Sustainable Rivers and Streams

Finding the Balance between Human and Ecological Needs for Water

Stream flow History

- 1971 — PA-229
- 1979 — Minimum Stream Flow Regulation Adopted
- 1982 — Diversion Act
- 2002 — Waterbury v. Washington
- 2003 — Program Review
- 2005 — PA 05-142

Public Act No. 05-142
AN ACT CONCERNING THE MINIMUM WATER FLOW REGULATIONS

DEP Commissioner shall adopt regulations for stream flow that…

- apply to all rivers and streams
- based on best available science
- provide for the needs and requirements of public health, flood control, industry, public utilities, water supply, public safety, agriculture and other lawful uses of such waters and further recognizing and providing for stream and river ecology, the requirements of natural aquatic life, natural wildlife and public recreation, and after considering the natural flow of water

Public Process

2005 PA 05-142

2005

3 Advisory Groups Formed by DEP

October 2009

DEP Publishes Notices Notice of Intent - Hearing January 2010

LRRC Rejection without Prejudice

10/2010

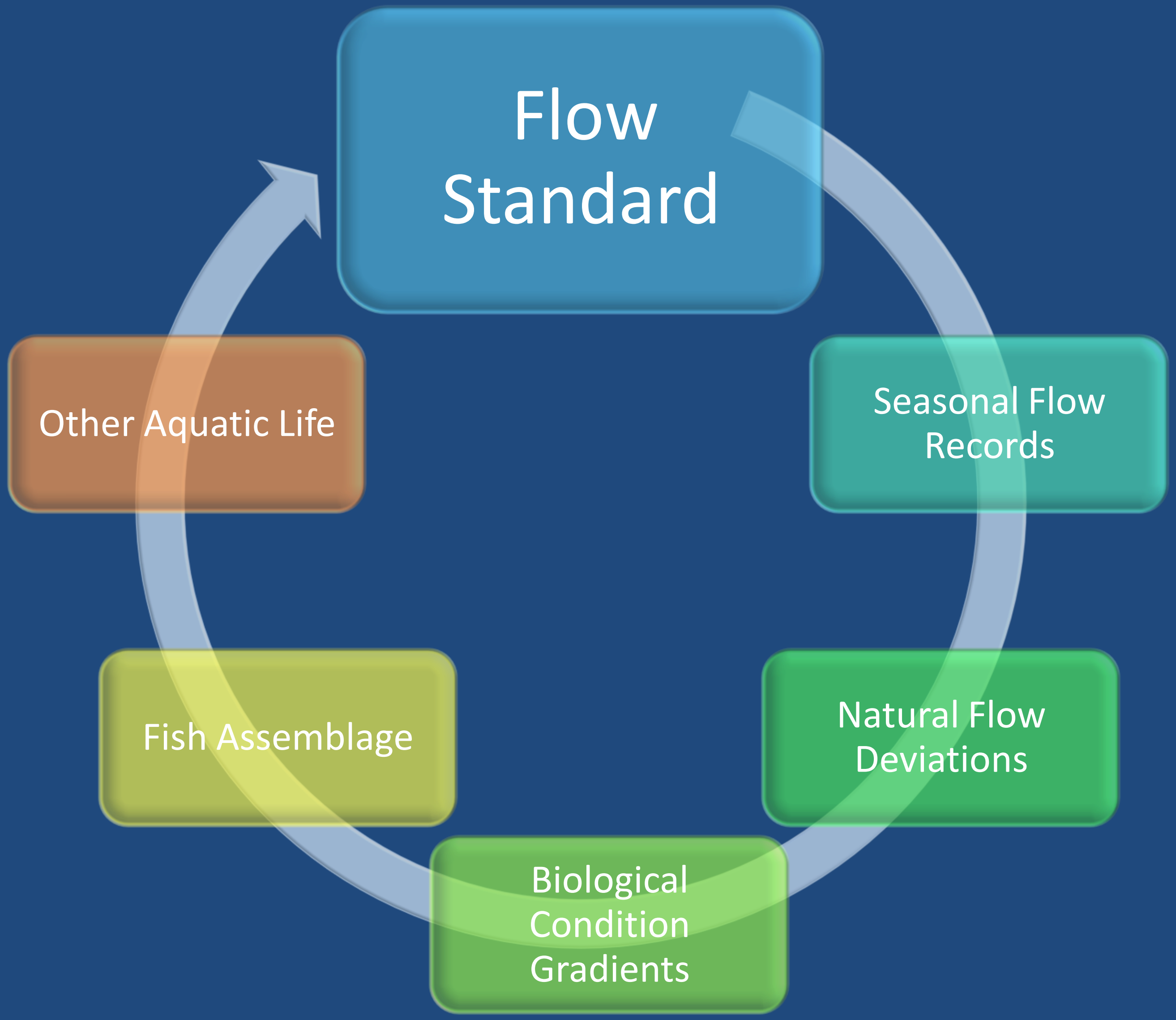
12/2010

Stakeholder Group February 2011 through July 2011

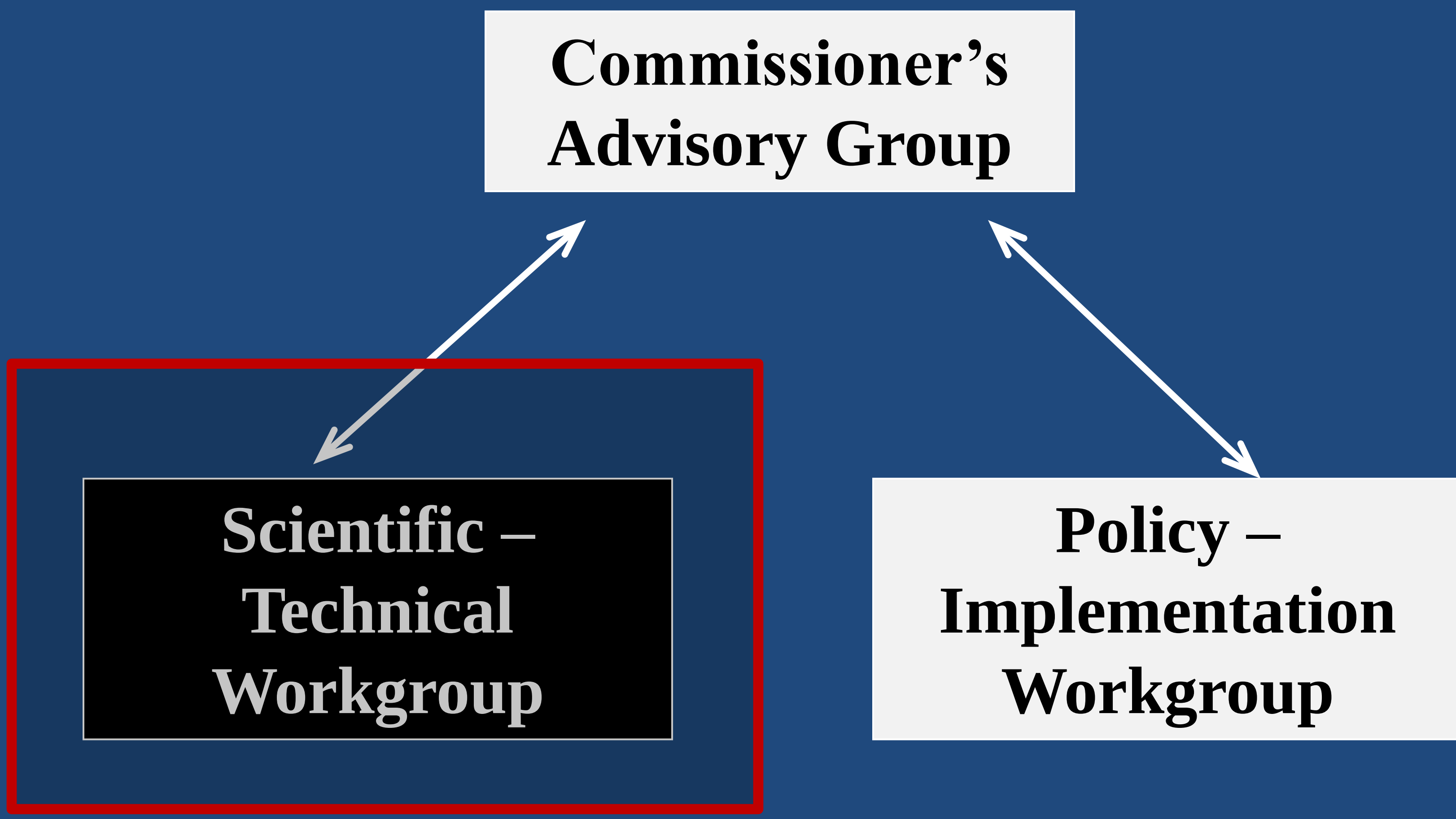
Approved LRRC November 2011

Filed December 2011

Best Available Science



The Path Towards the Stream Flow Regulation



- Broad Group of Stakeholders including other state agencies, USGS, USEPA, Nature Conservancy, Trout Unlimited, Rivers Alliance, Water Utilities, and Universities

Scientific –Technical Committee

Hydrogeologists

Geomorphologists

Committee consisted of a diverse group of scientists from multiple backgrounds

Water Resource Engineers

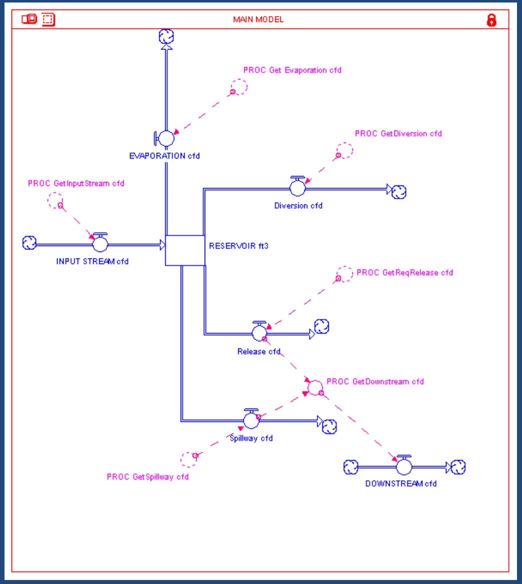
Stream Ecologists

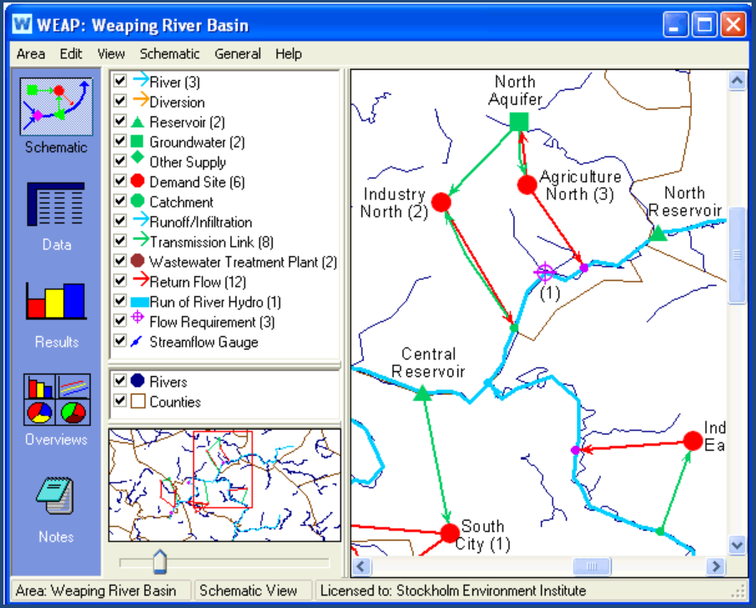
Fisheries Biologists

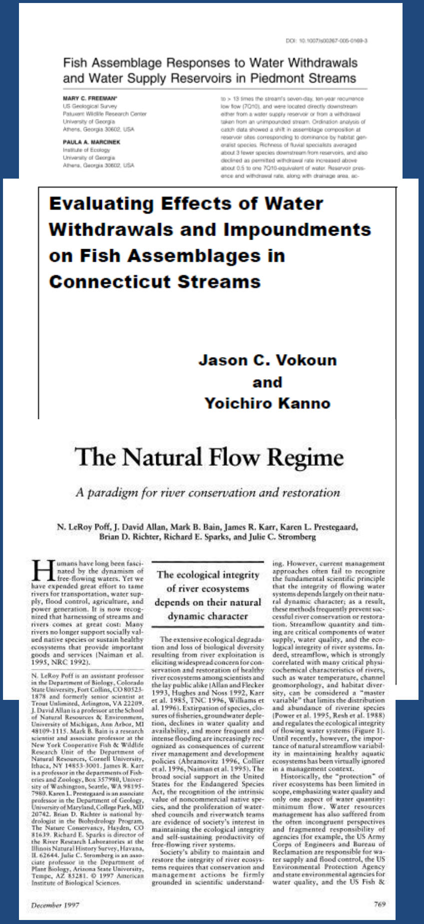
Scientific –Technical Committee

What It Takes to Develop Stream flow Standards…

- 24 Meetings (January 2006 – December 2008)
- > 140 Meeting Hours
- 2,126 Model Runs
- 1,000 Cheese Cubes







Defining Important Stream Flows for Connecticut

1. **Natural Hydrograph** is Important !

