



Stony Brook Streamflow Restoration Project

A Case Study of Coordinated Management of Shared Water Resources

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- Management of passive infrastructure such as small dams is often based on rough estimates and professional judgement of system response.





- Poor management can lead to unintended downstream (or upstream) consequences.



Low Flow ([Image Credit](#))

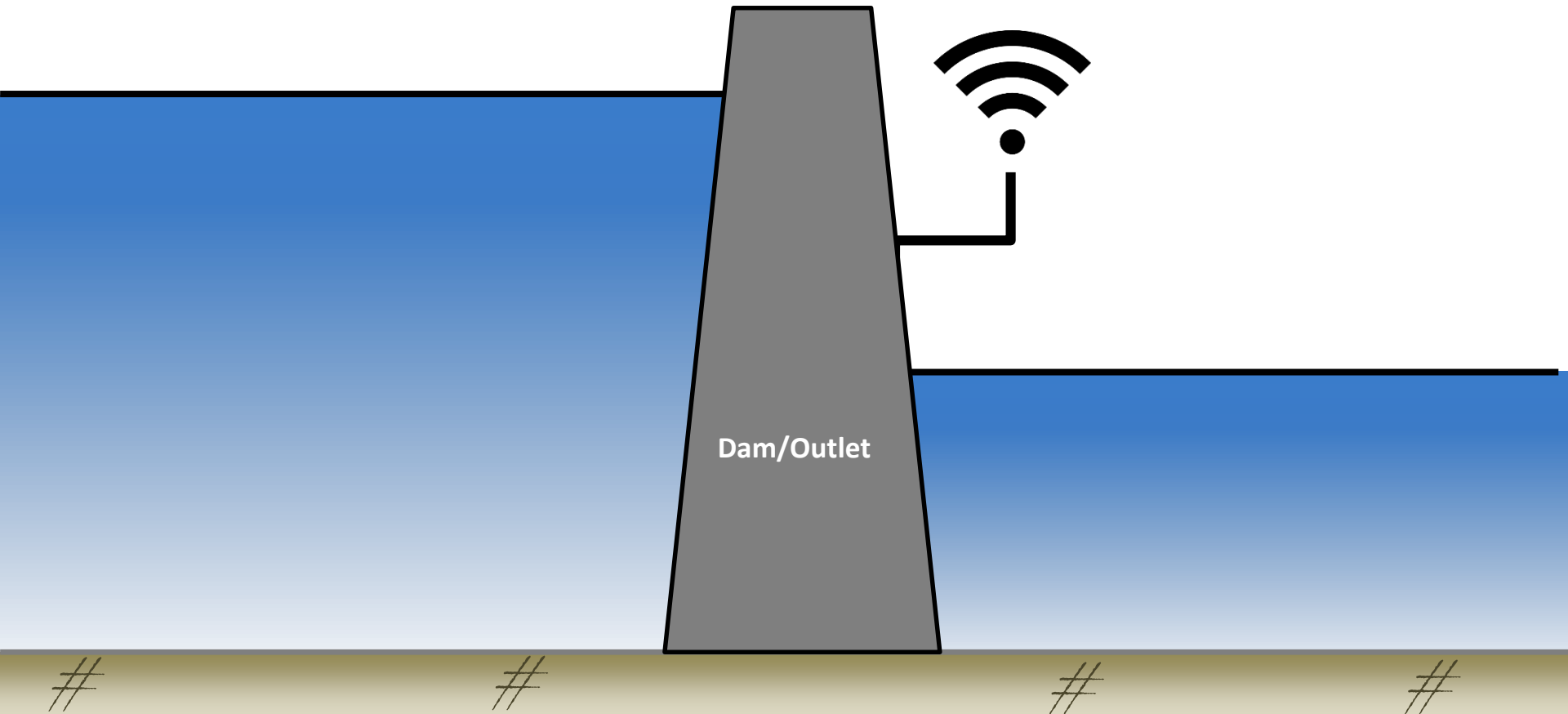


Bank Erosion ([Image Credit](#))

DAM Dashboard Concept



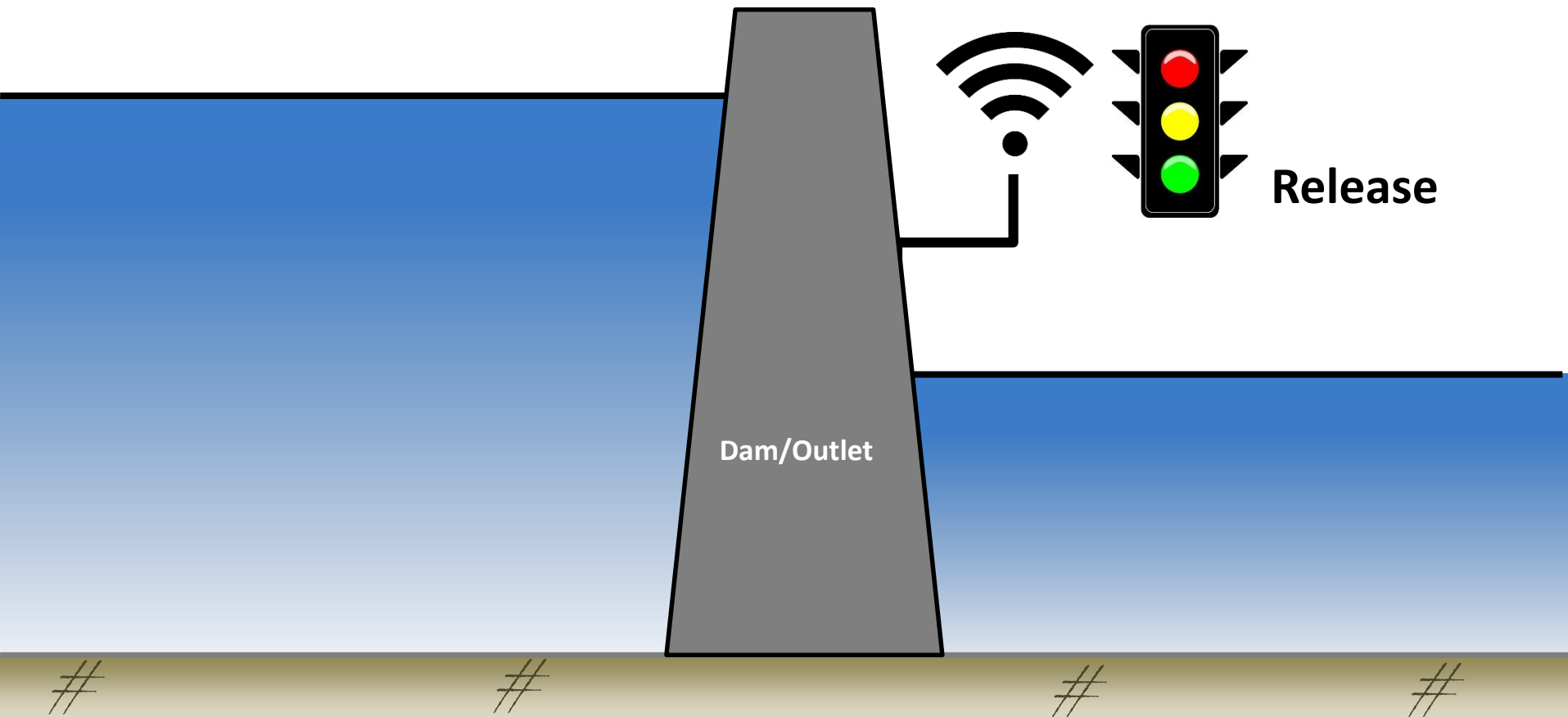
- DAM Dashboard establishes an information network for dams and other infrastructure.



DAM Dashboard Concept



- DAM Dashboard combines monitoring data and forecasts to recommend management actions





- **DAM Dashboard Goal:** Improve management through informed decision making

Water Supply

- Drought management
- Improve streamflow

Lake Management

- Drawdown compliance
- Wetland permit compliance

Flood Control

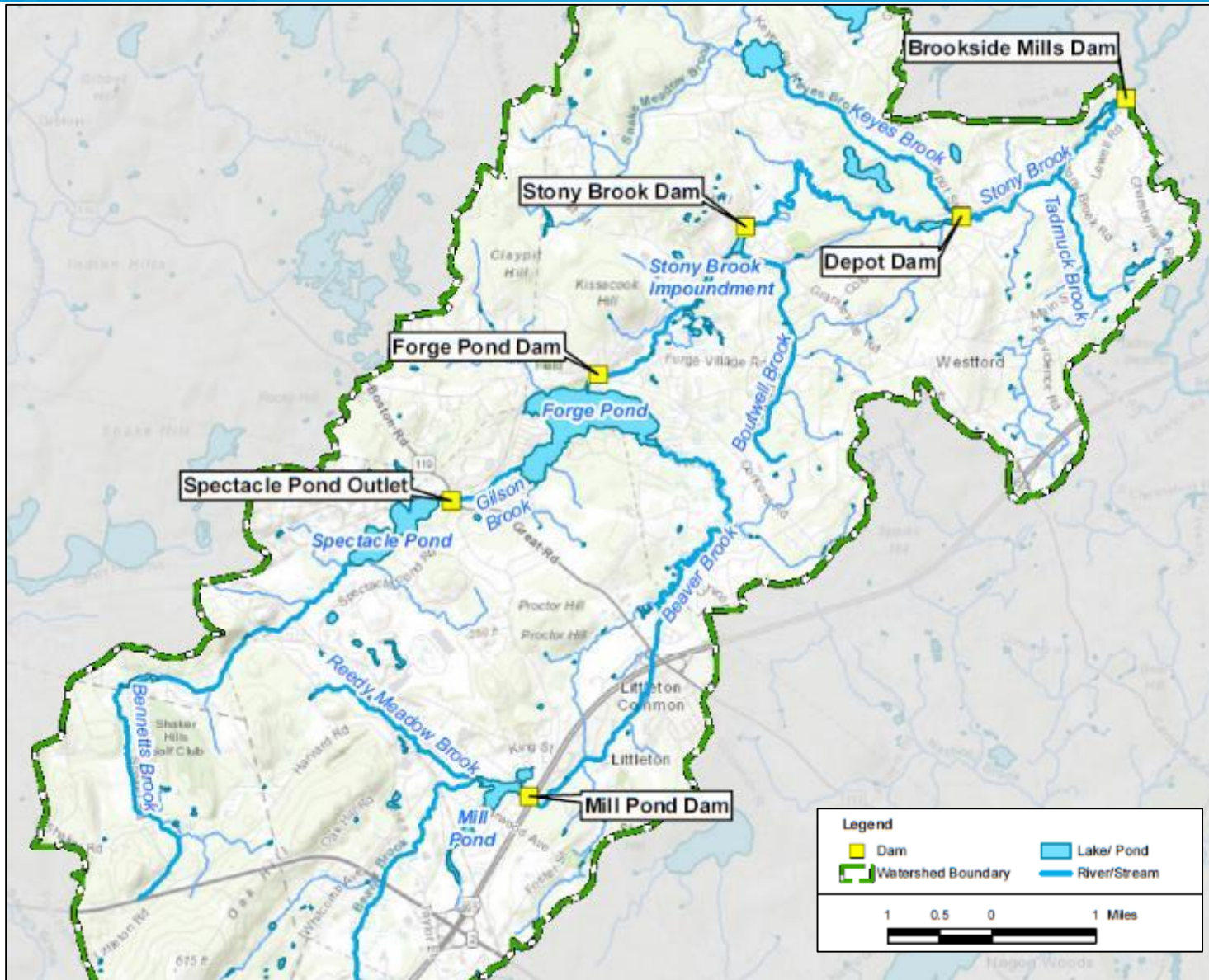
- Reduce Flood Damage Risk
- Minimize Downstream Erosion

