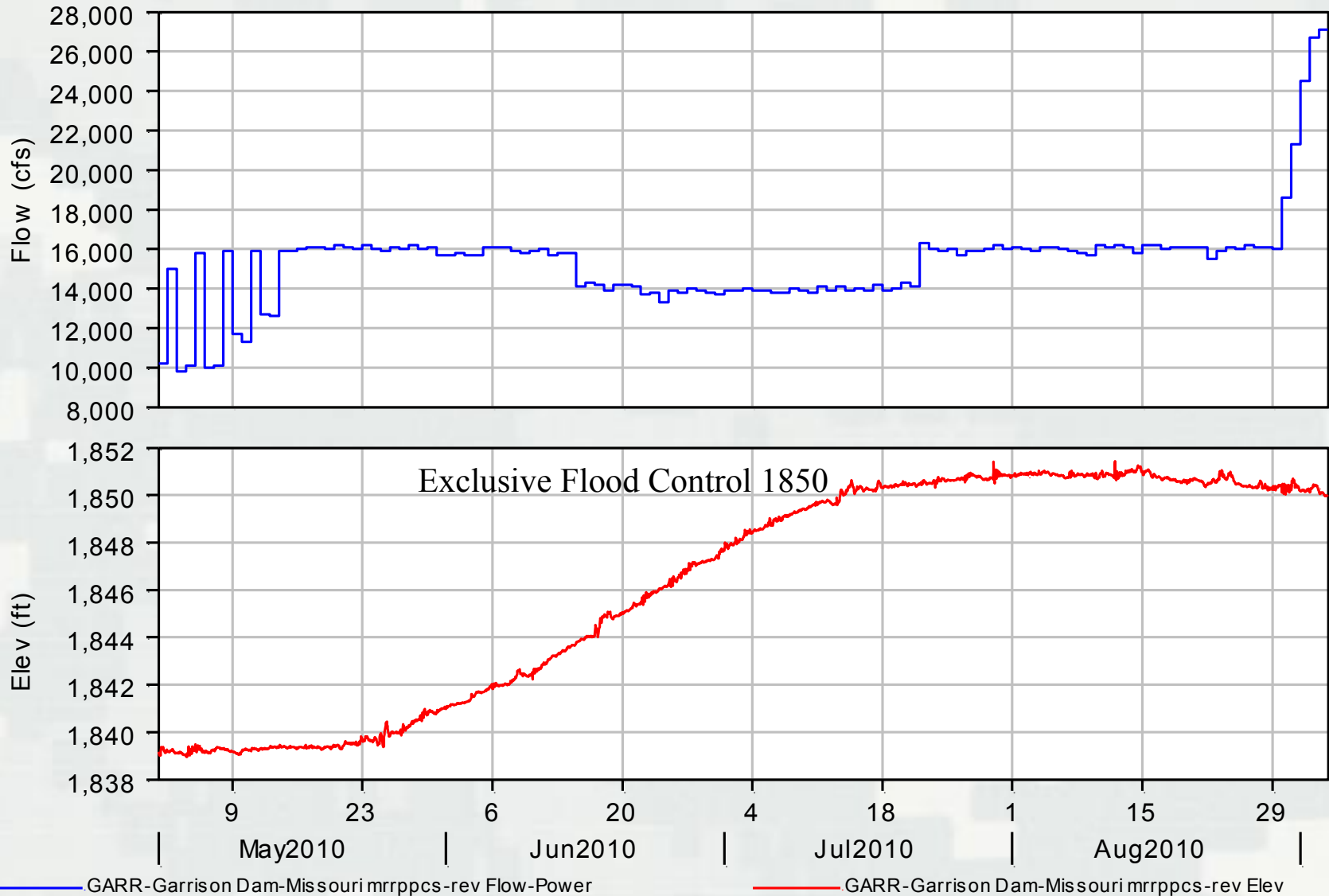
— FTRA-FortRandall Dam-Missouri mrrppcs-rev Flow-Power