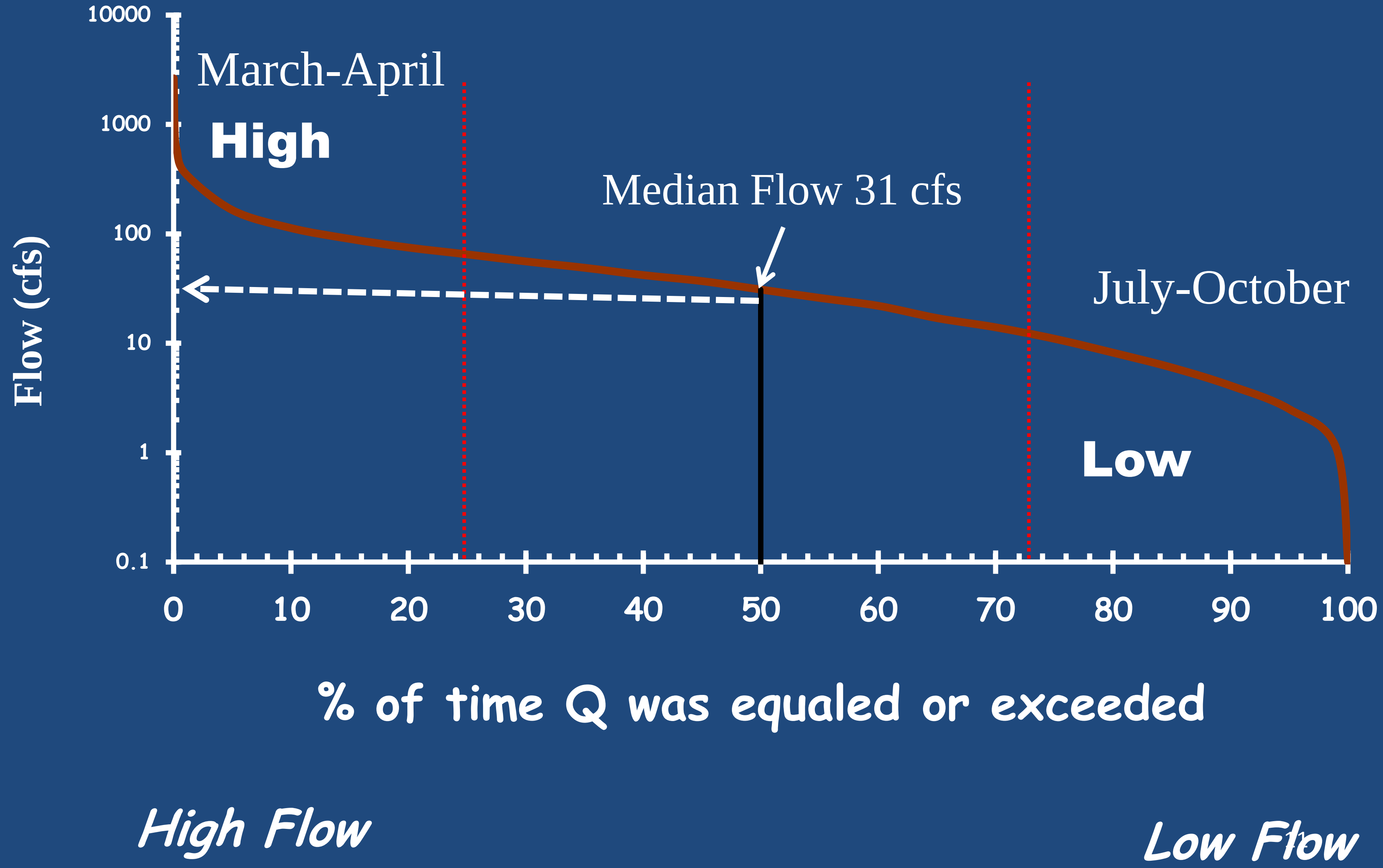
   -The more water that is used for human uses, the more the hydrograph is altered

   -The more the hydrograph is altered, the more it impacts aquatic life

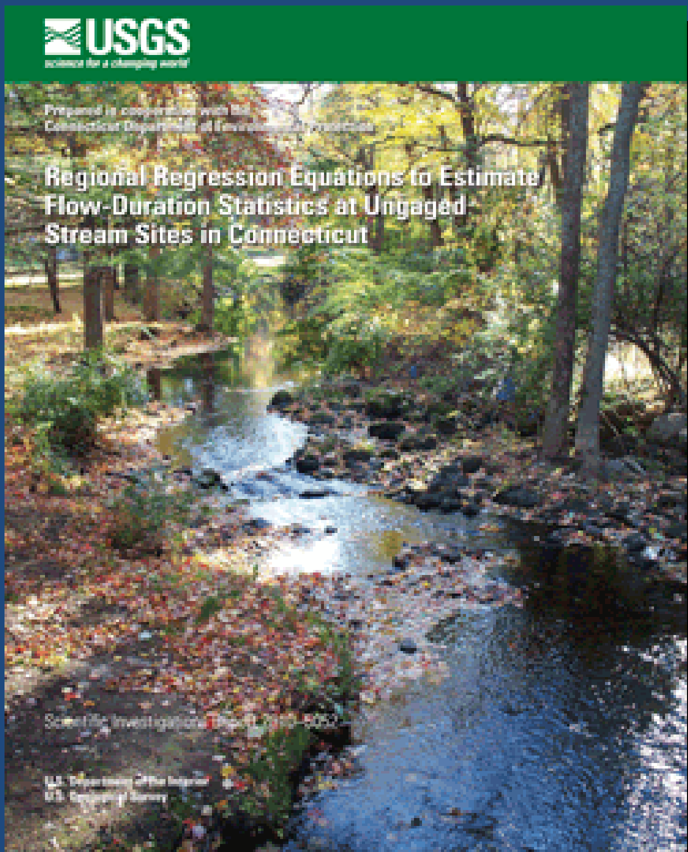
2. **Bioperiods**- seasonal flow variation linked to biological processes

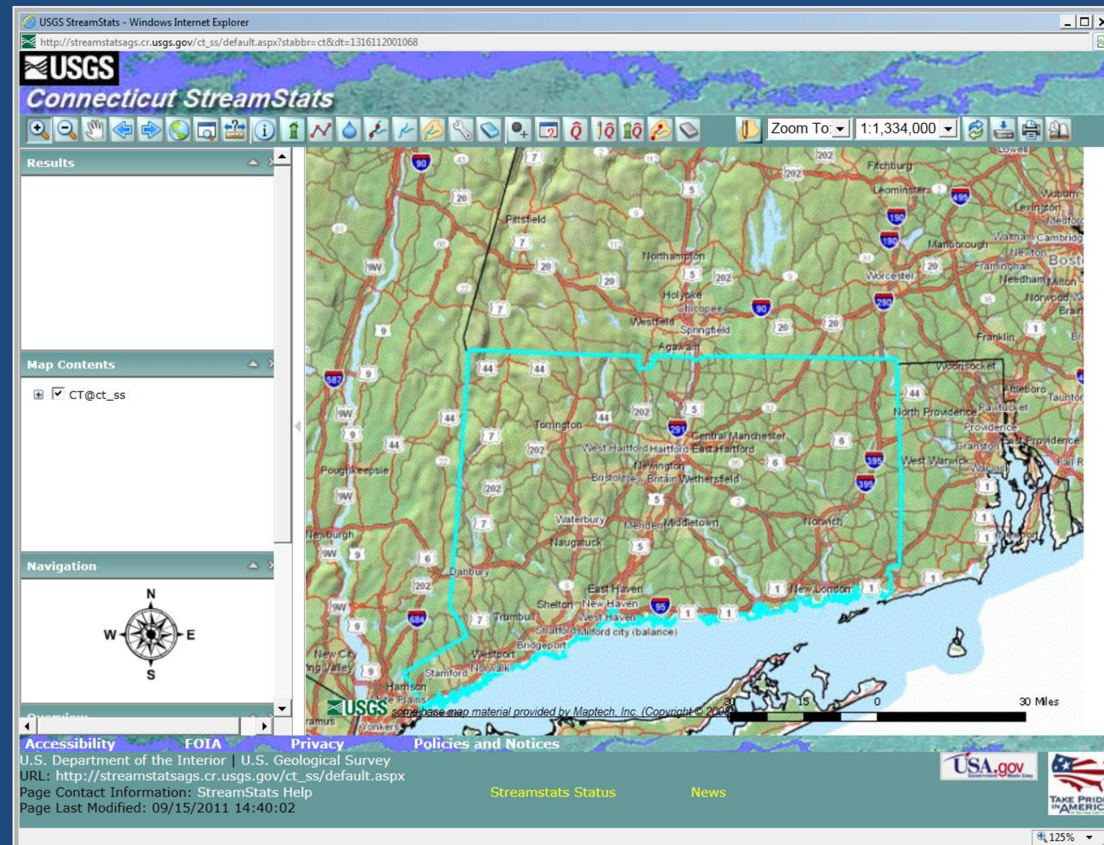
3. **Biological Condition Gradient** as Unifying Theme

Natural Variation in Stream Flow



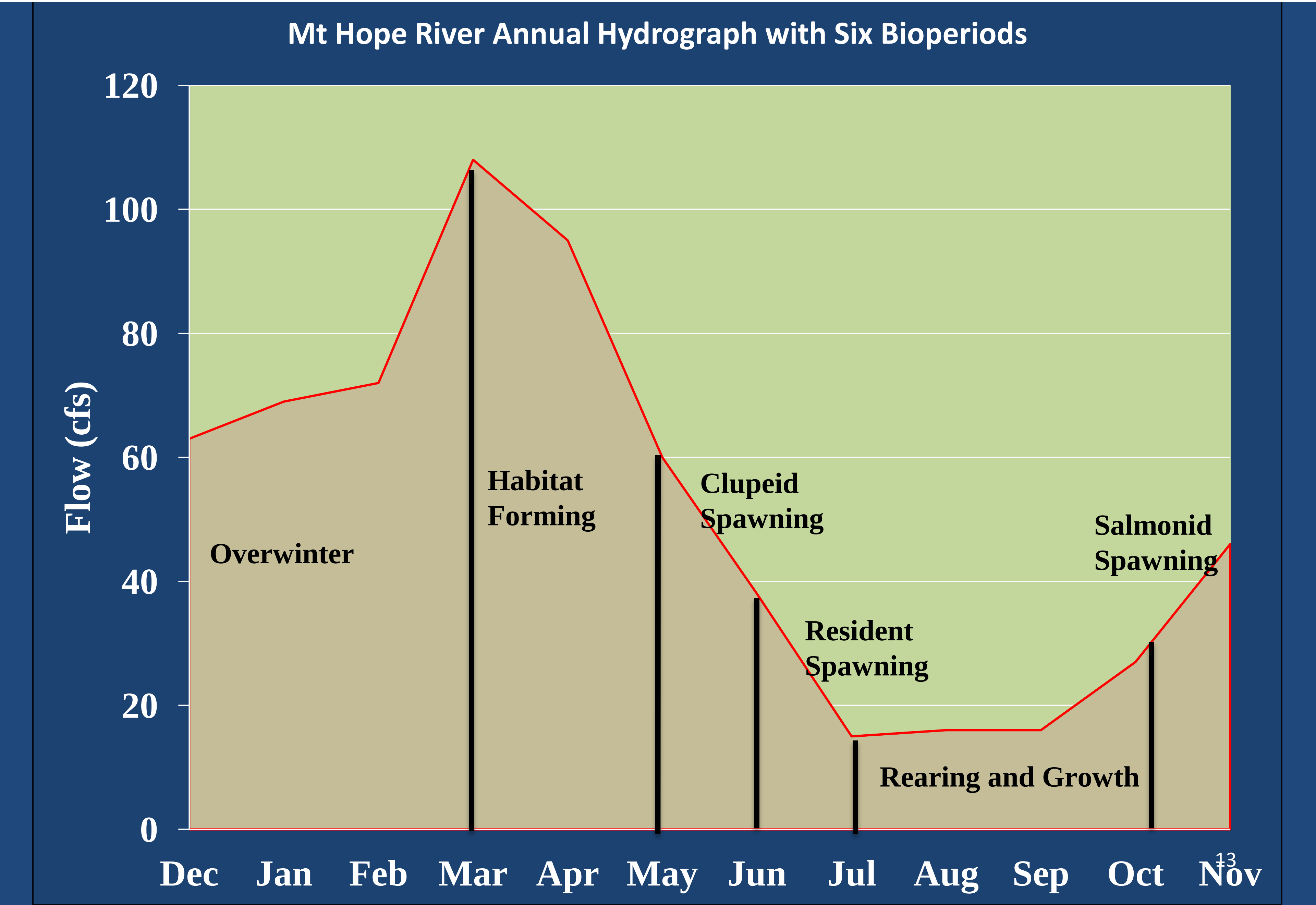
StreamStats





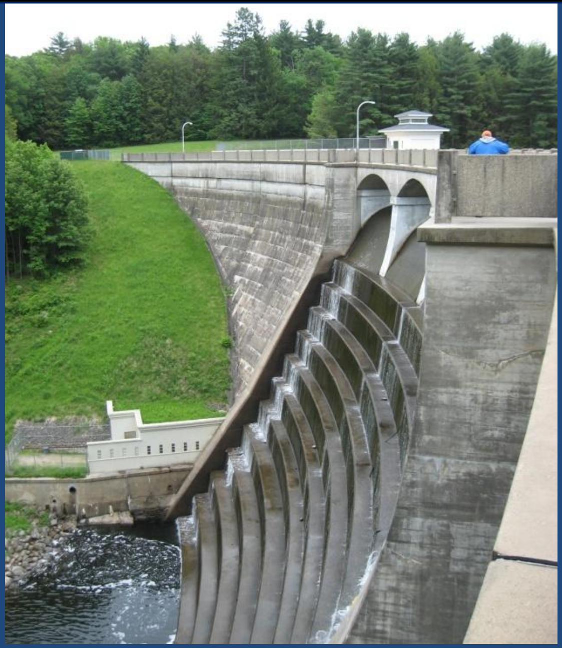
USGS StreamStats Website
http://water.usgs.gov/osw/streamstats/connecticut.html