Stony Brook Flow Restoration Project

(Pictured: Mill Pond Dam, 4/4/2018)



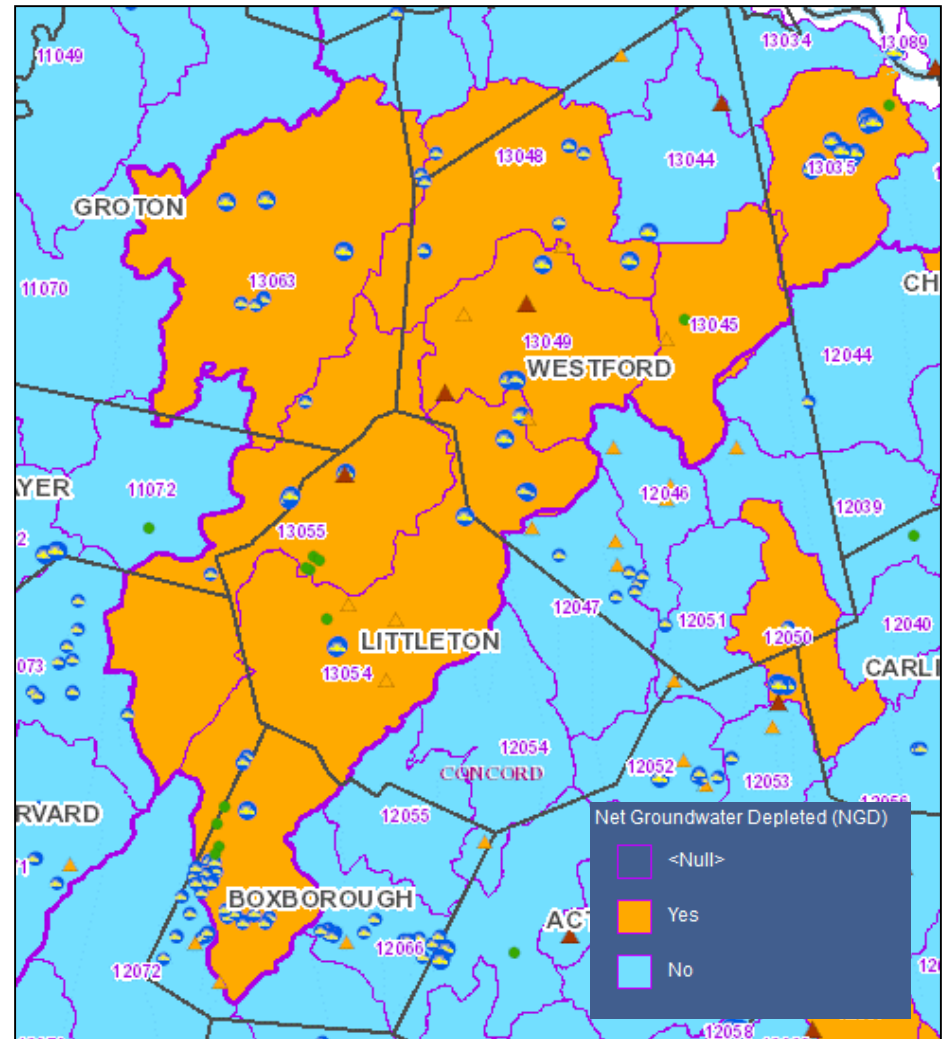
Study Area



Project Background / Driver



- Water supply source basins are stressed
- Requirement to minimize impact of groundwater withdrawals



Project Background / Driver



Streamflow along mainstem is often low throughout watershed
(Pictured: Spectacle Pond Outlet, Drought Conditions, 9/27/2016)



Collaborate with stakeholders to improve streamflow through coordinated operation of existing impoundments using decision support tools informed by model results, streamflow data, and weather forecasts.

- **Outcomes**

- Calibrated Model
- Operational Goals
- Monitoring Network
- Operational Strategies
- Decision Support Dashboard
- **Improved Streamflow Management!**



Collect Data

Engage Stakeholders

Develop Model

Test Strategies

Provide Decision Support Tools

A photograph of a dam with water cascading over it, surrounded by lush green vegetation. The dam is a concrete structure with a metal railing on the left side. The water is white and foamy as it falls. The background is filled with dense green foliage.

Project Initiation: Goal Setting

(Pictured: Forge Pond Dam, 8/2/2017)



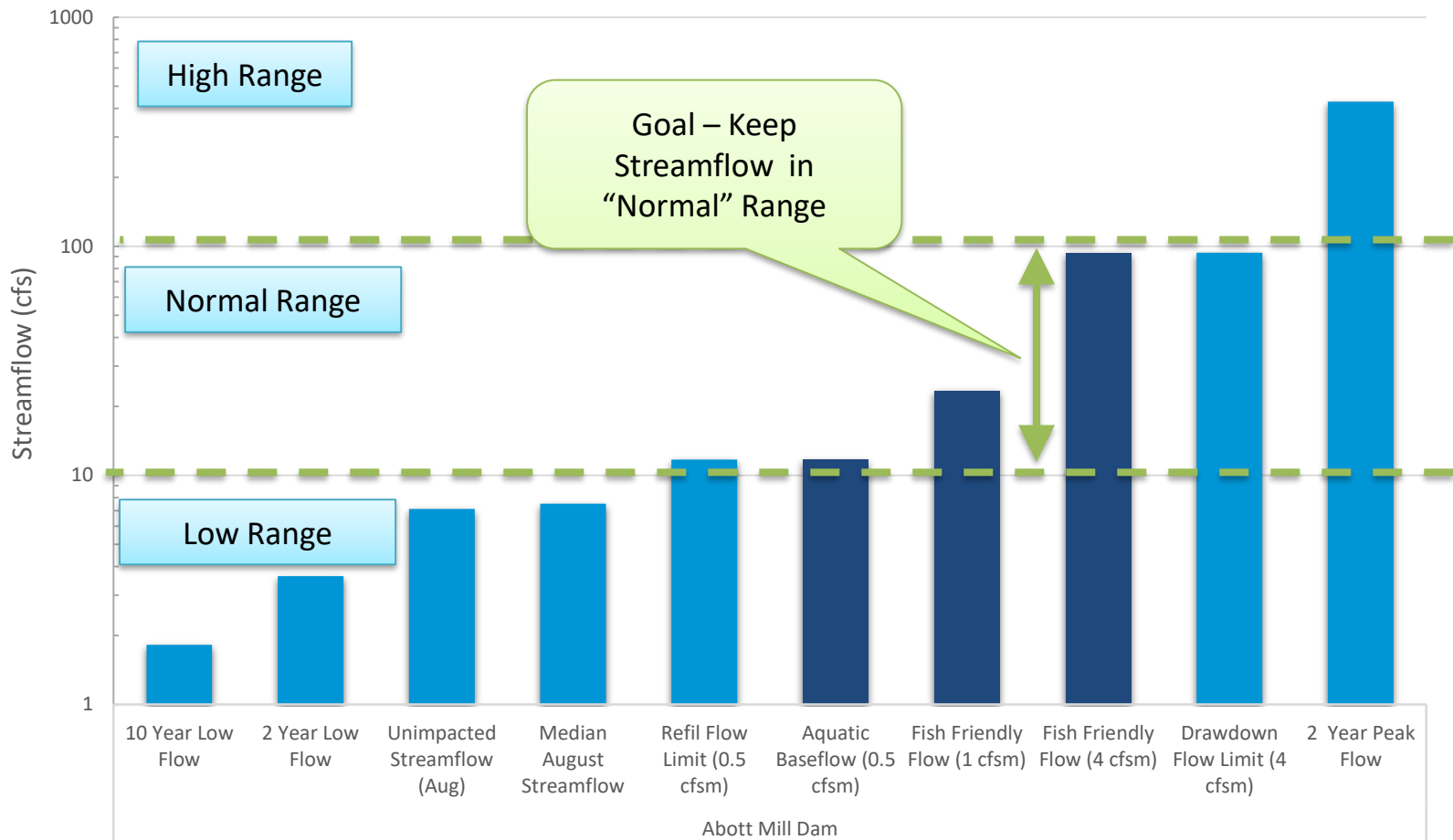
- Overarching goal to mimic “natural” streamflow conditions without compromising other in-lake uses and stakeholder concerns

Goals
Mimic Natural Conditions
Maintain Streamflow
Improve Storm Resiliency
Protect Fish Populations
Control Vegetation
Maintain Recreational Uses

Indicator Threshold Definitions



- Developed Simplified Streamflow and Water Level Thresholds to Evaluate Goals at Each Impoundment