— FTRA-FortRandall Dam-Missouri mrrppcs-rev Flow-Power

— GWSD-Greenwood-Missouri Combined-rev Stage



# Garrison Reservoir Elevation and Releases

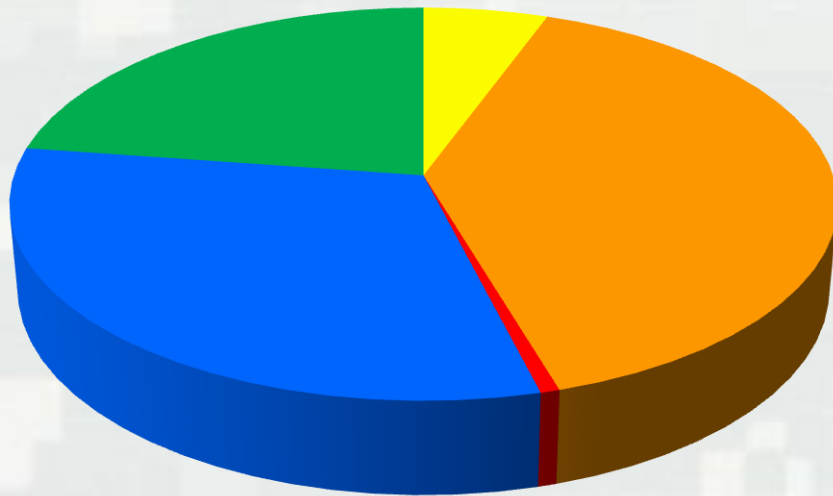




# Fish and Wildlife

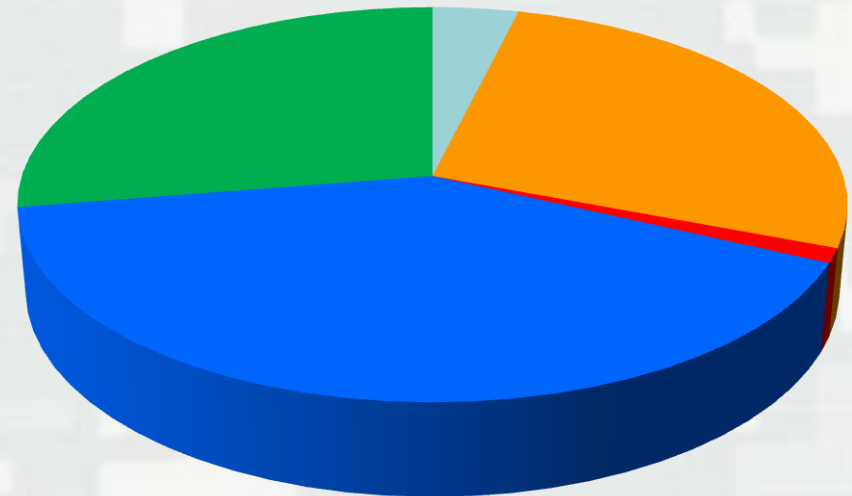
## Threatened and Endangered Species

**2010 Piping Plover Fledglings  
(304)**



- |                      |                        |
|----------------------|------------------------|
| ■ Fort Peck          | ■ Fort Peck River      |
| ■ Garrison (17)      | ■ Garrison River (121) |
| ■ Oahe (2)           | ■ Big Bend             |
| ■ Fort Randall River | ■ Gavins (95)          |
| ■ Gavins River (69)  |                        |