Example of Natural Hydrograph



Diversions that Impact Streamflow

Dam Release Rule

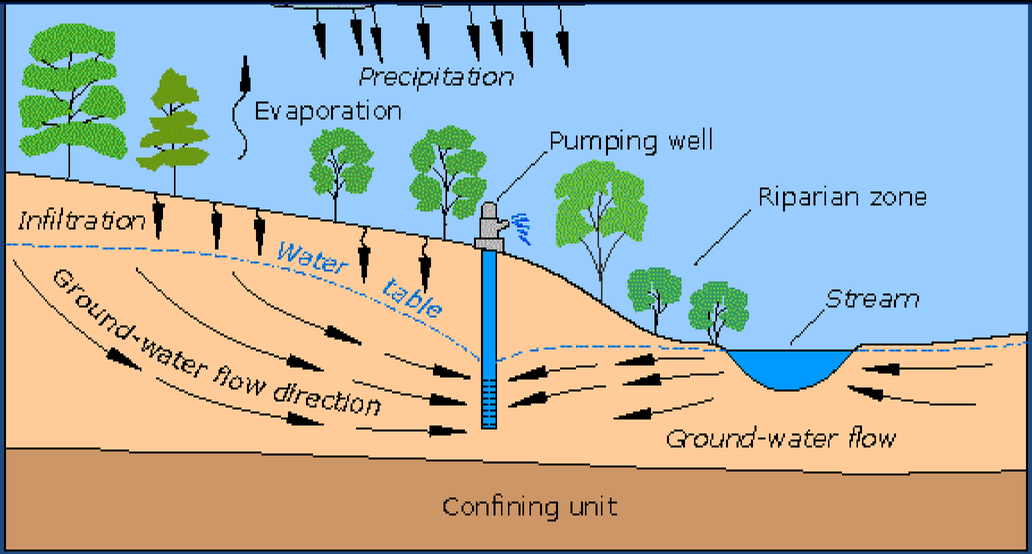


Source - DEP

Two major ways we influence flow in rivers and streams – dams with storage and other withdrawals (wells, pumps, siphons, channels, water intake etc)

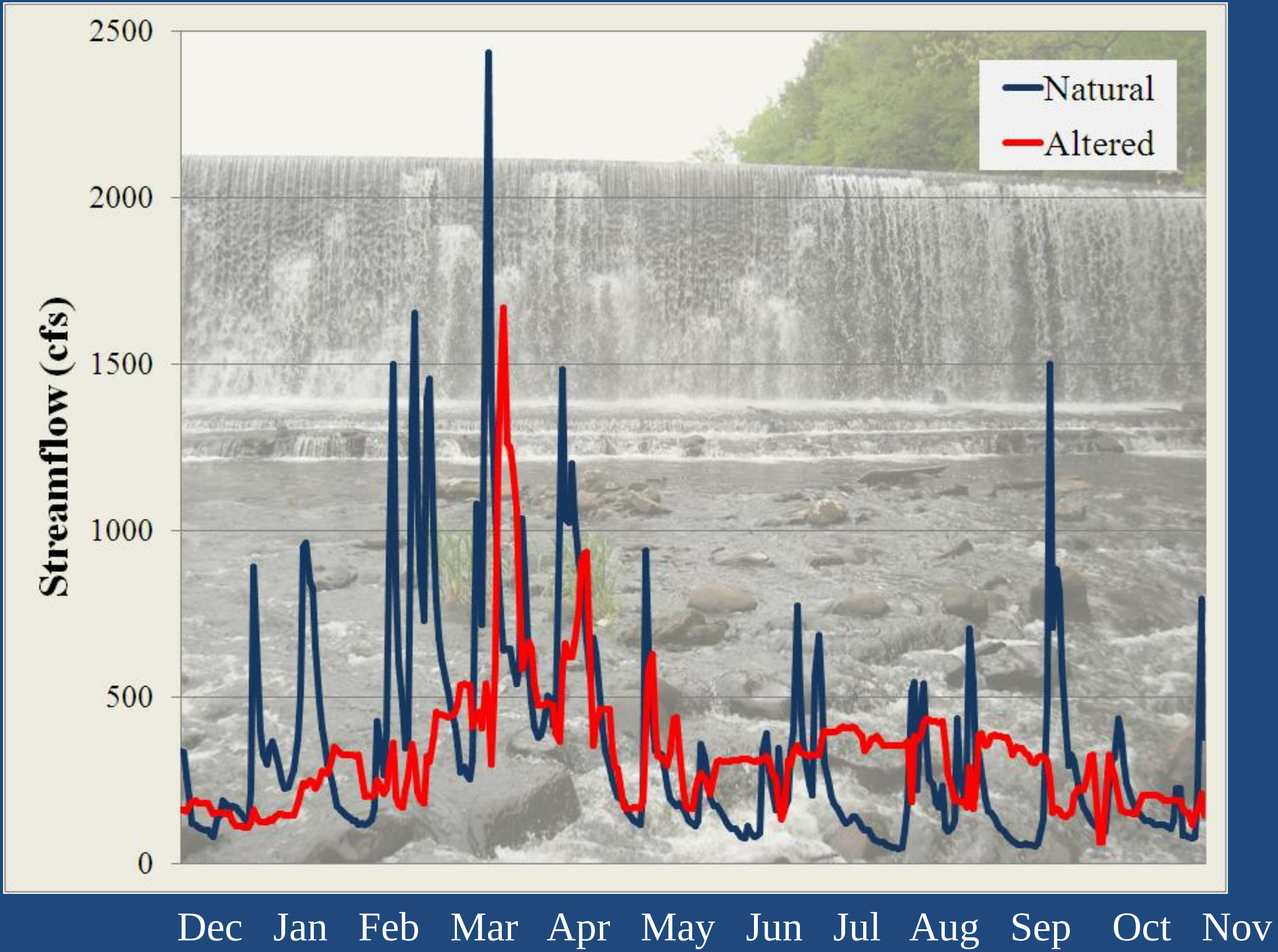
Each requires a different approach - degree of variation from natural flow is class dependent