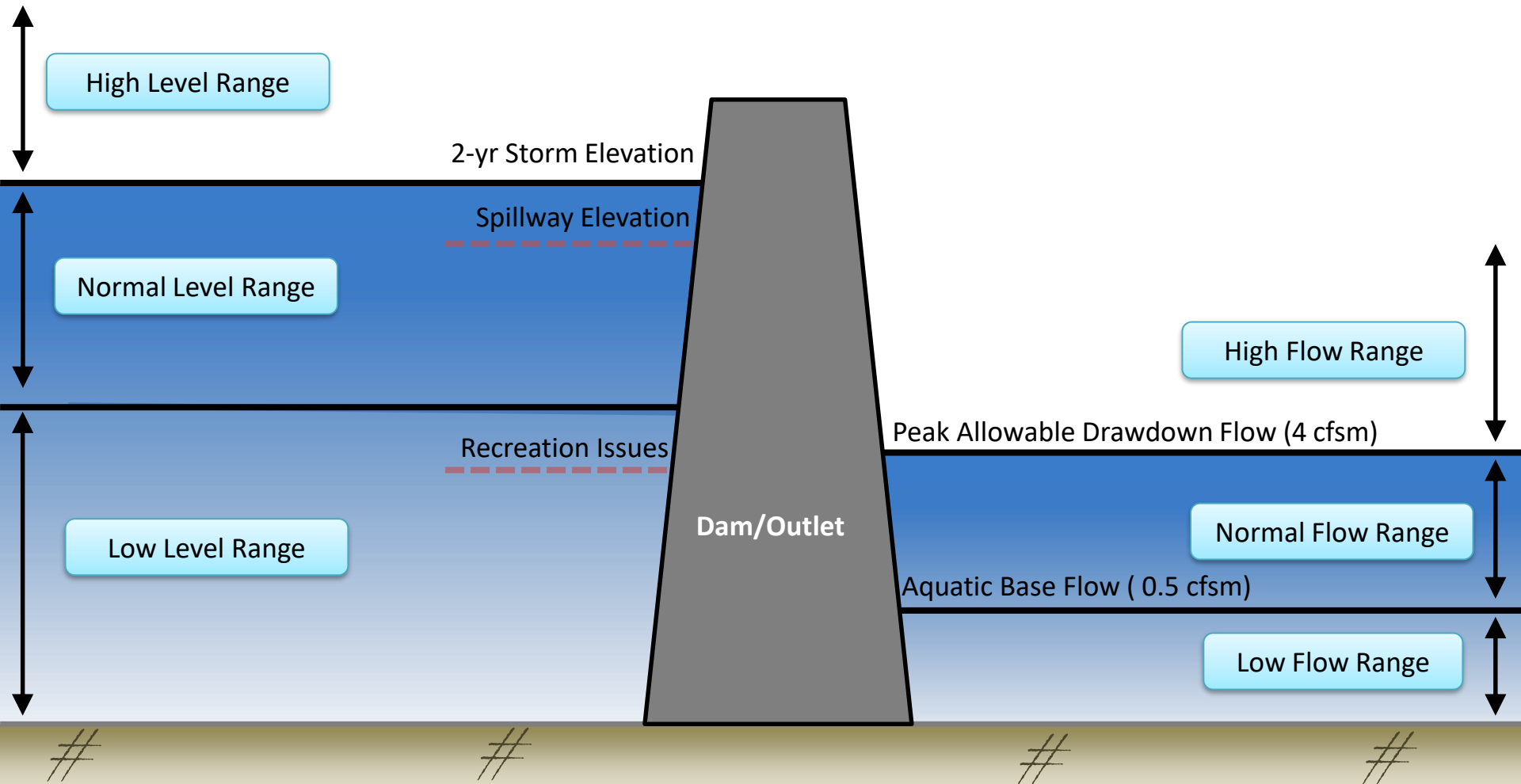
Evaluation Thresholds

Example Indicator Thresholds

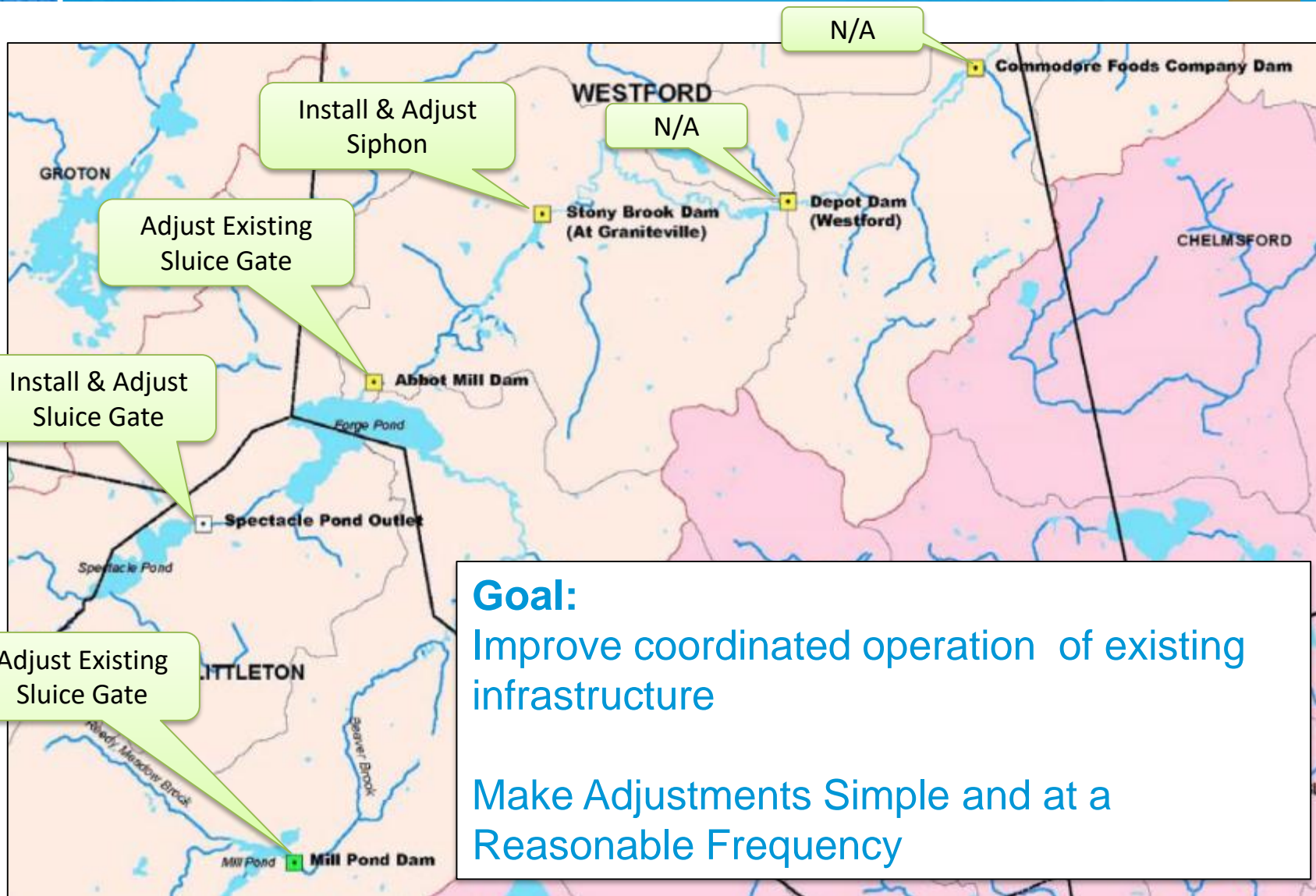


(Upstream – Pond)

(Downstream – Channel)



Potential Operational Adjustments



Goal:
Improve coordinated operation of existing infrastructure

Make Adjustments Simple and at a Reasonable Frequency

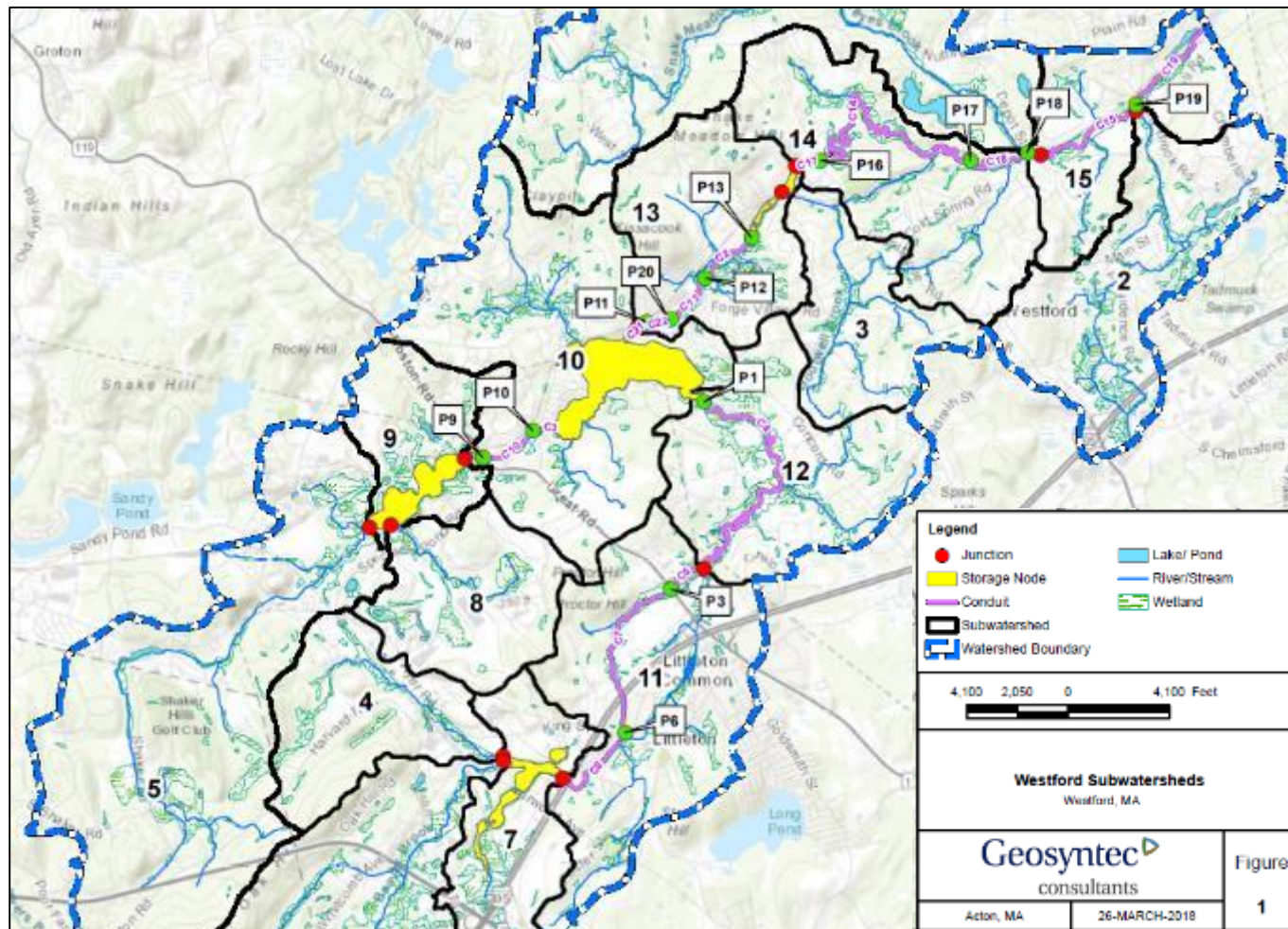


Model Development

(Pictured: Stony Brook Dam, 4/5/2018)