**2010 Least Tern Fledglings  
(338)**

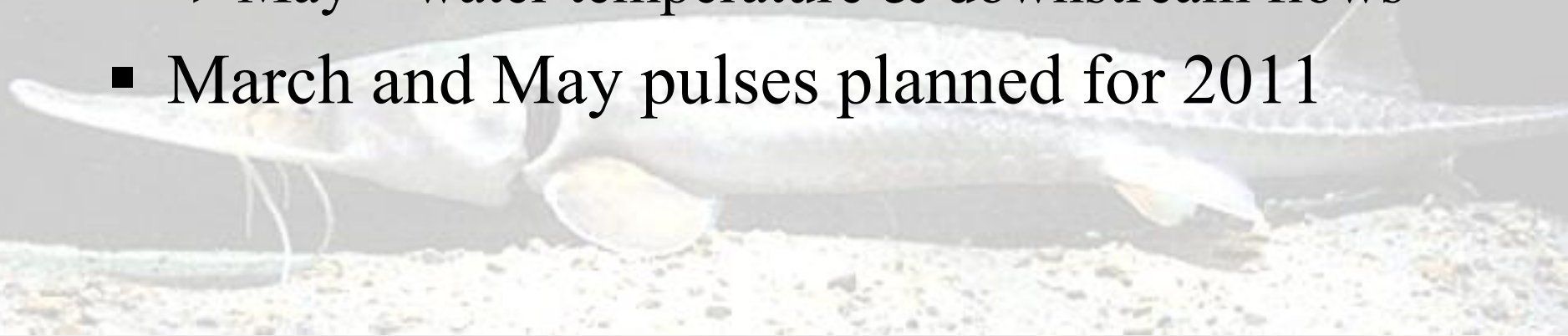


- |                      |                        |
|----------------------|------------------------|
| ■ Fort Peck          | ■ Fort Peck River (13) |
| ■ Garrison           | ■ Garrison River (91)  |
| ■ Oahe (4)           | ■ Big Bend             |
| ■ Fort Randall River | ■ Gavins (137)         |
| ■ Gavins River (93)  |                        |

# Threatened and Endangered Species

## Bi-Modal Spring Pulse – Pallid Sturgeon

- 2003 Amended Biological Opinion – Reasonable and Prudent Alternative
- Neither pulse conducted in 2010
  - ▶ March – downstream flows
  - ▶ May – water temperature & downstream flows
- March and May pulses planned for 2011





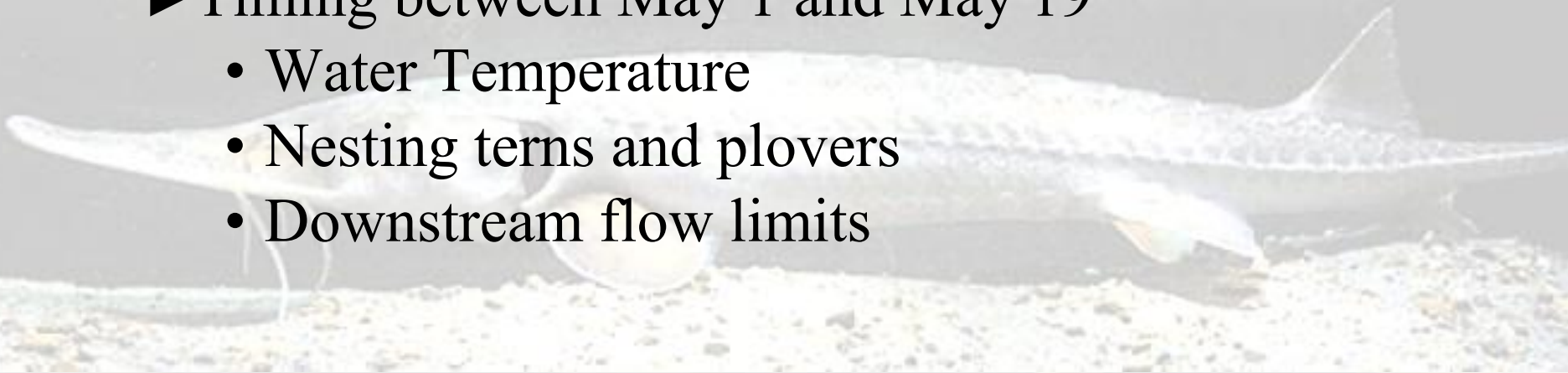
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# Threatened and Endangered Species

## Bi-Modal Spring Pulse – Pallid Sturgeon

- 2011 March
  - ▶ March – magnitude 5 kcfs
- 2011 May
  - ▶ Magnitude from 9 kcfs to 20 kcfs
  - ▶ Timing between May 1 and May 19
    - Water Temperature
    - Nesting terns and plovers
    - Downstream flow limits