Other Structure

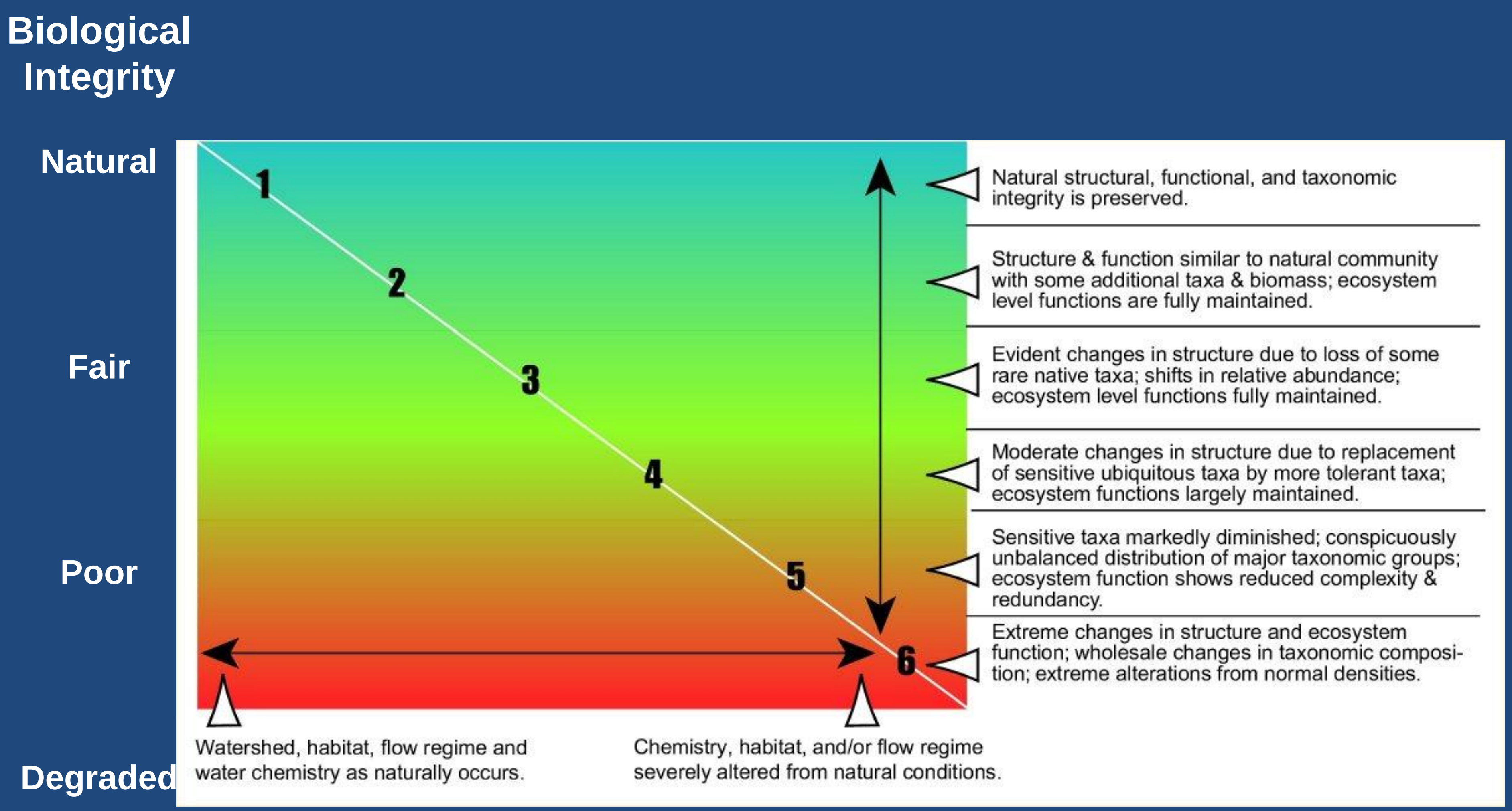


Source - USGS

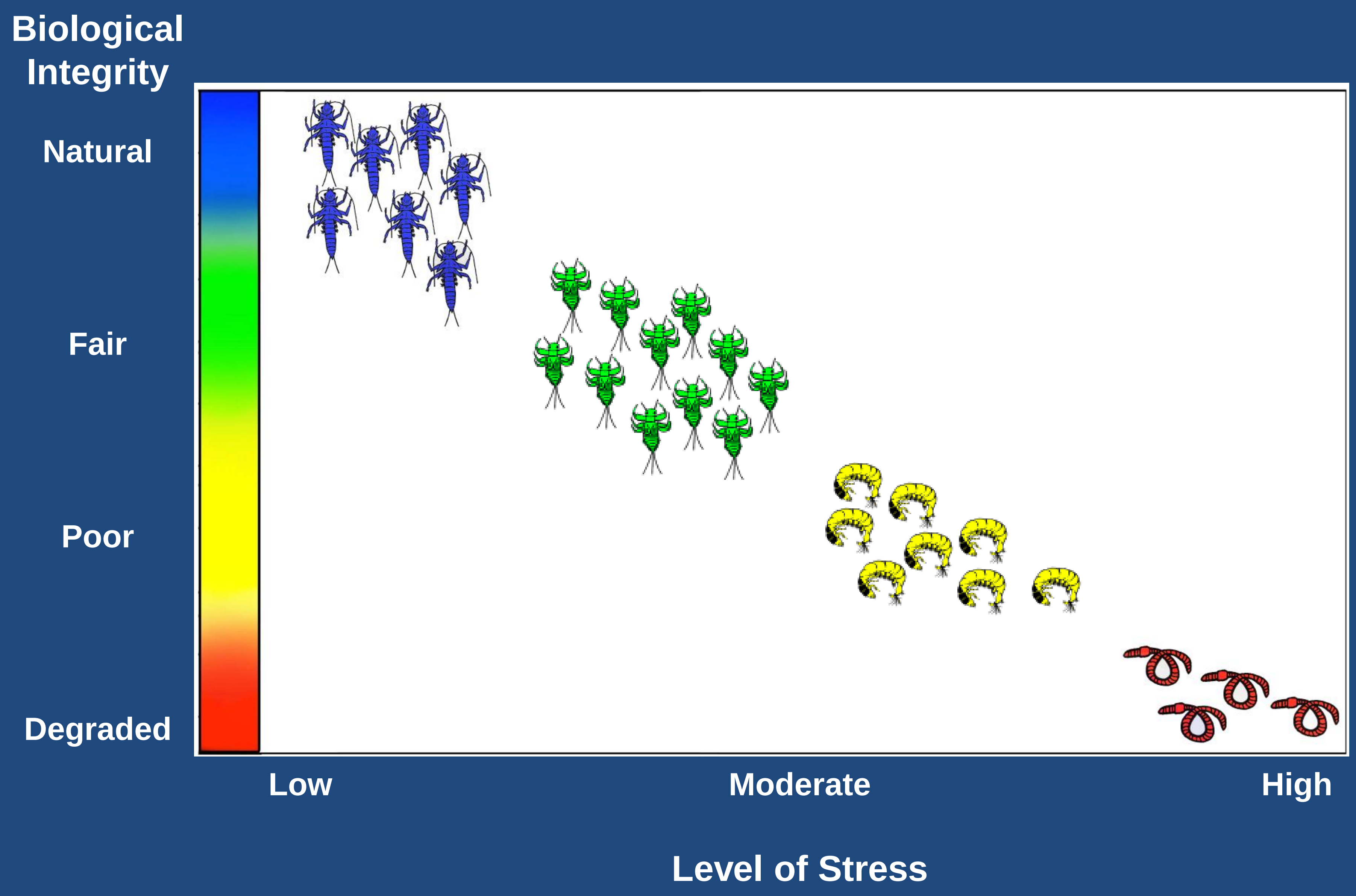
Humans Alter the Natural Hydrograph



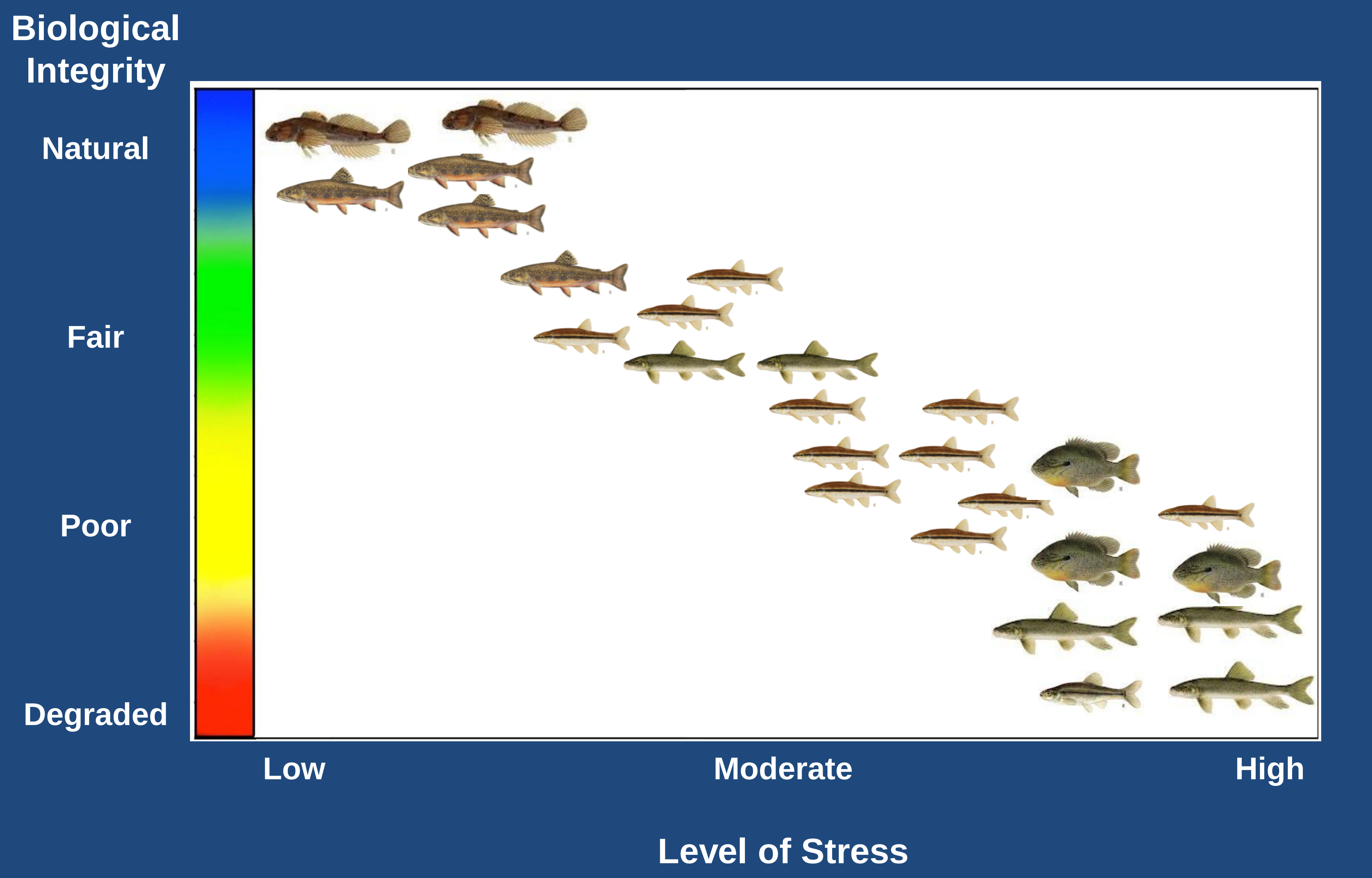
Biological Condition Gradient



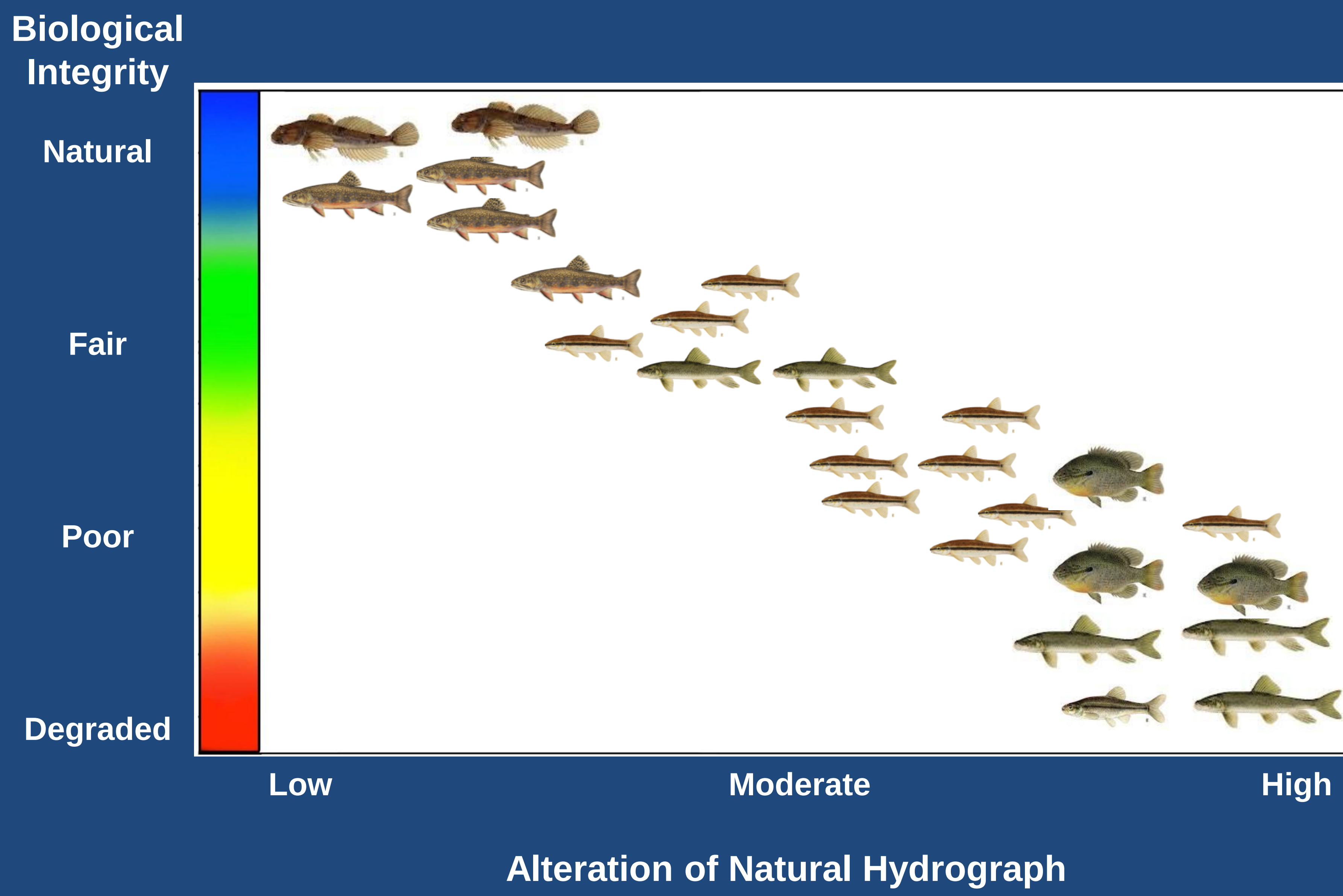
Biological Condition Gradient



Biological Condition Gradient



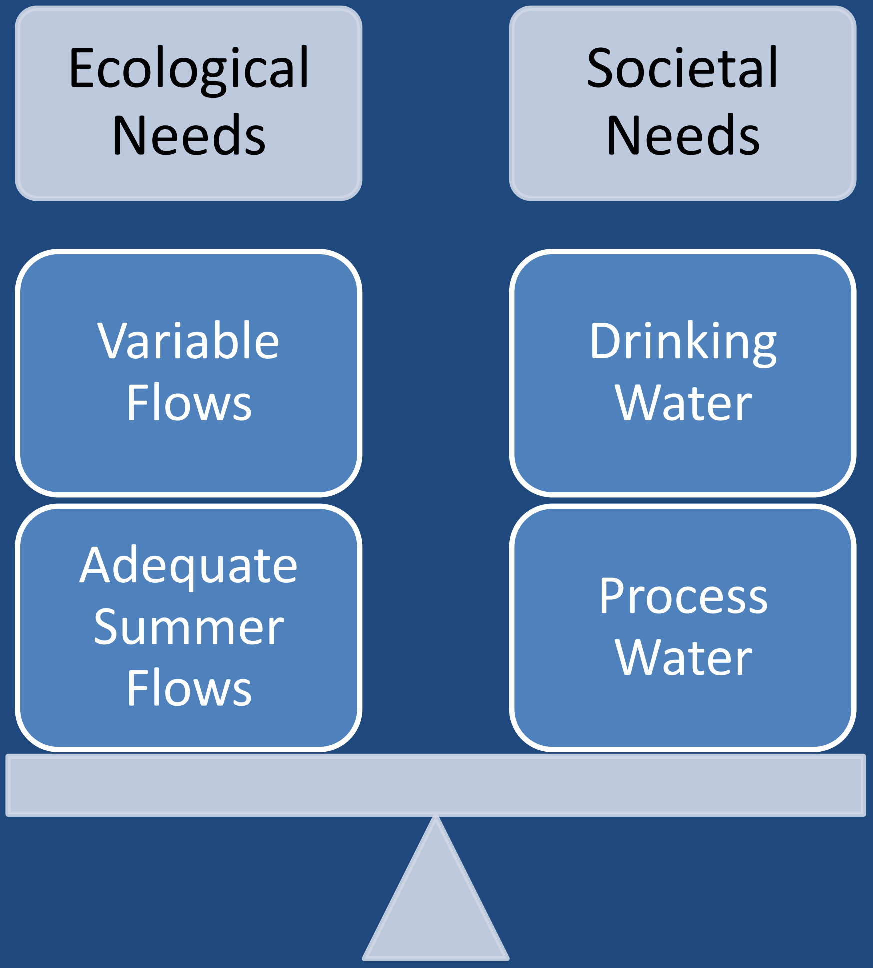
Biological Condition Gradient



Integrating the Information

- Not all streams and rivers in the state are the same
- Not possible to take everything back to pristine
- Need variability to incorporate seasonal flow patterns and bioperiods with human needs
- Challenge is to define:
  - Who needs to comply
  - What is needed where
  - When
    - variability needed
    - full compliance

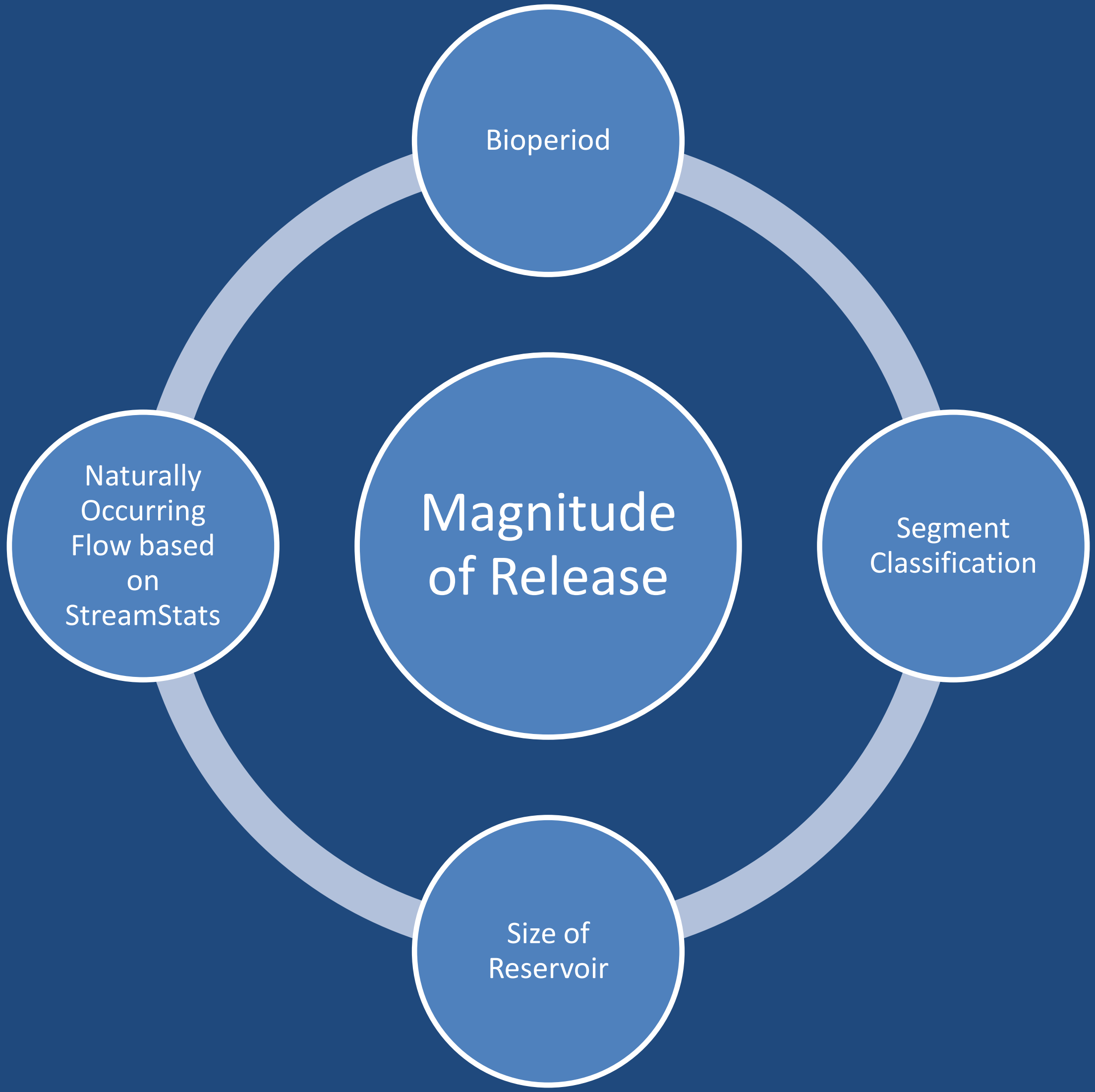
Challenge is to Balance:



What is Regulated?