Existing Conditions Model

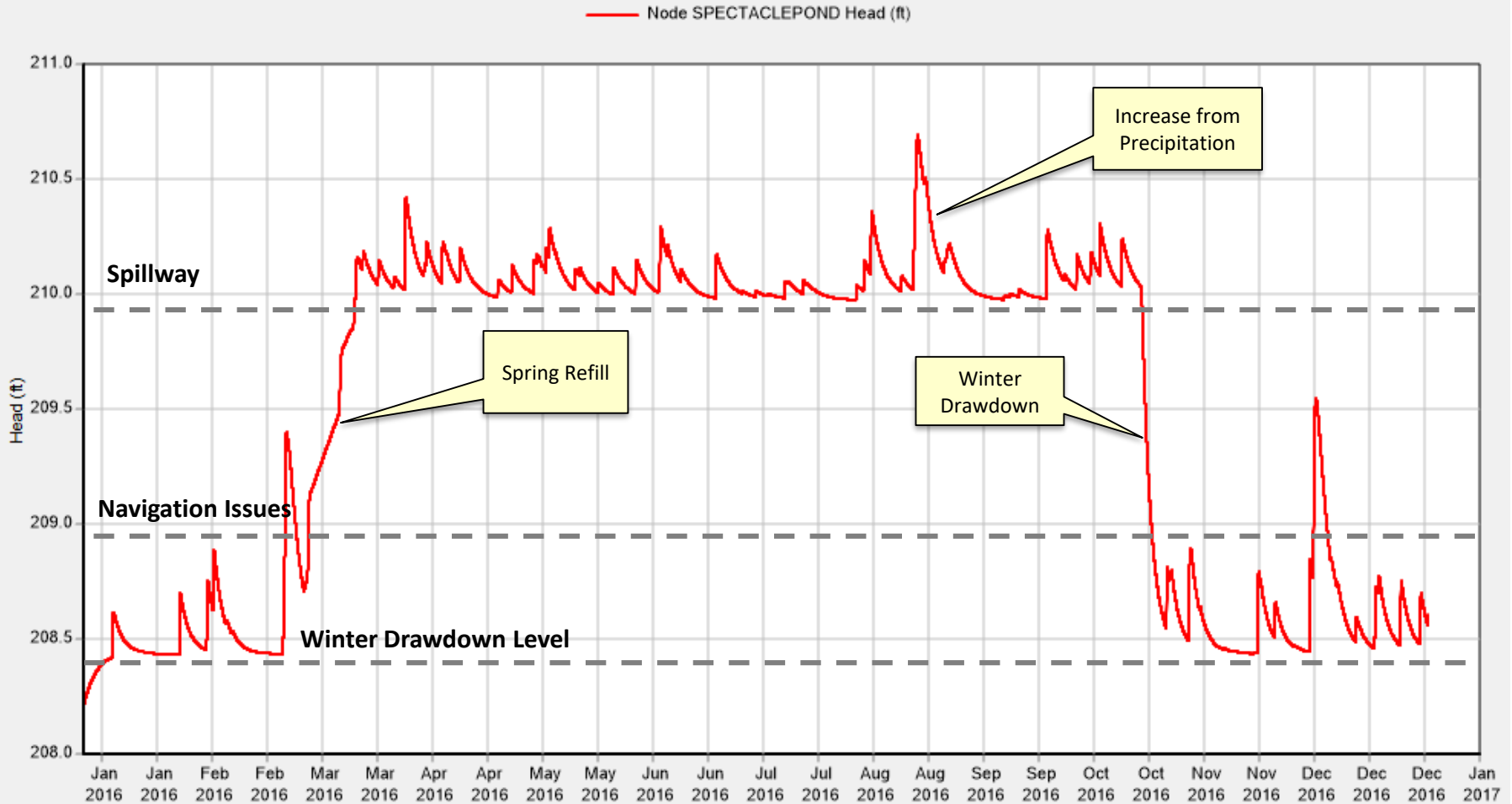
- Developed to enable testing of evaluation strategies (Model: EPA SWMM 5.1)



Existing Conditions Simulations – Spectacle Pond



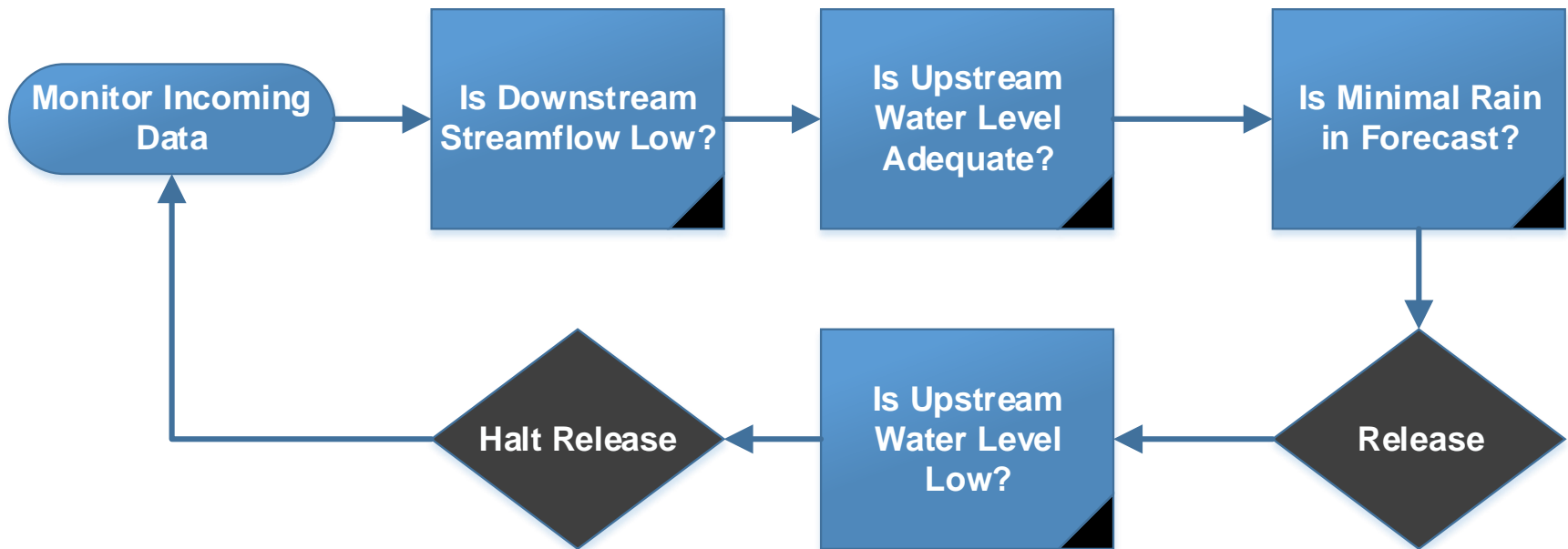
- Simulations take into account seasonal drawdown and refill



Operational Strategy Development



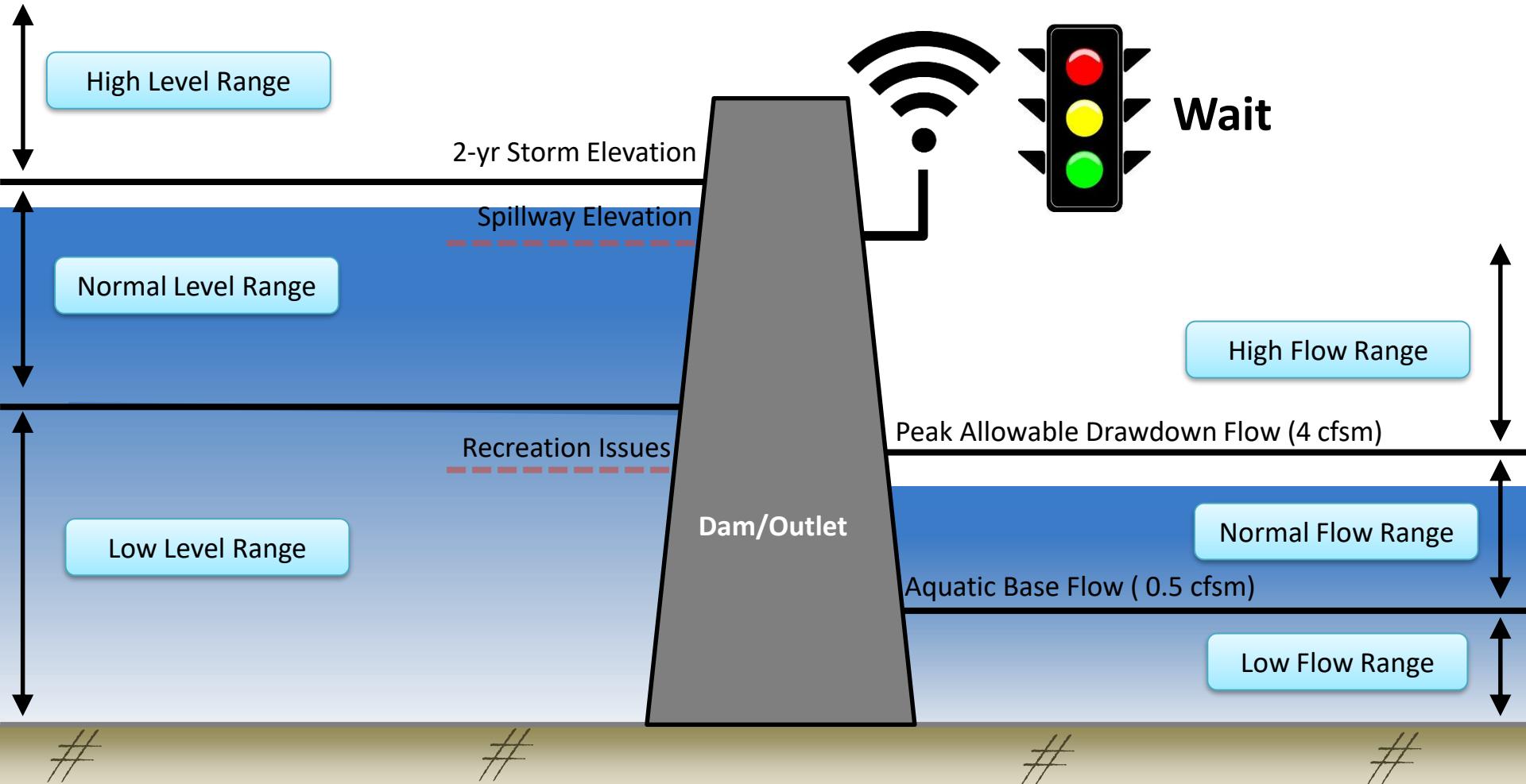
- Developed three (3) model iterations to test potential streamflow improvements
- Simplified logic sequence for selected iteration:



Example Logic Sequence



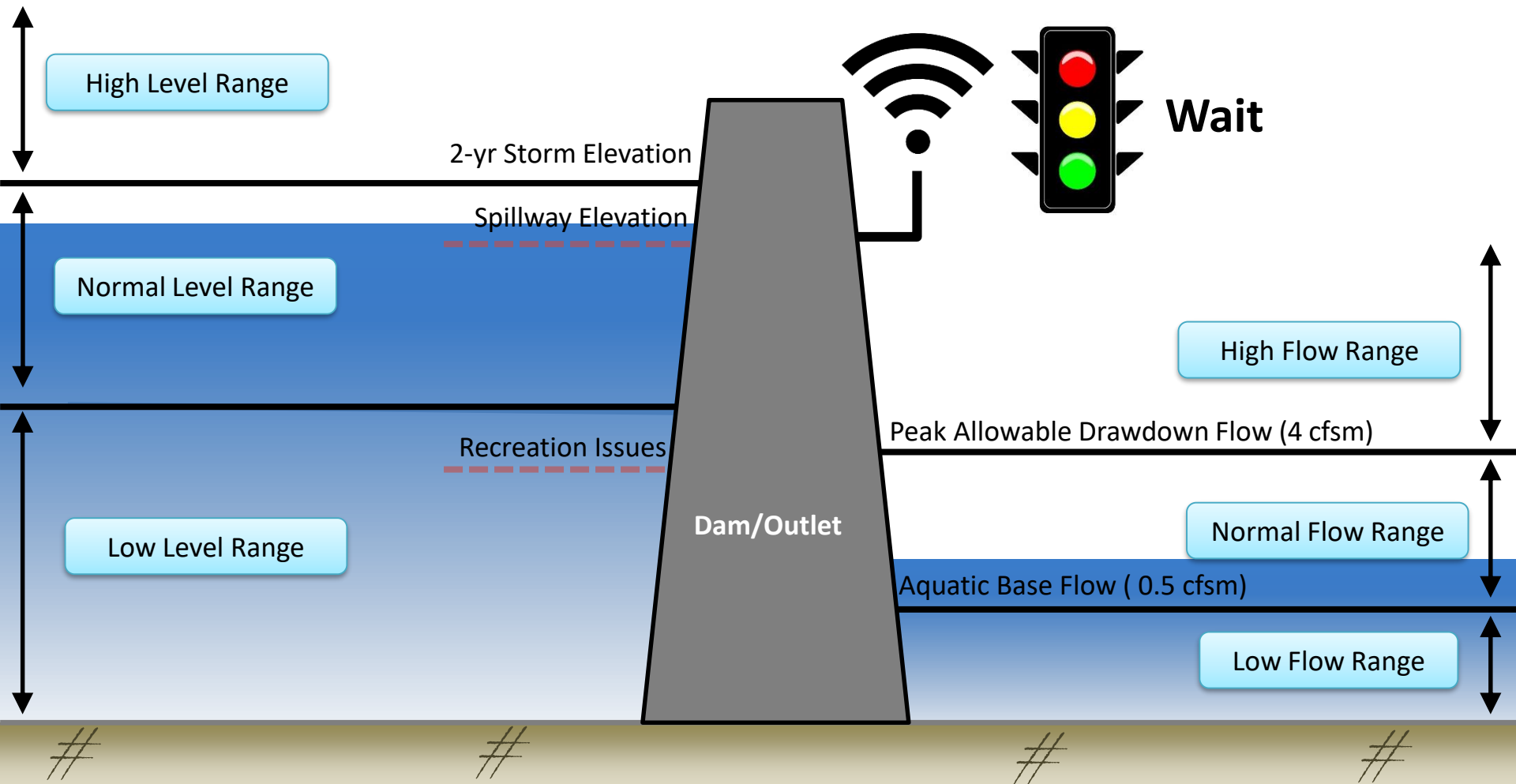
Initiate Monitoring



Example Logic Sequence



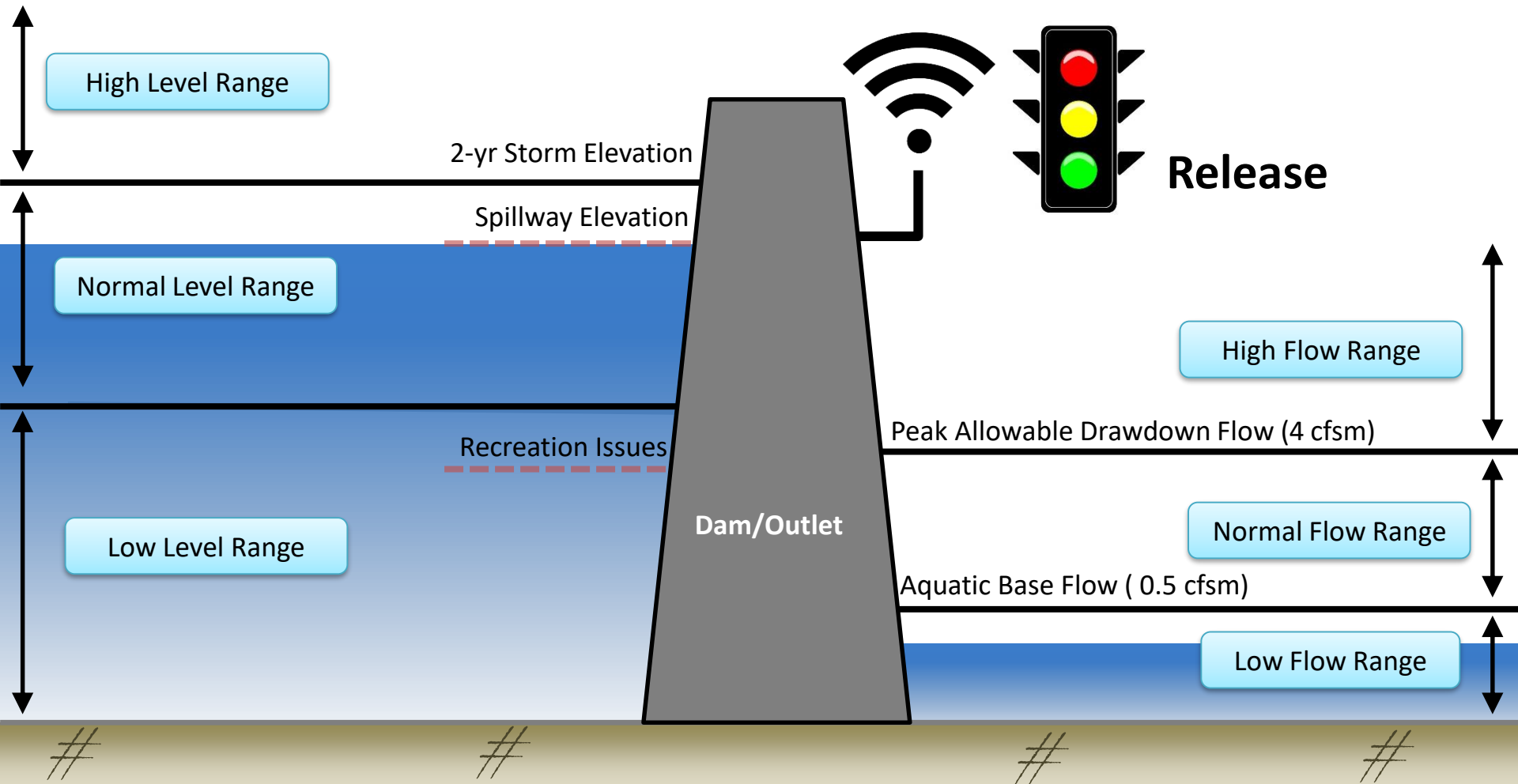
Streamflow Dropping



Example Logic Sequence



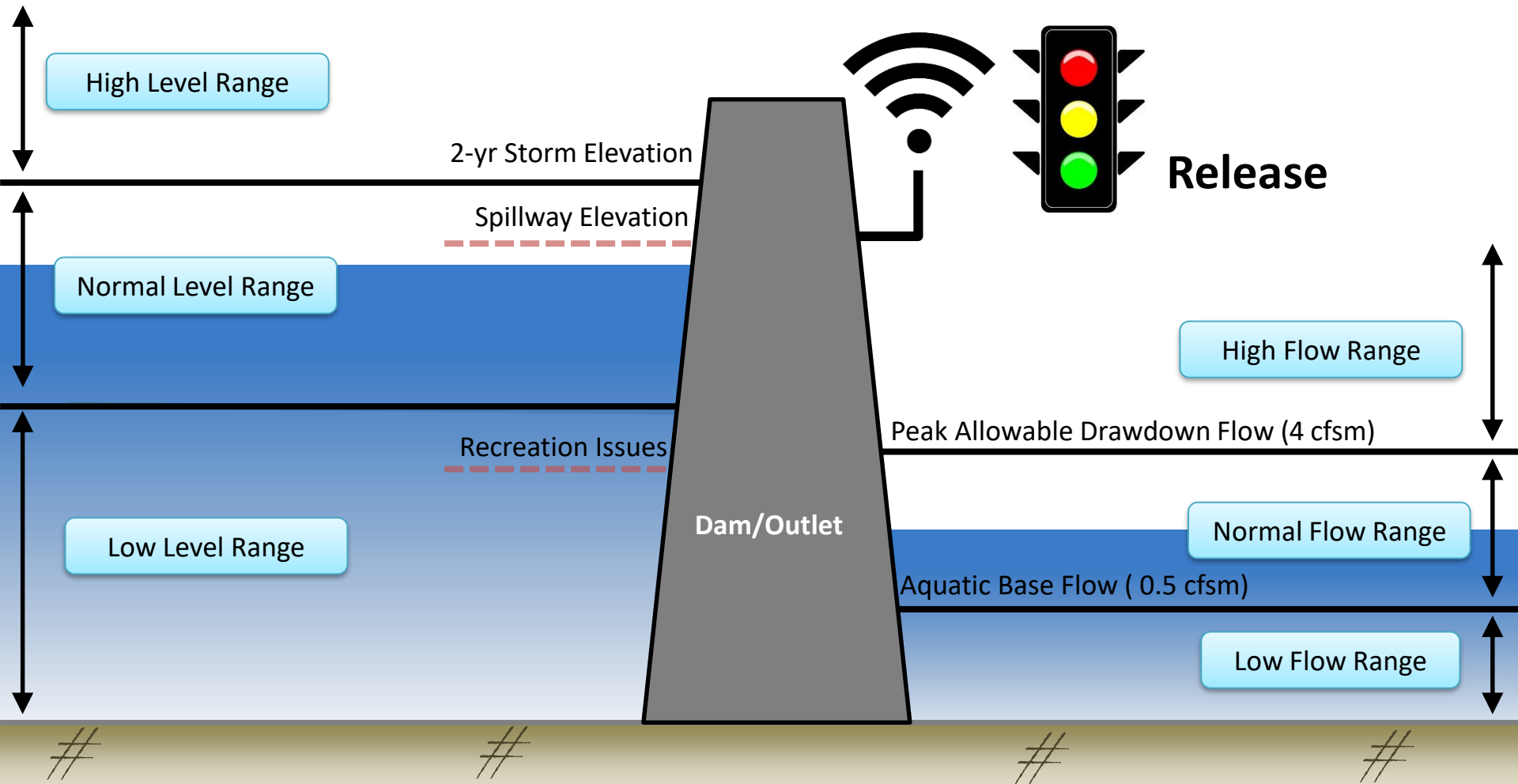
Low Flow Reached, Initiate Release



Example Logic Sequence