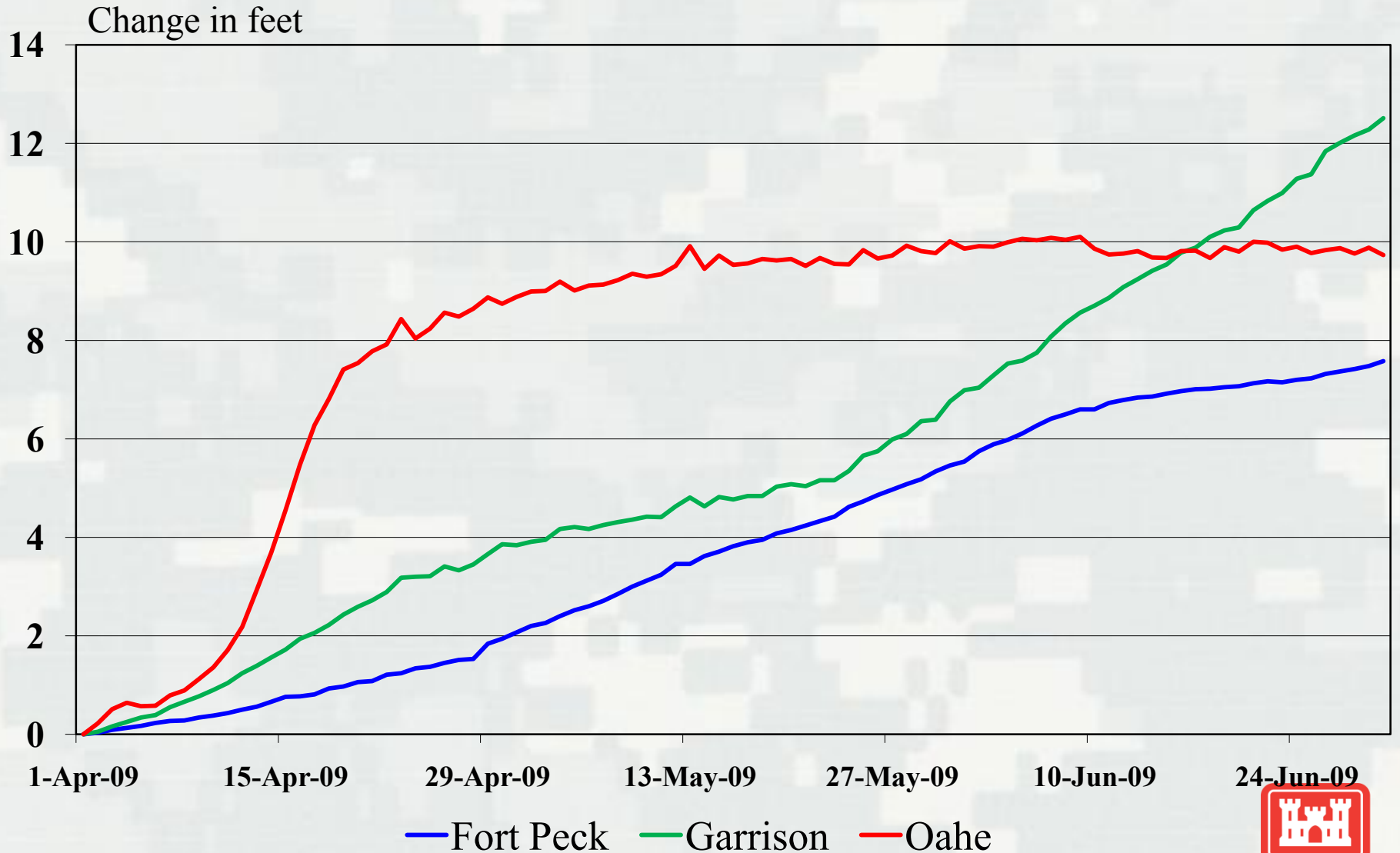
# Threatened and Endangered Species

## Bi-Modal Spring Pulse – Pallid Sturgeon

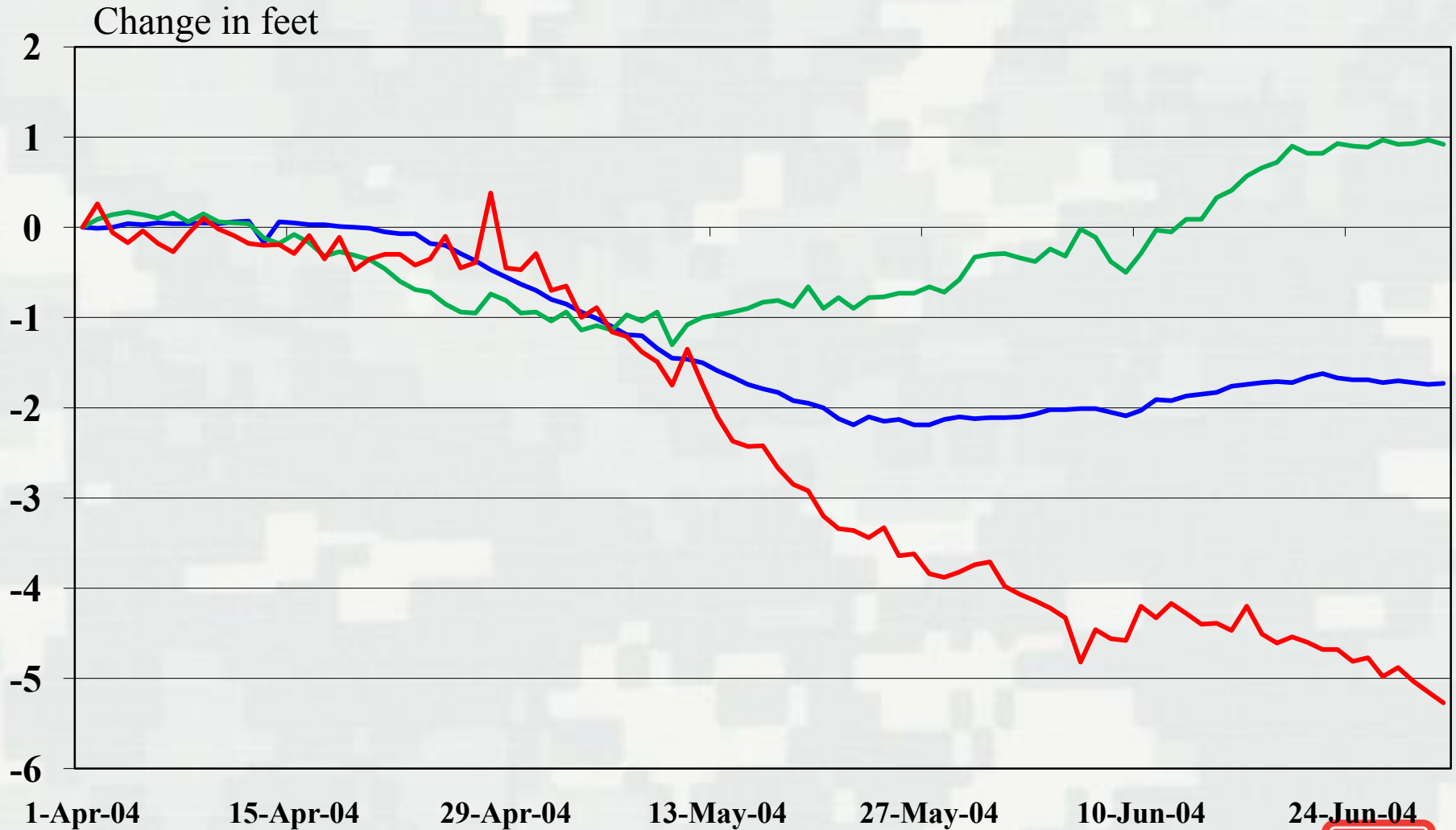
- Downstream flow limits
  - ▶ Omaha (41,000 cfs)
  - ▶ Nebraska City (47,000 cfs)
  - ▶ Kansas City (71,000 cfs)
- Eliminate pulse downstream of Kansas City using tributary reservoirs
- Monitoring in place
  - ▶ Biological
  - ▶ Interior drainage
  - ▶ Groundwater