- Downstream releases from dams with an authorized consumptive diversion behind the dam

What is Release Requirement?

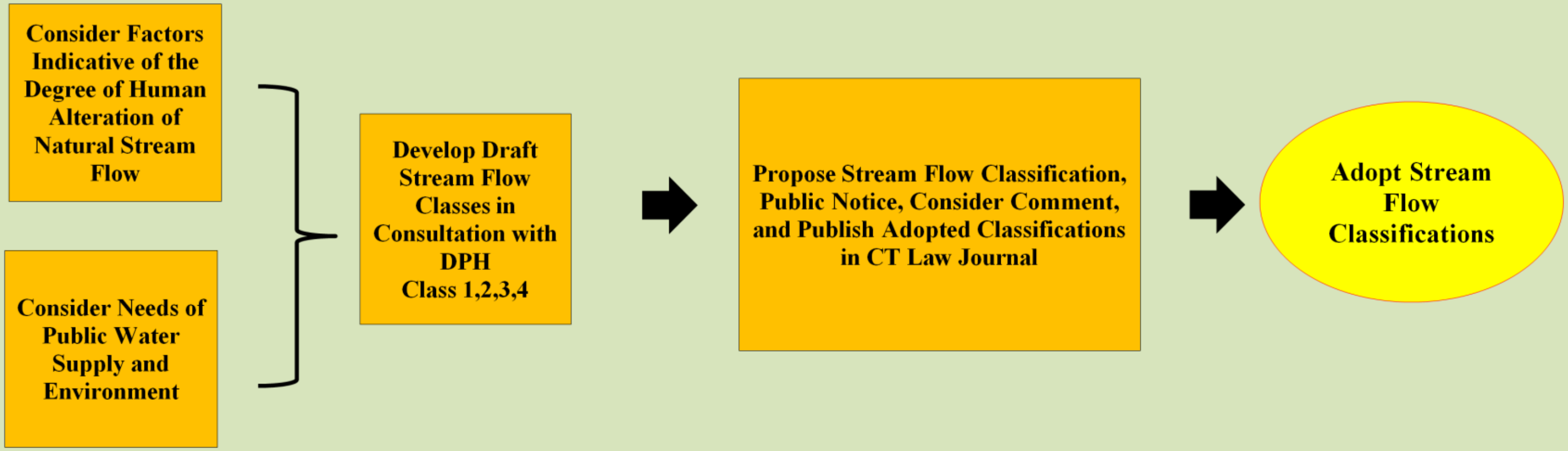


Framework of the Regulations

- Title
- Definitions
- Applicability
- Narrative standards
- Adoption of stream system classifications
- Release requirements
- Record keeping and reporting
- Conflict and severance

Adopted Stream Flow Regulations - December 2011

Stream Flow Classification Process *



* any classification changes or petition to change follows a simlar public process

Compliance 10 Years Post Classification

Full Release

Class 1 - Free-flowing
Class 2 - Release 75% of Natural Inflow
Class 3 - Release According to Rule Below:

Bioperiod	Effective Dates	Minimum Required Release	
		Antecedent Period Dry	Antecedent Period Wet
Overwinter	Dec 1- Feb 28/29	Bioperiod Q99	
Habitat Forming	Mar 1 – Apr 30	Bioperiod Q99	
Clupeid Spawning	May 1 – May 31	Bioperiod Q95	
Resident Spawning	June 1 – June 30	Bioperiod Q90	
Rearing and Growth	July 1- Oct 31	Bioperiod Q80	Bioperiod Q50
Salmonid Spawning	Nov 1 – Nov 30	Bioperiod Q90	

Class 4 - Class 4 Narrative Streamflow Standards with goal of Class 3 to maximum extent practicable through approved site specific release

Minimum Release Provisons

Dams with Watersheds < 3 square miles,
Reservoirs in Series,
Reservoirs with Usable Storage < 100 MG

Release Rearing and Growth Bioperiod Q80 or Natural Inflow, whichever is less

Special Compliance Provisions

Spring Storage Preservation,
Can Reduce Releases Consistent with Water Supply Plan Triggers under Drought Conditions,
Maintaining Margin Of Safety

At no time shall Release be less than Rearing and Growth Bioperiod Q80 or Natural Inflow, whichever is less

Other Options

Short-term Variance Procedures, Site Specific Release including Class 4

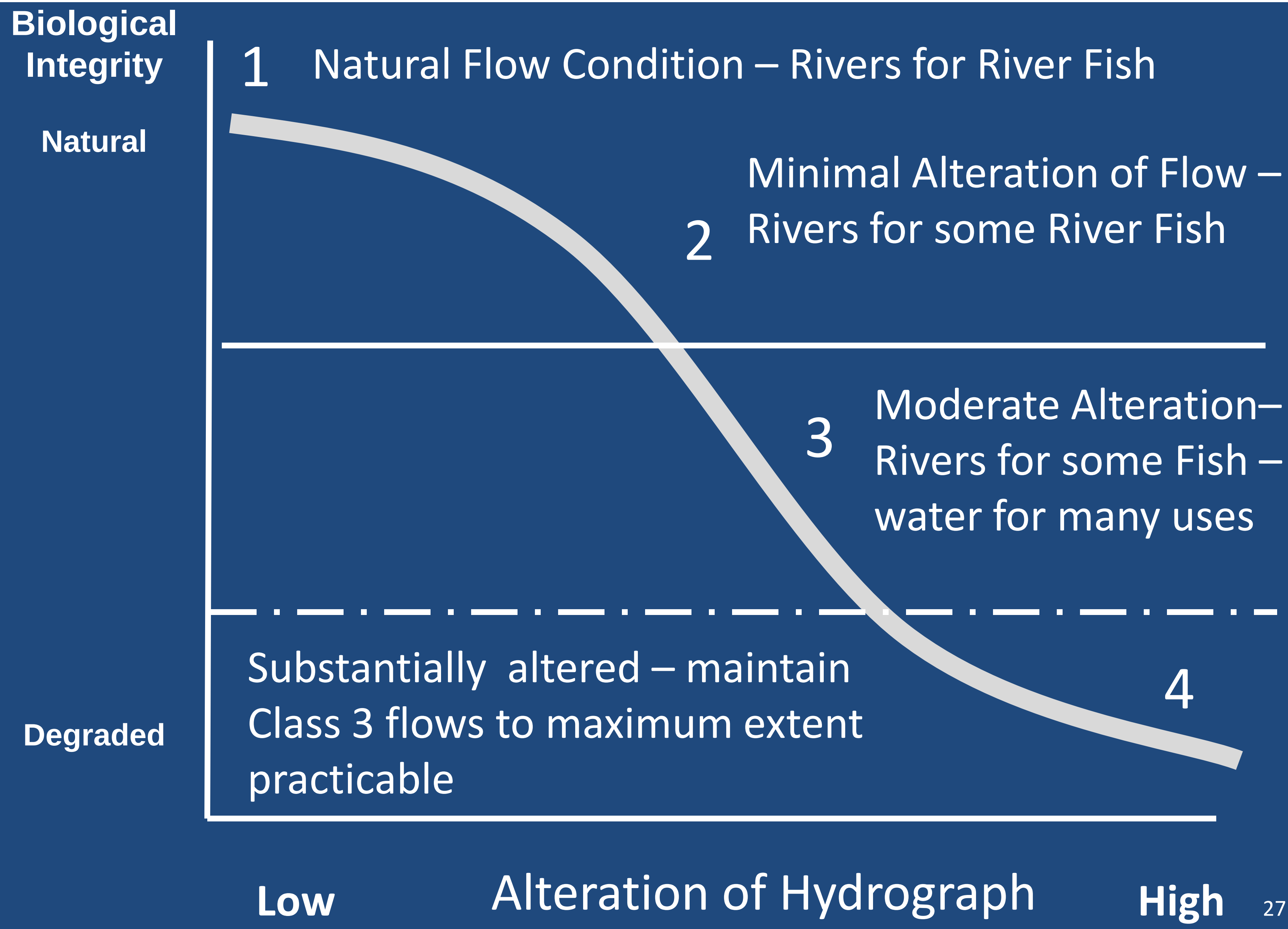
Exemptions
(some subject to conditions)

Include Hydropower under FERC, Large Tidal Rivers, Dams without Consumptive Diversions, Permitted Diversions, Public Safety Withdrawals, Diversions for Agriculture and Golf Courses, Flood Control Dams, others

Key Points Regarding Applicability

- If release required under 1979 regulations – must continue until new release required
- Exemptions
  - Permitted diversions
  - FERC regulated dams
  - Flood control dams
  - Recreational impoundments
  - Dams discharging to tidal rivers
  - Dams with small watersheds and/or naturally small flows

Narrative Stream Flow Standards



Procedures to Classify Waters

Consider Factors Indicative of the Degree of Human Alteration of Natural Stream Flow

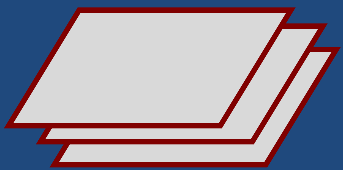
Consider Needs of Public Water Supply and Environment

Develop Draft Stream Flow Classes in Consultation with DPH Class 1,2,3,4

Propose Stream Flow Classification, Public Notice, Consider Comment, and Publish Adopted Classifications in CT Law Journal