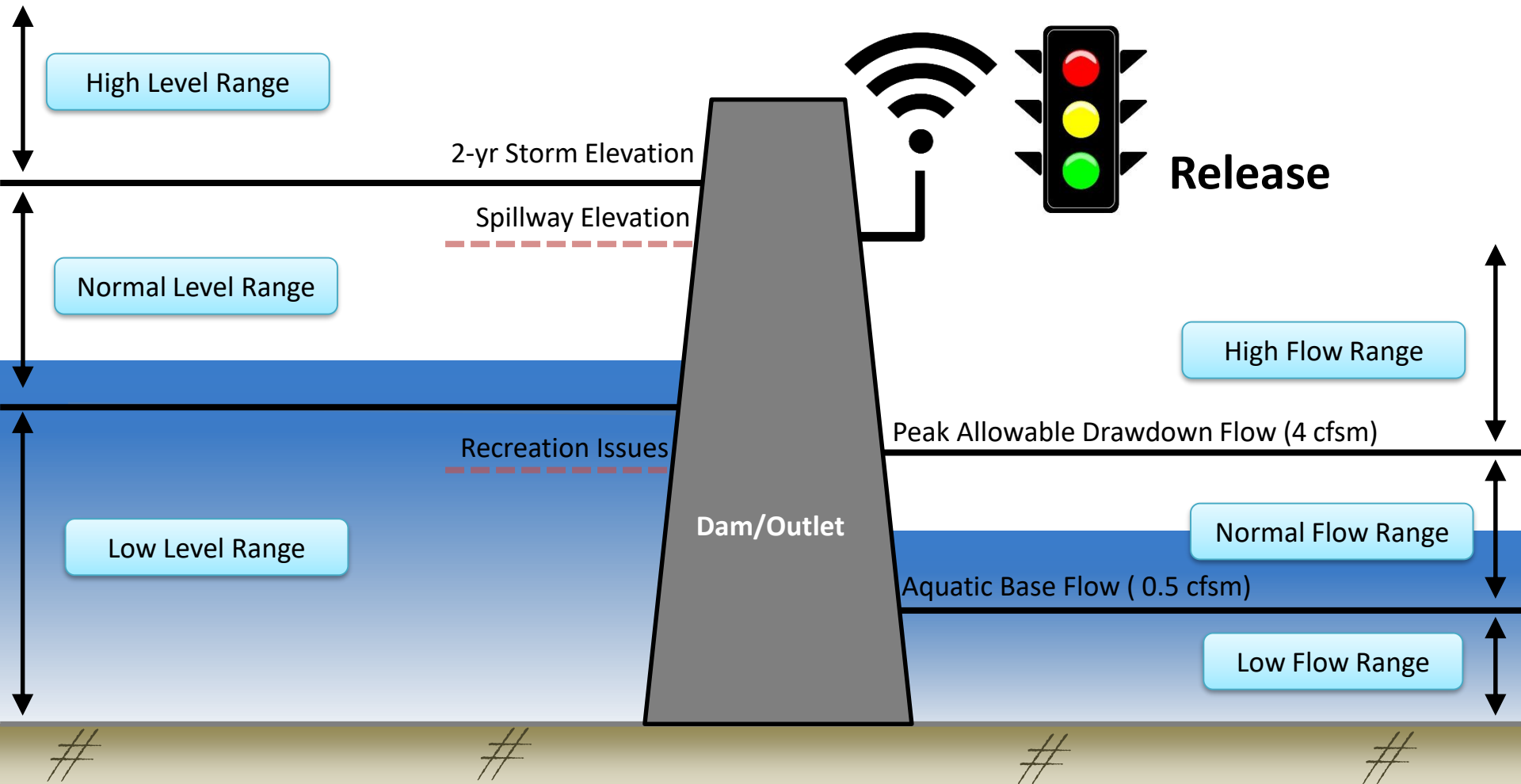
Normal Flow Reached, Continue Releasing



Example Logic Sequence



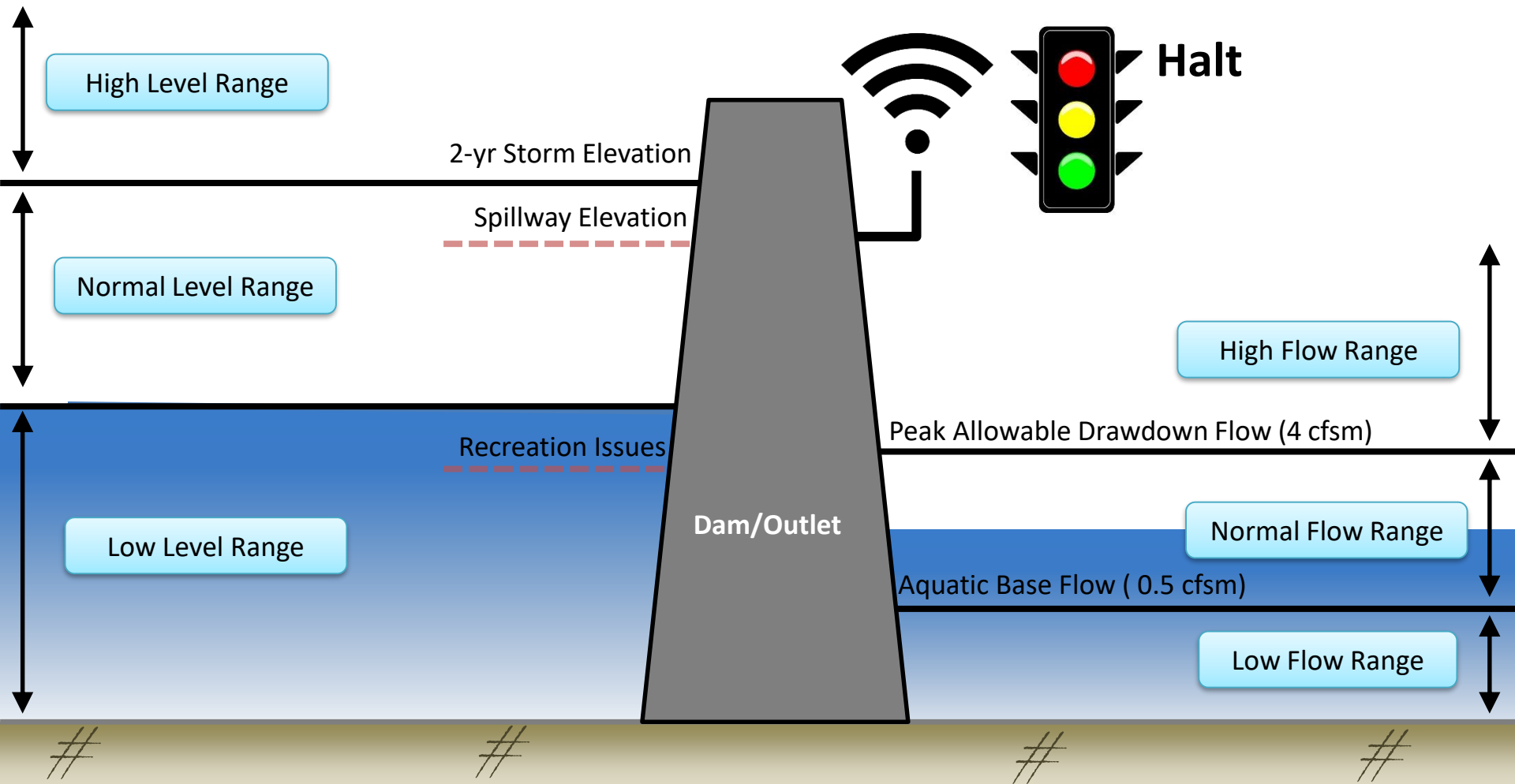
Approaching Low Water Level



Example Logic Sequence



Low Water Level Reached, Halt Release





Results

(Pictured: Depot Dam, 4/5/2018)