# 2009 Spring Reservoir Level Change



# 2004 Spring Reservoir Level Change



— Fort Peck — Garrison — Oahe



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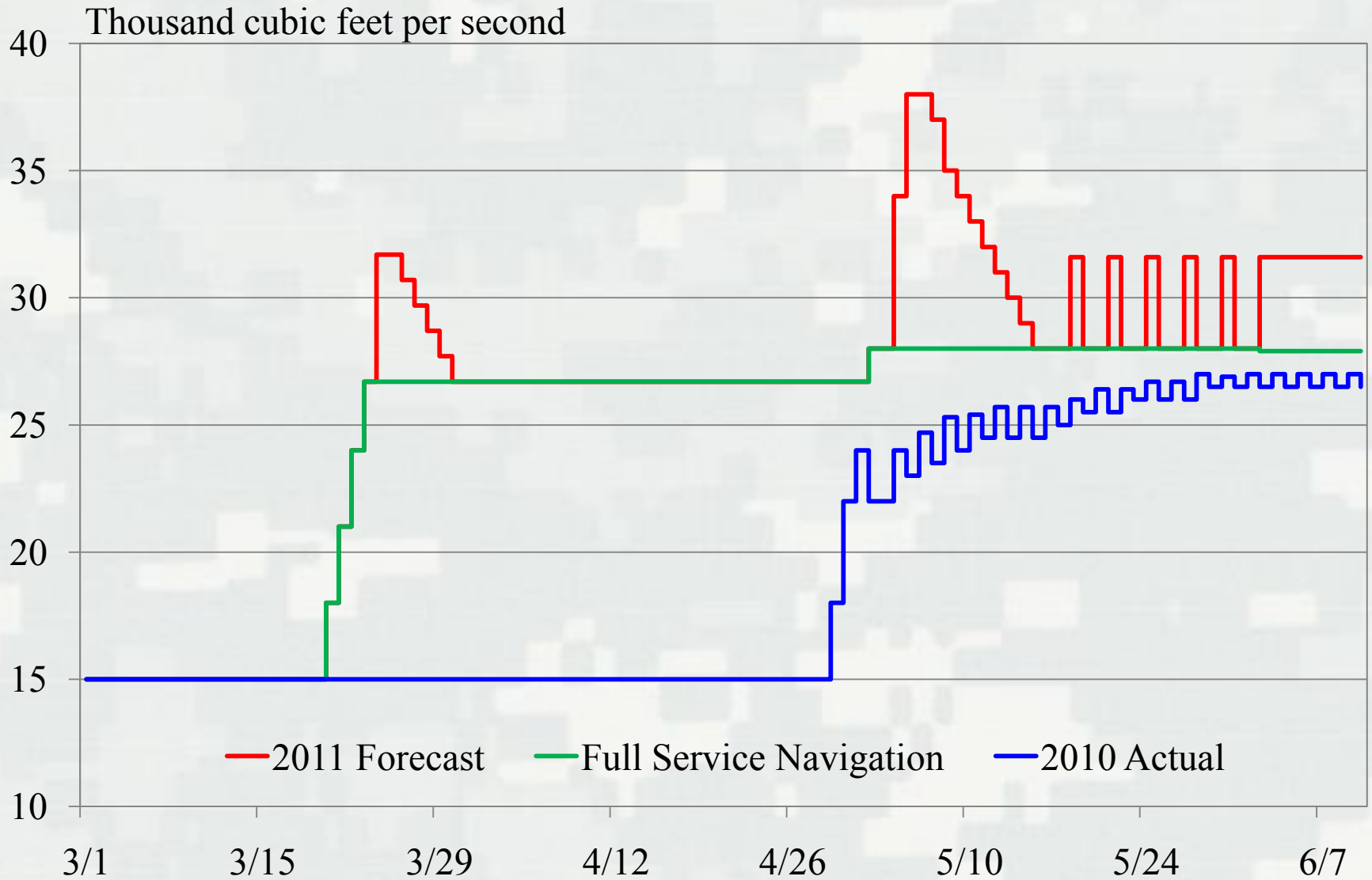


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# Gavins Point Releases



# Final 2010-2011 Annual Operating Plan (AOP) Median Runoff Condition

- Flood Control
  - ▶ Entire flood pool available in 2011
- Navigation
  - ▶ Full service flows to start season
  - ▶ Full service flows following July 1 storage check
  - ▶ Full length navigation season + 10 day extension
- Hydropower – Annual Generation = 10.4 BkWh in 2011



# Final 2010-2011 Annual Operating Plan (AOP)

## Median Runoff Condition

- Recreation, water supply and irrigation
  - ▶ Near normal due to higher reservoir levels and releases
  - ▶ Higher winter releases from Gavins Point
- Fish and Wildlife / Endangered Species
  - ▶ Favor Garrison during forage fish spawn
  - ▶ March and May spring pulses from Gavins Point
  - ▶ No intrasystem unbalancing in 2011
  - ▶ No Fort Peck spring rise pending results of modification of Intake Diversion Dam on the Yellowstone
  - ▶ Minimize zero releases at Fort Randall to the extent reasonably possible during the nesting season