Adopt Stream Flow Classifications

GIS Data Layers

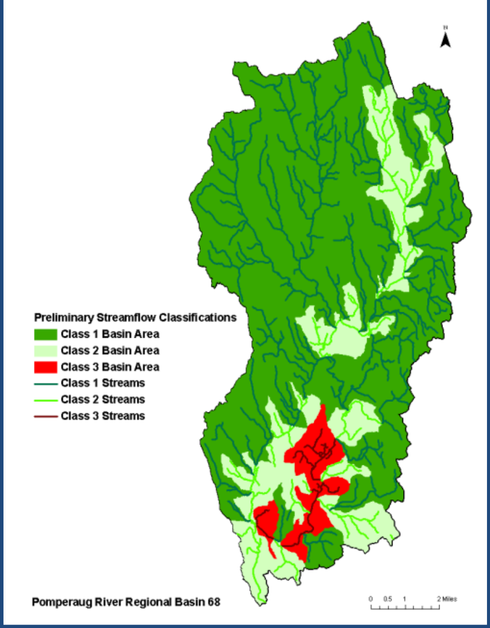


- Diversions
- Dams
- Impervious Cover
- Return Flow
- Unique Factors

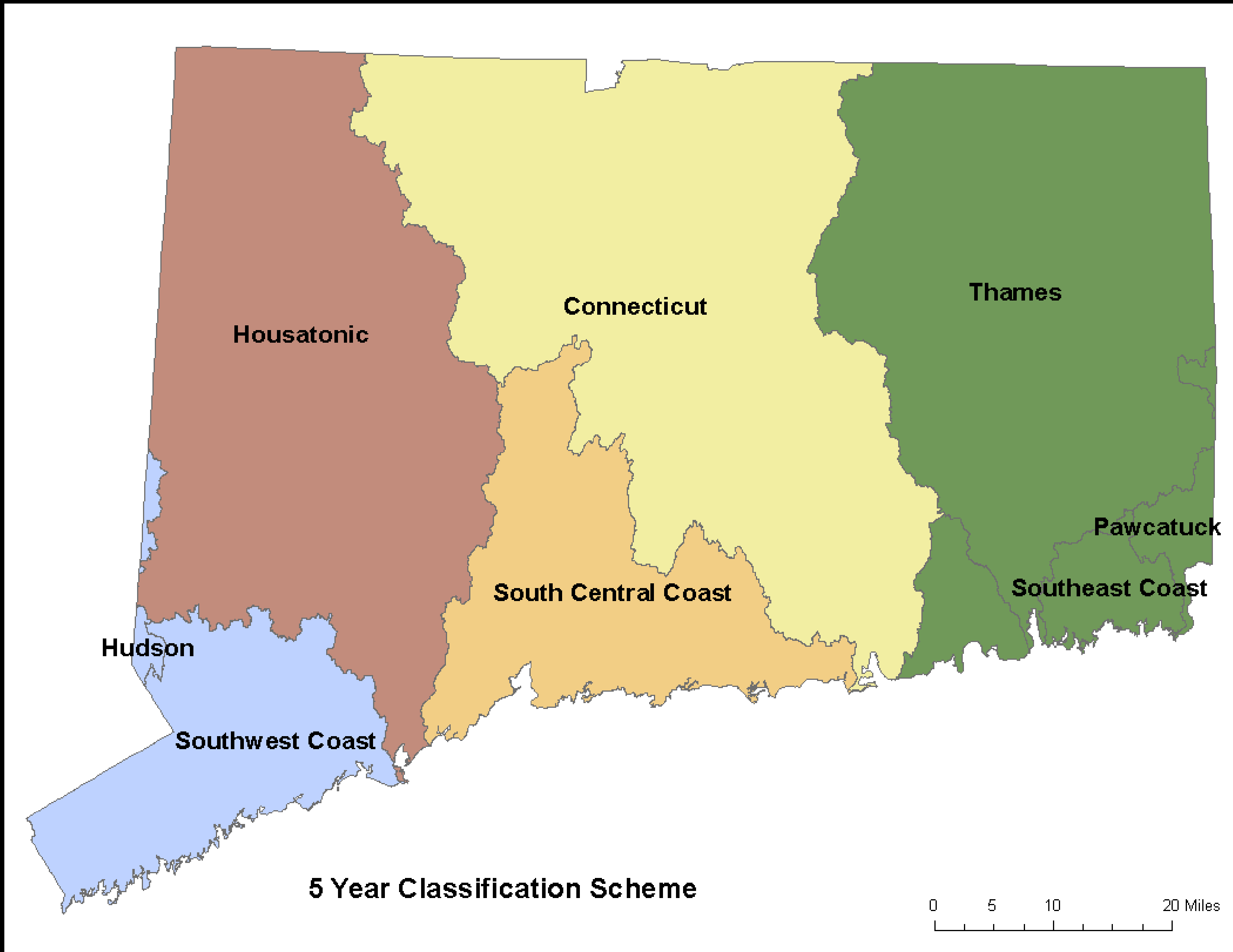
- Water Supply MOS
- Wild and Scenic Rivers
- Anadromous fish, and other plants and animals and others

Public Process

Stream Flow Classes



Procedures to Classify Waters



Implementation Timeframe

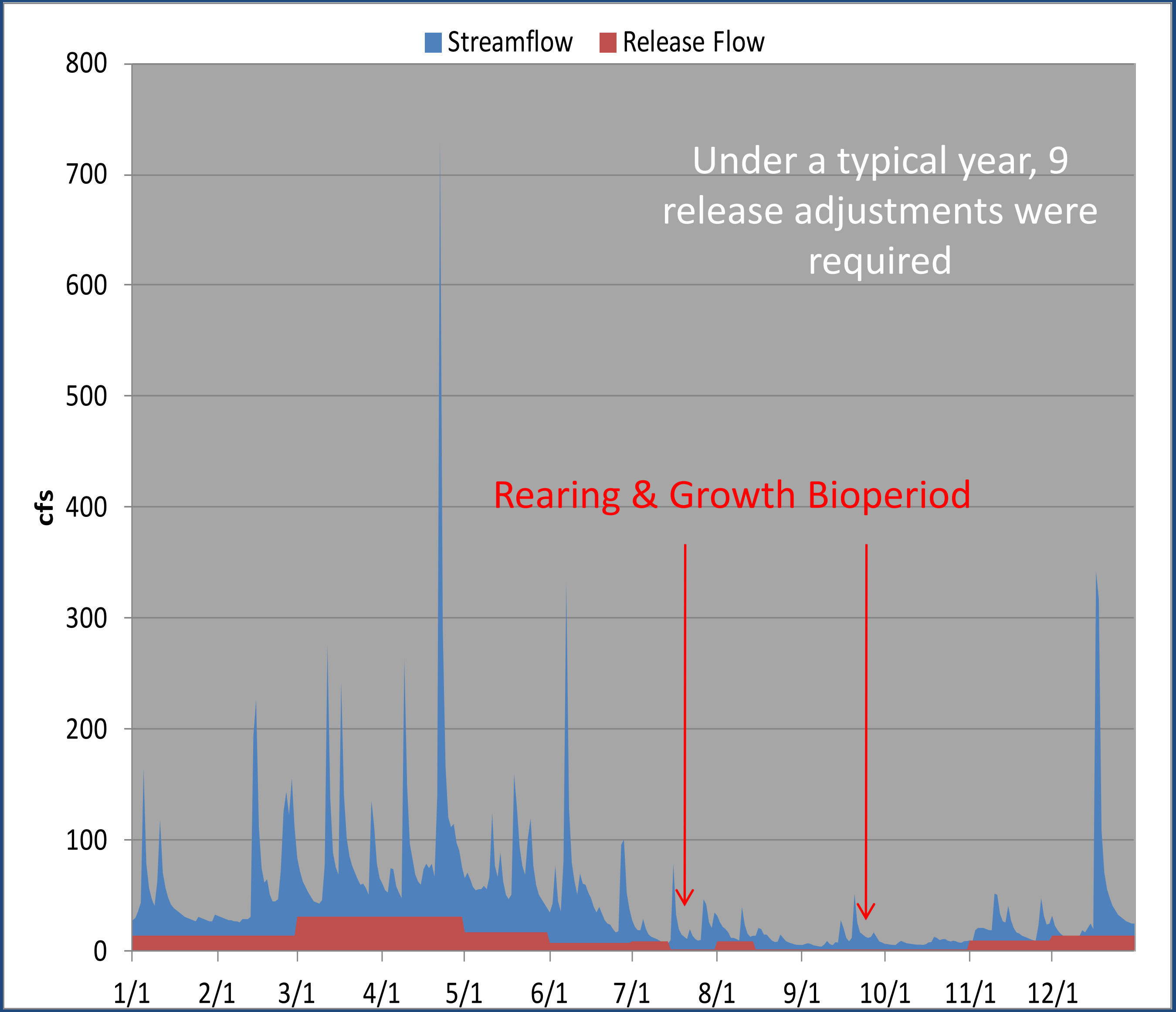
Basic Class 3 Release Rule

Multi Release Rule

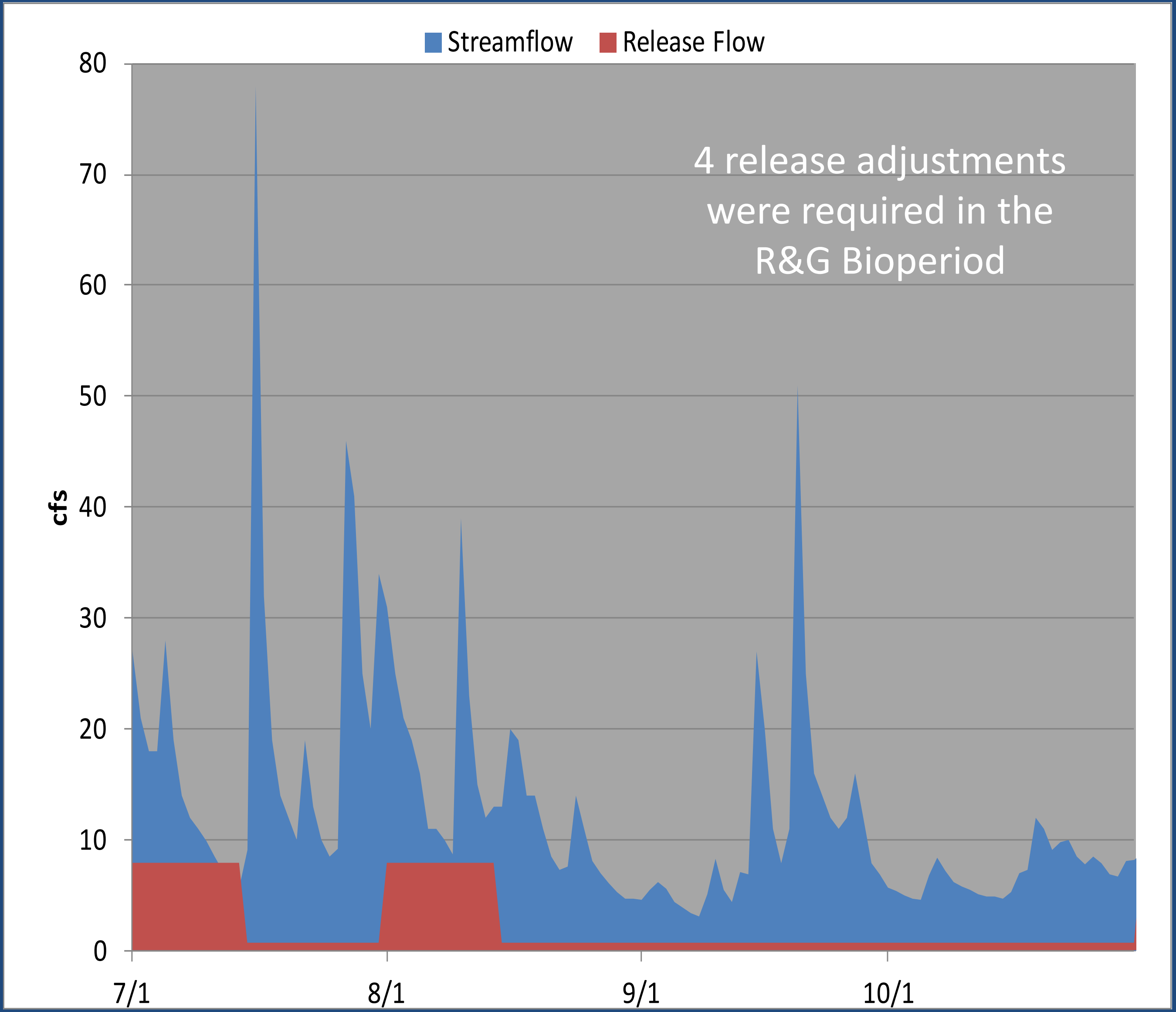
Bioperiod	Effective Dates	Minimum Required Release	
		Antecedent Period Dry	Antecedent Period Wet
Overwinter	Dec 1- Feb 28/29	Bioperiod Q99*	
Habitat Forming	Mar 1 – Apr 30	Bioperiod Q99	
Clupeid Spawning	May 1 – May 31	Bioperiod Q95	
Resident Spawning	June 1 – June 30	Bioperiod Q90	
Rearing and Growth	July 1- Oct 31	Bioperiod Q80	Bioperiod Q50
Salmonid Spawning	Nov 1 – Nov 30	Bioperiod Q90	