Result Takeaways

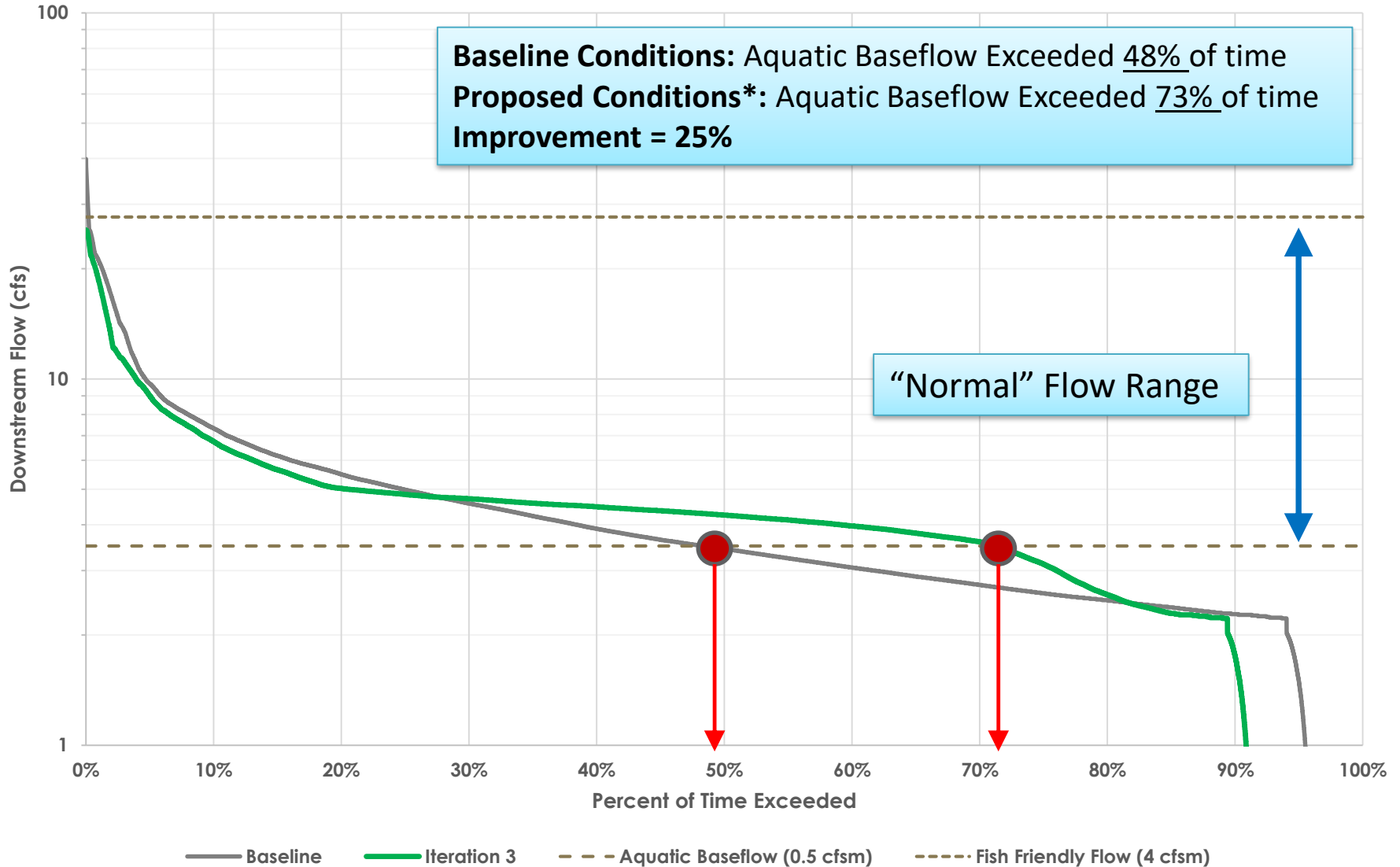


1. Streamflow improvements were simulated at all locations.
2. All impoundments are susceptible to low downstream flow resulting from prolonged dry periods.
3. Model simulations are sensitive – empirical testing is needed to validate results.

Example Model Results - Streamflow



Spectacle Pond Streamflow Exceedance Curve - 2016



*Proposed Conditions = Iteration 3

Streamflow Exceedance Results



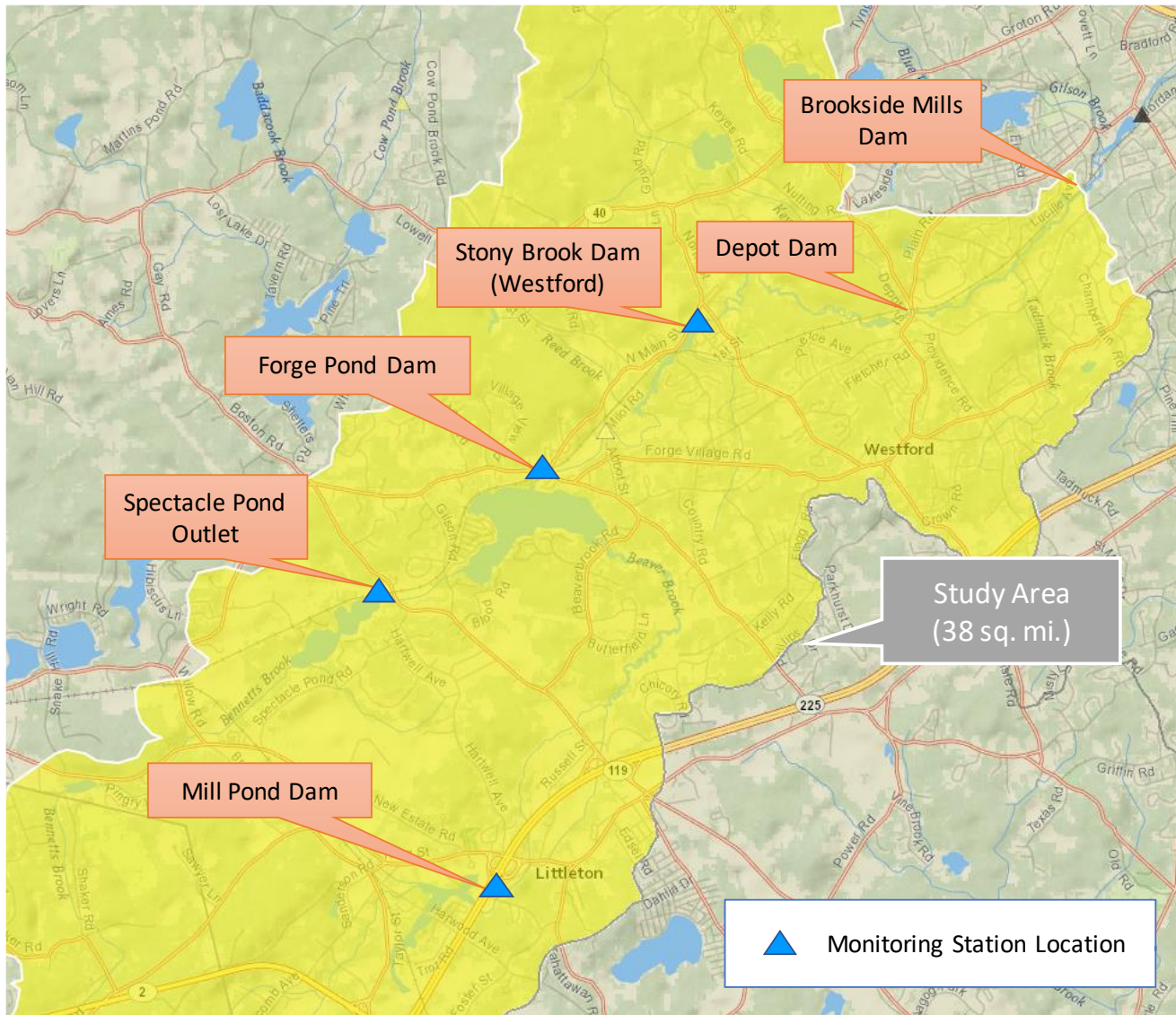
Year	Impoundment	Percent of Time Simulated Downstream Streamflow is "Normal"				Percent Improvement from Baseline		
		Baseline	Iteration 1	Iteration 2	Iteration 3 (Recommended)	Iteration 1	Iteration 2	Iteration 3 (Recommended)
2016	Mill Pond Dam	37%	60%	54%	55%	23%	17%	18%
	Spectacle Pond Outlet	48%	73%	63%	71%	25%	15%	23%
	Forge Pond Dam	54%	62%	60%	63%	8%	6%	9%
	Stony Brook Dam	56%	76%	68%	74%	20%	12%	18%
	Depot Dam	50%	70%	59%	59%	20%	9%	9%
	Brookside Mills Dam	47%	67%	53%	53%	20%	6%	6%
2017	Mill Pond Dam	64%	74%	67%	73%	10%	3%	9%
	Spectacle Pond Outlet	61%	75%	65%	69%	14%	4%	8%
	Forge Pond Dam	75%	83%	78%	82%	8%	3%	7%
	Stony Brook Dam	72%	77%	76%	74%	5%	4%	2%
	Depot Dam	74%	80%	78%	78%	6%	4%	4%
	Brookside Mills Dam	77%	84%	80%	83%	7%	3%	6%

A photograph of a stone dam with water flowing through its spillways. The dam is constructed from large, dark grey stone blocks. A metal beam is visible on top of the dam. The background shows a wooded area with bare trees and a small wooden structure on the left. The water is turbulent as it flows over the spillways, creating white foam. The overall scene is in a natural, wooded setting.