* Established by Stream Stats

Variable Release Rule



Rearing & Growth Bioperiod

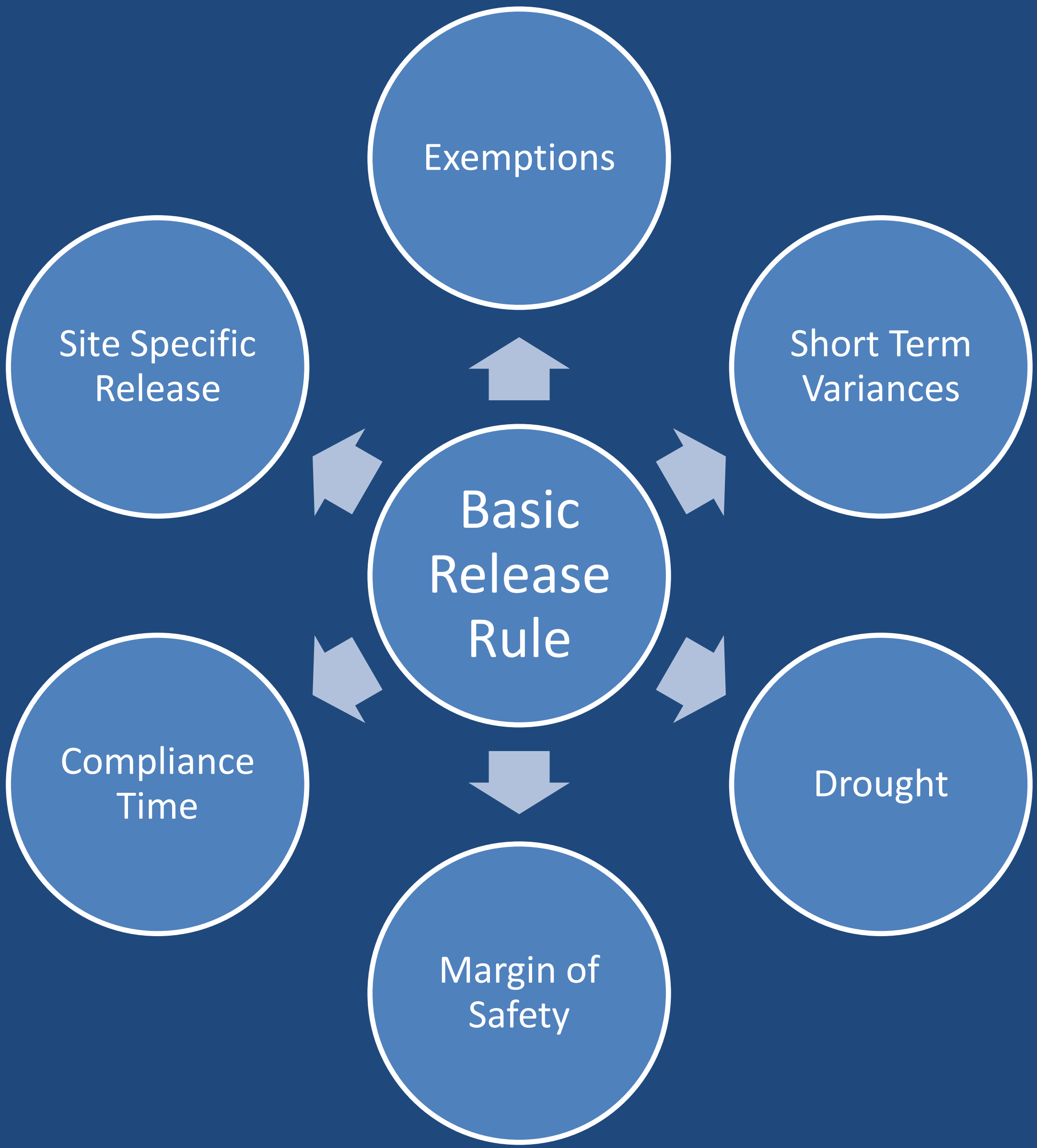


Key Tension Point

Full Releases

Adequate Water for Suppliers

Release Rule Off Ramps



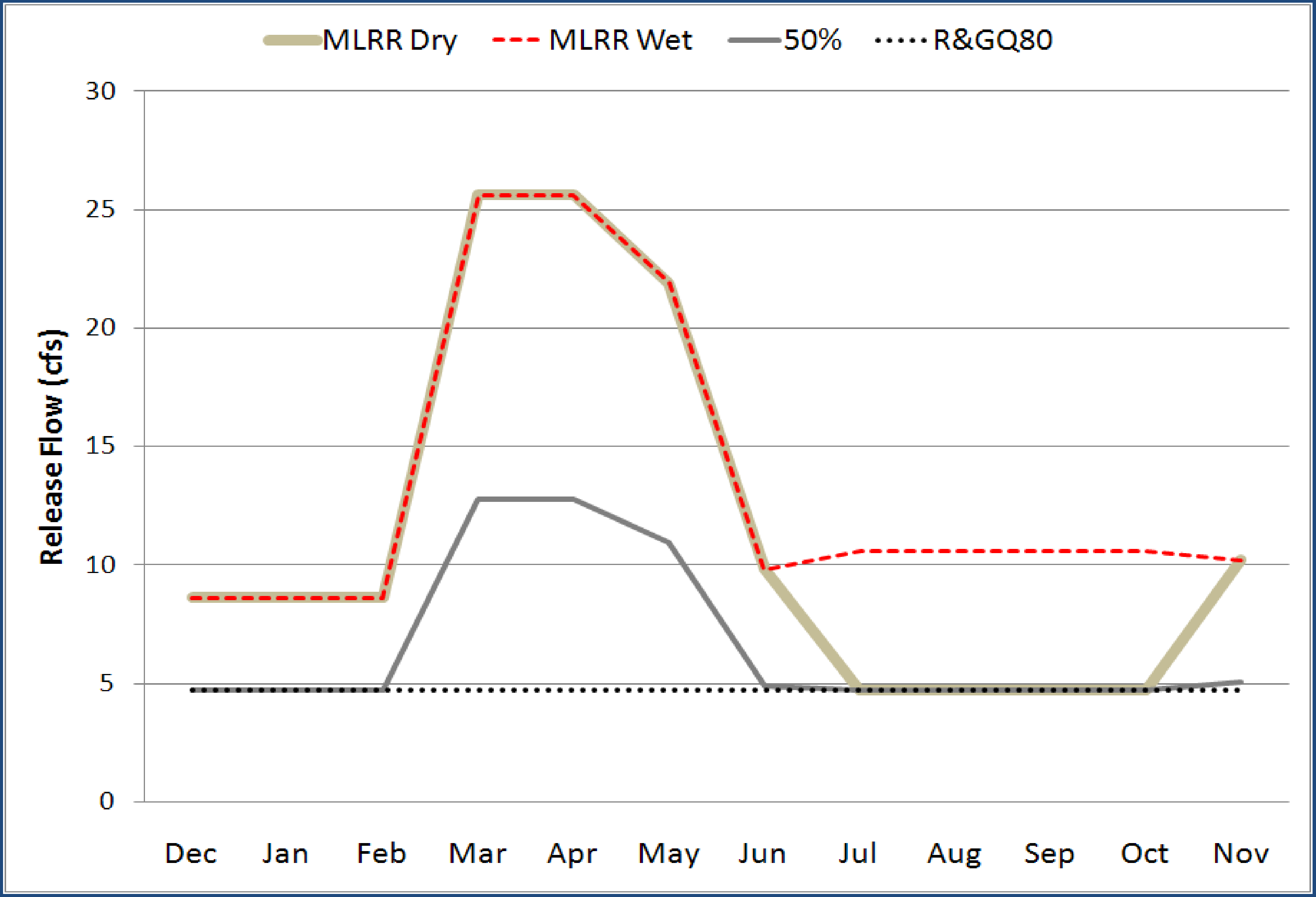
Reservoirs Subject to Multi Level Release Rule

Compliance Flexibility

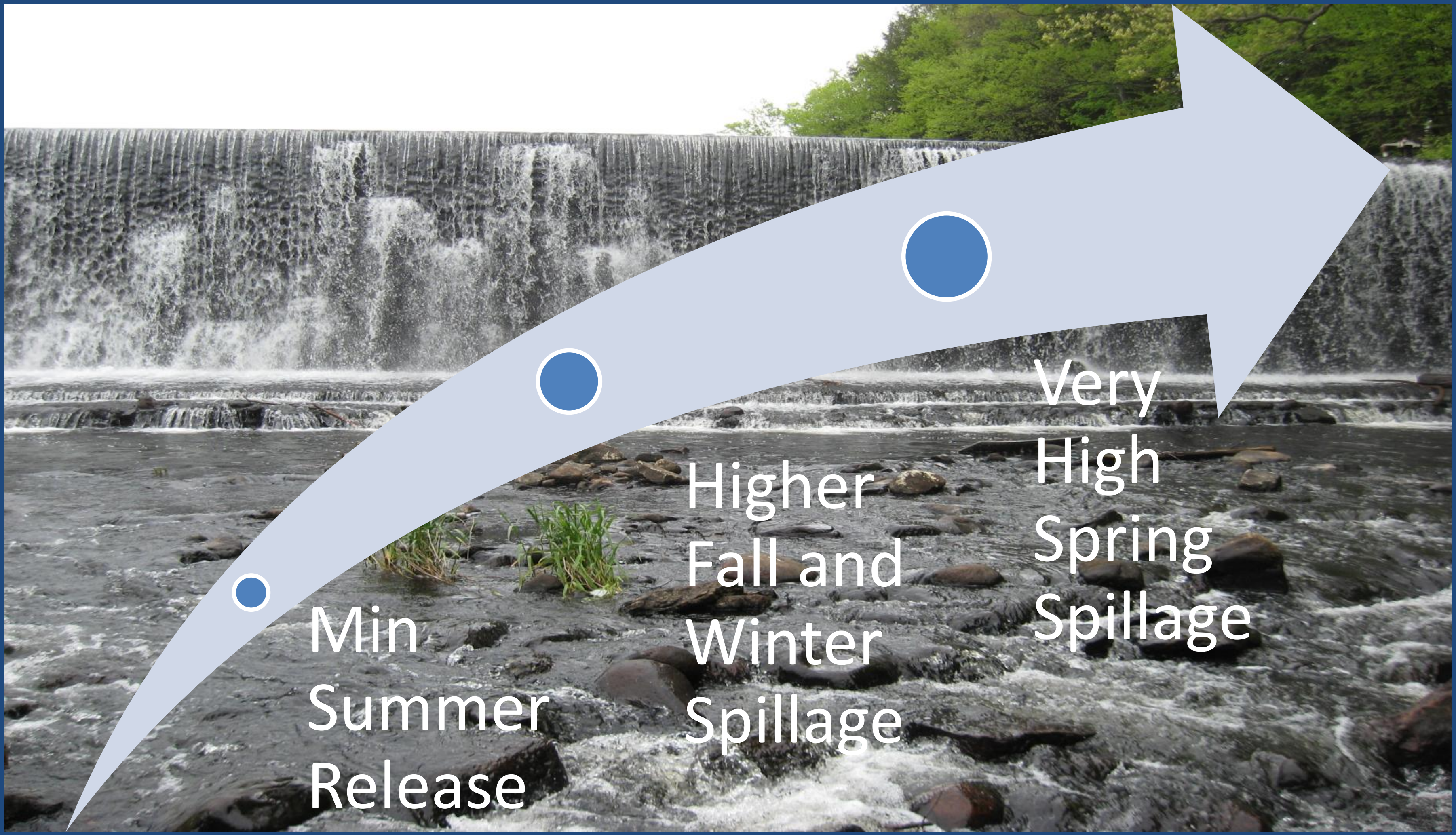
- Self Implementing Based on Ambient Condition
  - Reduce Spring Releases to 85 % to Preserve Storage
  - Drought Off Ramps
- Self Implementing
  - Reduce Release up to 50% * or as necessary to Preserve MOS **(For 10 years**)
- DEEP Approval
  - Reduce Release* up to 50% to Preserve MOS (For > 10 years)
  - Reduce Release > 50% to Preserve MOS

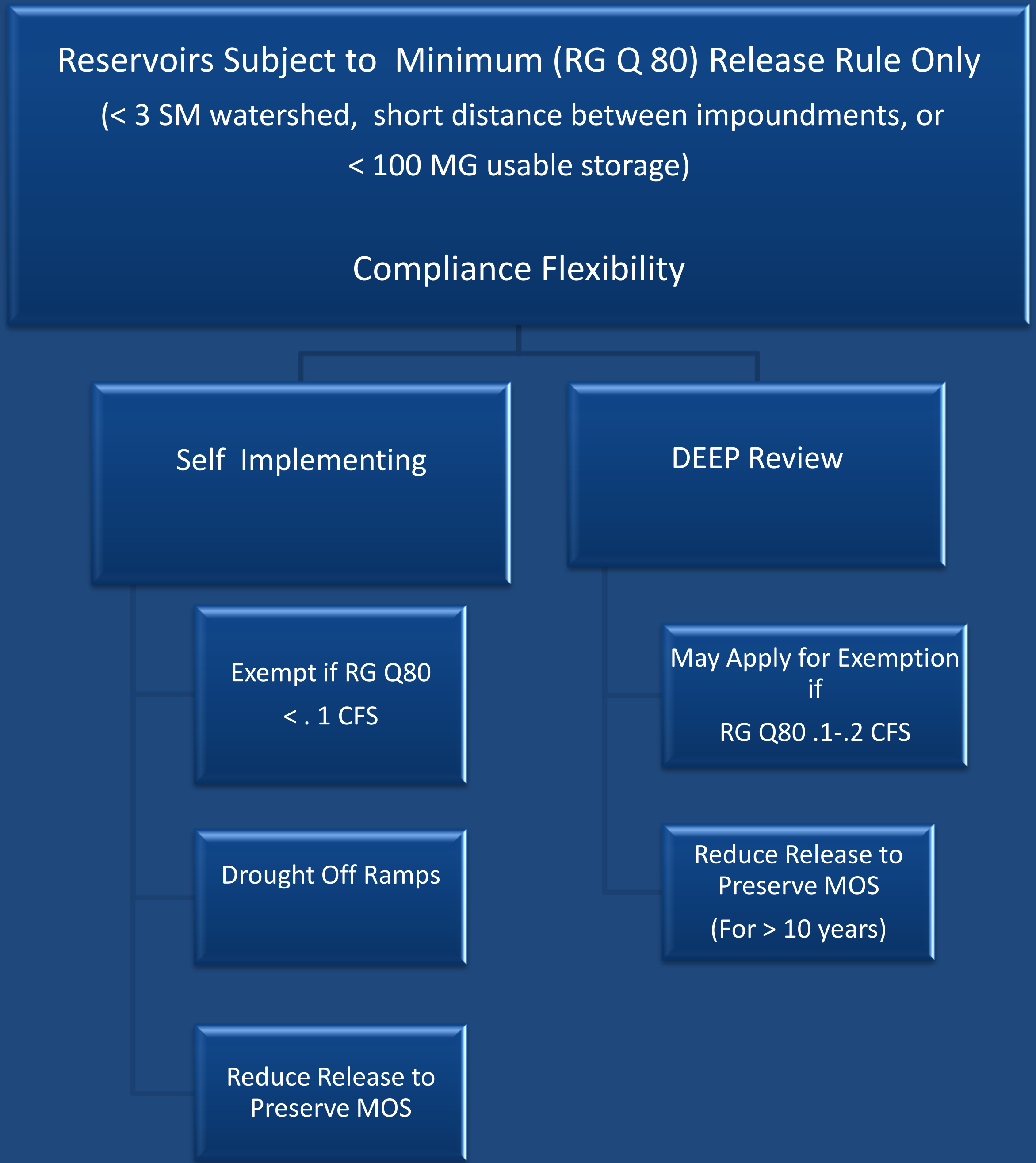
* Not less than RG Q80

•50% reduced releases to maintain adequate MOS

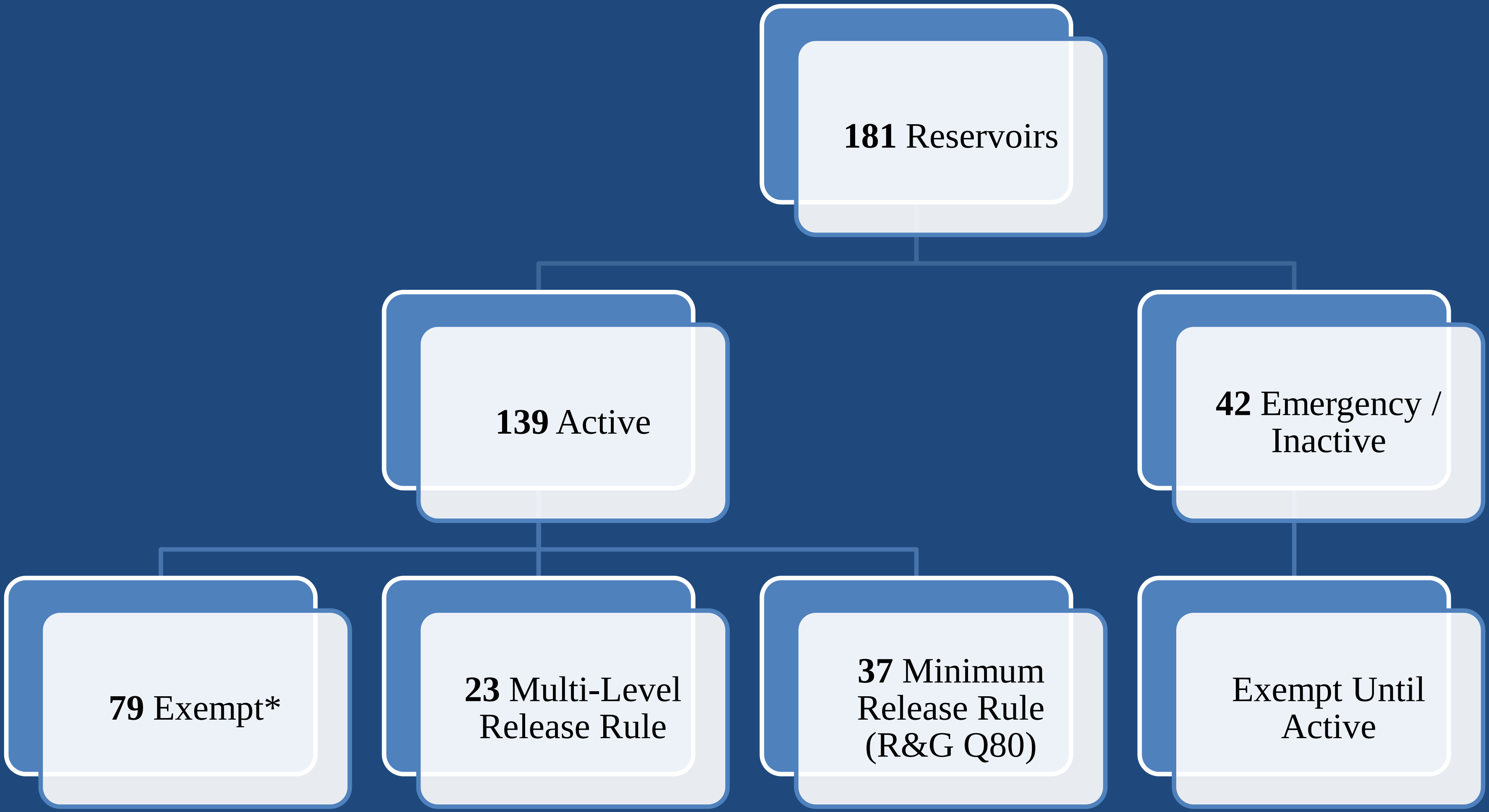


SMALL RESERVOIR FLOW VARABLITY




Reservoirs Subject to Minimum (RG Q 80) Release Rule Only
(< 3 SM watershed, short distance between impoundments, or
< 100 MG usable storage)
Compliance Flexibility
Self Implementing
DEEP Review
Exempt if RG Q80
< . 1 CFS
Drought Off Ramps
Reduce Release to Preserve MOS
May Apply for Exemption if
RG Q80 .1-.2 CFS
Reduce Release to Preserve MOS
(For > 10 years)

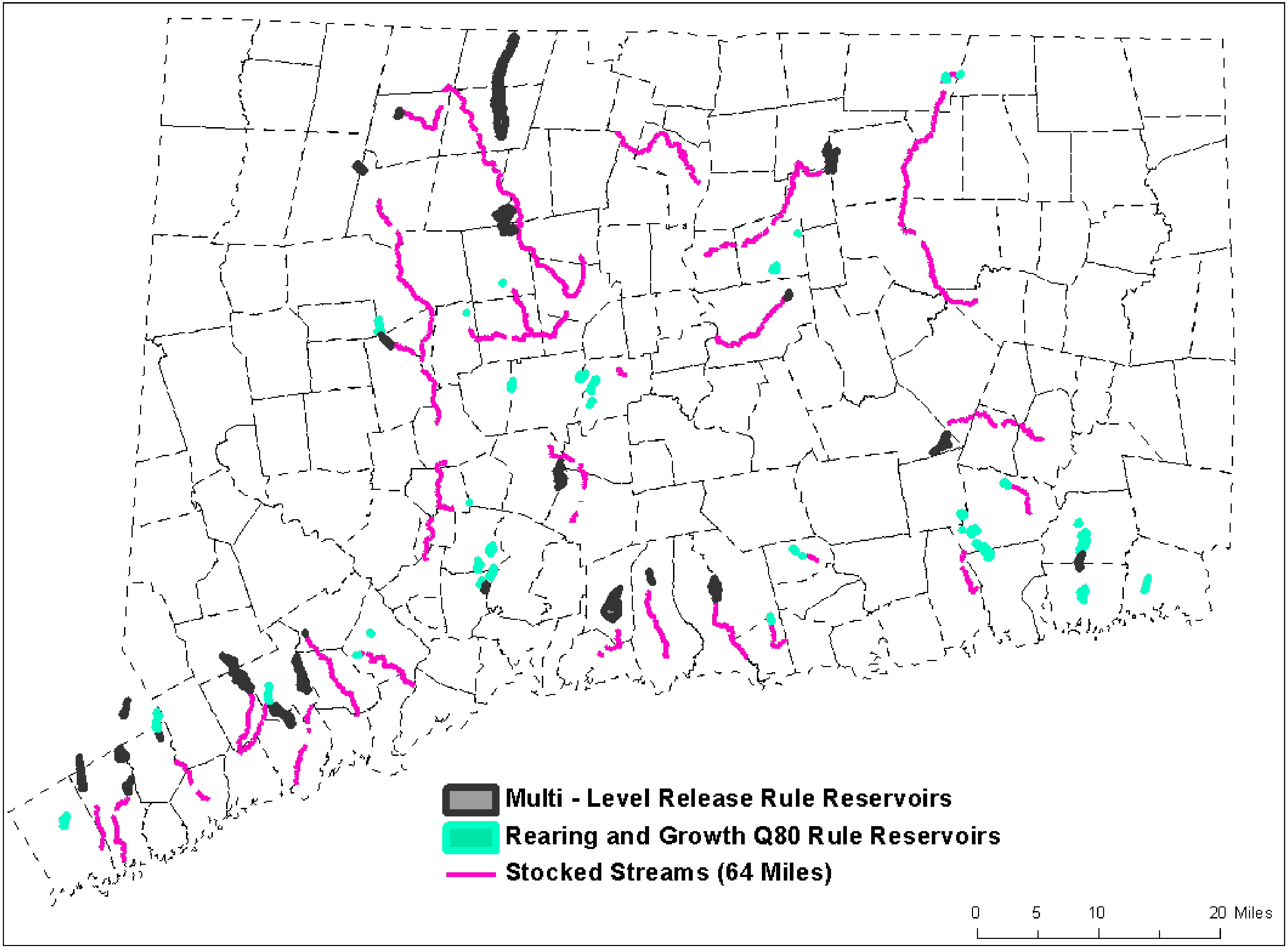
To the Best of Our Knowledge, the Stream flow Universe of Reservoirs



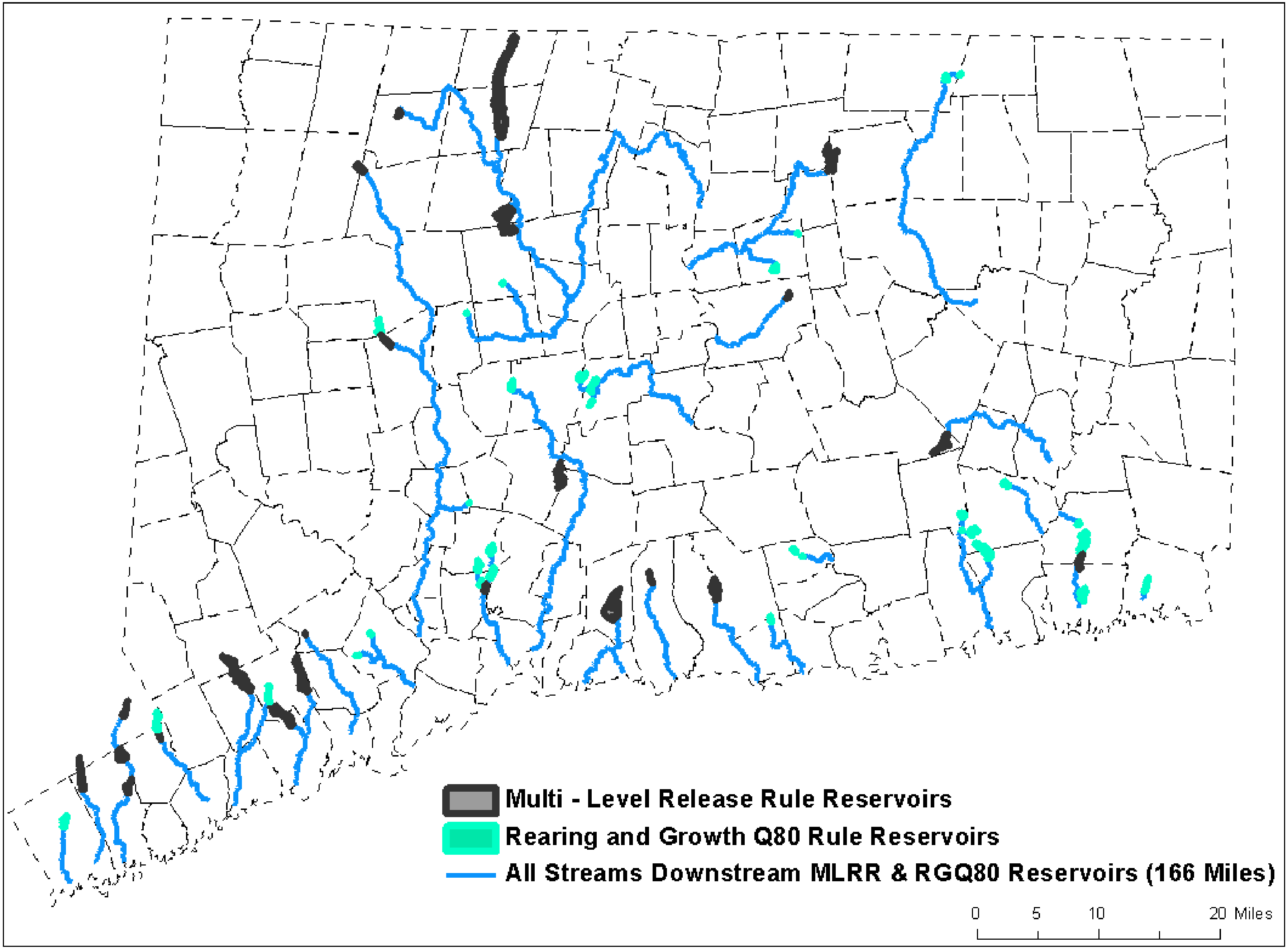
* Releases May Be Required for Permitted Reservoirs

Site Specific Release

- Option for Class 3
  - Needs to meet Class 3 Narrative Standard
  - Requires public notice
  - Commissioner Approval
- Required for Class 4
  - Best that can be accomplished toward Class 3 Narrative Standard



Multi - Level Release Rule Reservoirs
Rearing and Growth Q80 Rule Reservoirs
Stocked Streams (64 Miles)
0
5
10
20 Miles


Multi - Level Release Rule Reservoirs
Rearing and Growth Q80 Rule Reservoirs
All Streams Downstream MLRR & RGQ80 Reservoirs (166 Miles)
0 5 10 20 Miles

Reporting Requirements for Owners– Clock Starts at Classification

- At one year – provide basic information
- At nine years – methods and locations for calculating releases and demonstrating compliance
- At ten years and forward – maintain operating logs and report when requested

The Balance of a Public Trust Resource

A Step Towards Sustainable Stream Flow

- Balances Both Environmental & Human Needs
- Statewide Flow Classification System
- Provides Public Processes
- Considers Existing & Future Water Needs
- Provides Predictable “Blueprint” For Future Water Availability