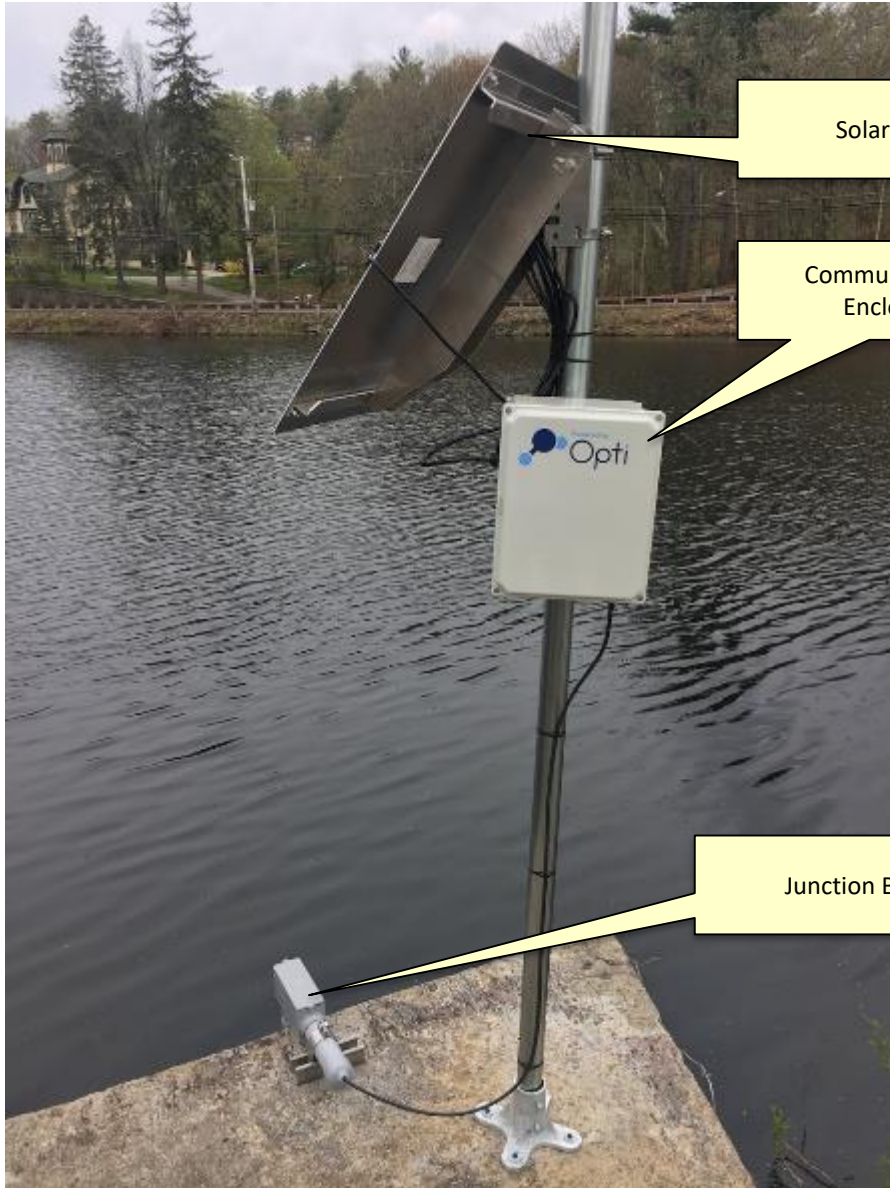
Monitoring and Decision Support

(Pictured: Brookside Mills Dam, 4/5/2018)

Monitoring Station Locations



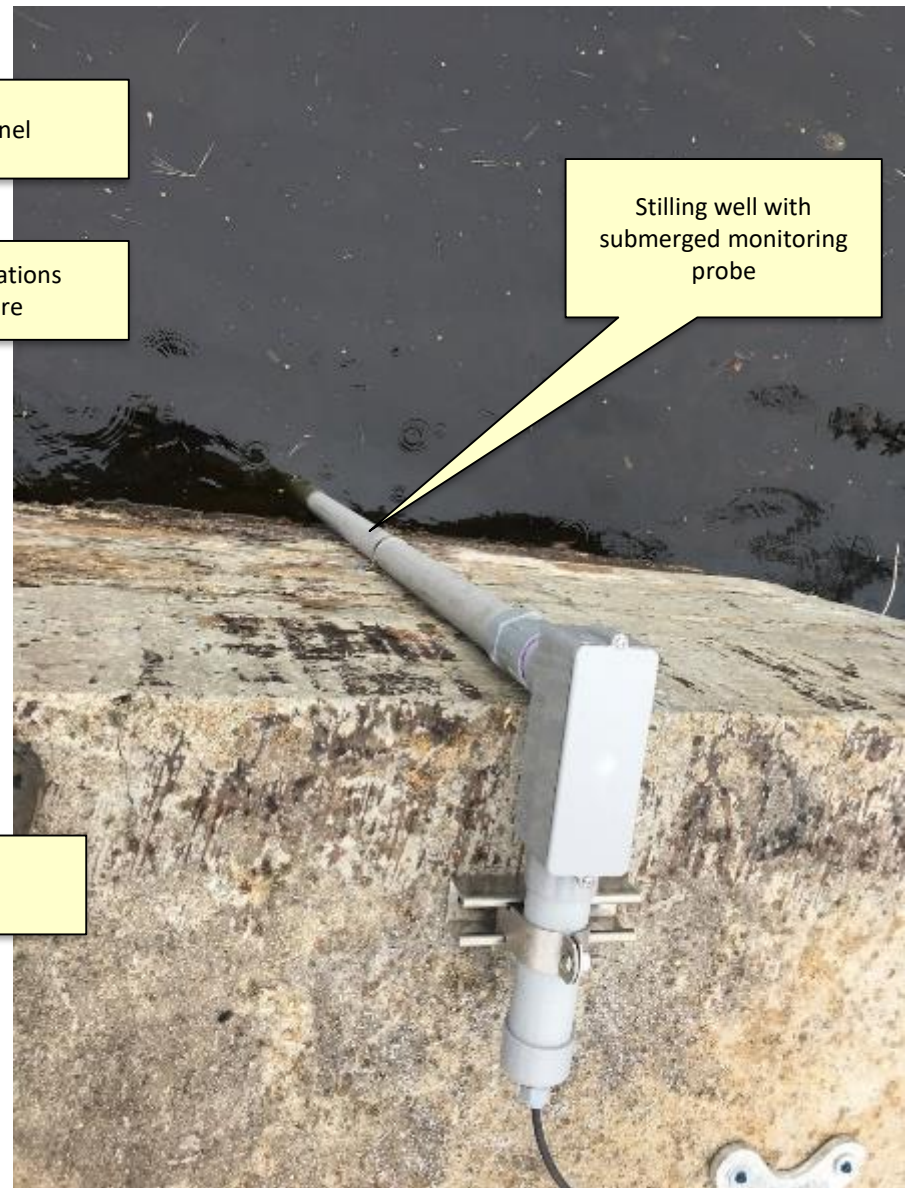
Stony Brook Monitoring Station



Solar Panel

Communications Enclosure

Junction Box



Stilling well with submerged monitoring probe

Dashboard Demonstration



OptiRTC Inc [US] | https://portal.onopti.com/home

Apps | LOW | 1940 Calendar | Google Calendar | Forecast IO | The Day You Became | The Open Notebook | NWS Boston | BWSC Urban Water C | Dashields Dam | BWSC Daily Rainfall | Geosyntec Consultan | Tide Predictions - NC | Hodge | 4 HR | Other bookmarks

Opti

Reset

▼ Projects (11)

- BBG Water Garden
- Conowingo Cistern
- Curtiss Pond
- DC Firehouse Green Tanks
- Dam Dashboard
- Dearborn Homes
- Forest House
- NSF-Villanova
- Opti Demo Project
- RISE:NYC Resiliency Network
- Upper Villa Park

▼ Groups (20)

- 54 Com St Admin
- Admin
- Forge Pond Admin
- Goodys Admin
- Guimenta Admin
- HeartSong Admin
- Hook View Only
- Ice Stone Admin
- Jeffrey F Admin
- John Lepore View Only
- MR Admin
- Majestic Admin
- Pratt Pond Admin
- Spectacle Pond Admin
- Sunnys Admin
- Thai Rock Admin
- The CHS Admin
- The Wave Admin
- View Only
- Waterfront Admin

54 Commerce St Corp. / Alpha Marine Inc.

BBG Water Garden

BBG Water Garden (View Only)

Cistern RTC

Cistern RTC (View Only)

Conowingo Rainwater Harvesting Control

Conowingo Rainwater Harvesting Control (View Only)

Curtiss Pond

Curtiss Pond (View Only)

Decision Support Dashboards



- **Provide continuous monitoring data**
 - Water level, discharge estimates, etc.
- **Provide forecast data and predictions**
 - Precipitation (7-day)
 - Predicted impoundment inflow (7-day)
- **Provide decision support email alerts**
 - Based on recommended model Iteration 3
 - E.g., Approaching Critical Streamflow, Initiate Release
- **All stakeholders can opt to receive selected alerts**

Alert Sequence – Low Flow Releases



Alert Sequence

Wait - Approaching Critical Low Flow

Start Release, Critical Low Flow Reached

Continue Release - Approaching Critical Low Water Level

Stop Release, Critical Low Level Reached



Example Email Alert – Forge Pond




Opti Notification: Stop Release, Critical Low Level Reached at Forge Pond - Message (HTML)

File Message Tell me what you want to do


Delete Archive Reply Reply All Forward Quick Steps Move Tags Editing Zoom Phish Alert Report Message

Mon 6/18/2018 2:49 PM

 alerts@optirtc.com

Opti Notification: Stop Release, Critical Low Level Reached at Forge Pond

To

 Click here to download pictures. To help protect your privacy, Outlook prevented automatic download of some pictures in this message.

Low Water Level, Halt Release! The measured water level of Forge Pond is below 202.5 ft. If a low flow release is currently occurring, mobilize immediately to halt the release.

To unsubscribe from Opti notifications, please email support@optirtc.com.

Click [Unsubscribe](#) to stop receiving all alerts from Opti.

Next Steps

(Pictured: Upstream Channel, Depot Dam, 4/5/2018)





- Selected as DER Priority River Restoration Project



Division of Ecological Restoration
Streamflow Restoration Program

- Obtained Additional Funding through Water Management Act Grant Program



(Pictured: Stony Brook Impoundment, 4/5/2018)

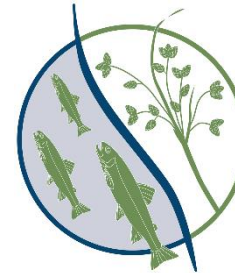


- Perform streamflow gauging and additional calibration / validation of model
- Perform baseline stream biota sampling
- Perform low flow feasibility evaluation
 - Obtain owner approval for all locations
 - Obtain state and local approval
- Perform empirical testing and evaluate effectiveness of recommendations
 - Release openings, release thresholds, forecast thresholds etc.
- Evaluate potential for automated controls
- Expand study area

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engineers | scientists | innovators

Partners:



Friends of Forge Pond

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