Massachusetts

SUSTAINABLE WATER MANAGEMENT INITIATIVE

Framework Summary

February 03, 2012

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2. Armstrong, D.S., Richards, T.A., and Brandt, S.L., 2010, Preliminary assessment of factors influencing riverine fish communities in Massachusetts: U.S. Geological Survey Open-File Report 2010–1139, 43 p.

3. Armstrong, D.S., Richards, T.A., and Levin, S.B., 2011, Factors influencing riverine fish assemblages in Massachusetts: U.S. Geological Survey Scientific-Investigations Report 2011–5193, 58p. (Also available at http://pubs.usgs.gov/sir/2011/5193.)

4. Davies, S. P., and S. K. Jackson. 2006. The biological condition gradient: A descriptive model for interpreting change in aquatic ecosystems. Ecological Applications, 16(4), 2006, pp. 1251–1266

5. Poff N.L., B.D. Richter, A.H. Arthington, S.E. Bunn, R.J. Naiman, E. Kendy, M. Acreman, C. Apse, B.P. Bledsoe, M.C. Freeman, J. Henriksen, R.B. Jacobson, J.G. Kennen, D.M. Merritt, J.H. O'Keefe, J.D. Olden, K. Rogers, R.E. Tharme, and A. Warner. 2010. The ecological limits of hydrologic alteration (ELOHA): a new framework for developing regional environmental flow standards. Nilsson, C., and Freshwater Biology 55: 147-170. doi:10.1111/j.1365-2427.2009.02204.x.

6. Weiskel, P.K., Brandt, S.L., DeSimone, L.A., Ostiguy, L.J., and Archfield, S.A., 2010, Indicators of streamflow alteration, habitat fragmentation, impervious cover, and water quality for Massachusetts stream basins: U.S. Geological Survey Scientific Investigations Report 2009–5272, 70 p., plus CD–ROM.

1. SAFE YIELD - Method Summary

1. **Safe Yield**
   Section 2 of the Water Management Act defines safe yield as "the maximum dependable withdrawals that can be made continuously from a water source including ground or surface water during a period of years in which the probable driest period or period of greatest water deficiency is likely to occur; provided, however, that such dependability is relative and is a function of storage and drought probability."

   The safe yield is being calculated as 55% of the Drought Basin Yield (Monthly Drought Year flows) plus Reservoir Storage Volumes, and the environmental protection factor as 45%. Each component is further described below.

2. **Drought Basin Yield:** is based on estimated near natural drought year flows as generated by the USGS Sustainable Yield Estimator (Archfield et al., 2010). SWMI staff evaluated a range of flow statistics (Q_{75} – Q_{90}) on an annual time step and found that Q_{90} flows across the major basins in the state are equal to, or lower than, the drought of record (generally 1965) flows. The monthly Q_{90} flow statistic represents a value that is exceeded 90% of the time during that month over the period of record (over 44 years). To address stakeholder concerns about seasonal fluctuations in stream flow, staff evaluated an annualized Q_{90} based on averaging of monthly Q_{90} streamflows. This value represents a drought year in which every month is in a drought.

   Applying this annualized monthly Q_{90} provides consistency across all basins, meets the intent of "probable driest period" in the Safe Yield definition from both a statistical and historical stand point, and incorporates concerns about seasonal fluctuations in streamflow.

3. **Why was 55% recommended for potential allocation?**
   The USGS fish and habitat study found a significant relationship between alteration of August median flows (Q_{50} flows), and relative abundance of fluvial fish (an indicator of aquatic habitat quality). Based on study results, the SWMI process discussed that alterations greater than 25% were expected to cause significant impact. Staff looked at the volume represented by 25% of the Q_{50} for each month, and determined what percent of the monthly Q_{90} it represented. On average, 25% of the Q_{50} is roughly equivalent to 60% of the Q_{90}. It was a little higher in some months and a little lower in others and also varied similarly across watersheds. An additional protection factor of almost 10% was added to result in 55% of Q_{90} as the safe yield.

4. **Environmental Protection Factor:** Because 55% of the Drought Basin Yield (annualized Q_{90}) was chosen as a volume that could be allocated, this would leave 45% of the flow in the river as environmental protection against a drought condition on an annual basis. It is important to remember that 90 percent of the time, a higher portion of monthly flows would remain in the river, and in average or wet years, much greater amounts of streamflow will be present in the rivers. In addition, at the seasonal and subbasin scale, Streamflow Criteria and permit tiers requirements provide additional environmental protection.

5. **Reservoir Storage Volumes** (see Appendix A for full methodology):
   As required by the Act, reservoir storage volumes were included in the safe yield. Storage volumes for reservoirs that store more than one year of average inflow were included. Staff found that very few

reservoirs qualify. The following is the amount of extra storage (above demand) in a drought year for those reservoirs that qualify:

Chicopee	214.0 MGD (MWRA-Quabbin, Fitchburg)		
Nashua	138.8 MGD (MWRA-Wachusett)		
Westfield	14.9 MGD (Springfield)	Boston Harbor	0.6 MGD (Winchester)
Narrangansett	12.6 MGD (Fall River)	Charles	0.5 MGD (Lincoln)
Quinebaug	0.4 MGD (Southbridge)	Housatonic	0.12 MGD

Note: These volumes can only be allocated to current/future communities serviced by these reservoirs.

6. **Determining Basin Yield in areas where application of SYE analysis is generally not available**
   A separate methodology (using best available data) for the South Coast, Plymouth Carver Aquifer, Cape Cod, and the Islands has been developed (see Appendix B for details).

7. **Sub-basin safe yields:** Individual safe yields are generated for three parts of the Boston Harbor Basin (Mystic, Weymouth/Weir, and Neponset), as well as two subbasins in the South Coastal Basin (North and South Rivers, South Coastal Shore). These sub-basin delineations are consistent with those adopted by the Massachusetts Water Resources Commission in 1985.

8. **Safe Yield in the Water Management Act Regulations:** Both the preamble to the Water Management Act regulations and the regulations will contain wording making it clear that SY is not a water allocation scheme. Under M.G.L. ch. 21G sec.11, if MassDEP "finds that the combined volume of existing, permitted and proposed water withdrawals exceeds the safe yield of a water source or that existing, permitted or proposed withdrawals are otherwise in conflict, it shall deny all applications for permits for withdrawals from the water source". In addition to substantive changes in the regulations, the Water Management Act regulation preamble will also be amended to recognize that, with few exceptions, it is highly unlikely that the full Safe Yield volume will be allocated, given application of streamflow criteria, with language such as:

   Safe Yield includes environmental protection factors, including ecological health of river systems, as well as hydrologic factors **[from DEP Clarification of Safe Yield, 2009].** ***As noted above, safe yield is not a water allocation scheme. It is highly unlikely that this amount would be fully allocated in a basin. Permits shall be evaluated based on streamflow criteria and other factors set forth in the Water Management Act and regulations at 310 CMR 36.00. In applying the streamflow criteria regulations pursuant to 310 CMR 36.00, there is no presumption that because existing, permitted and proposed withdrawals do not exceed Safe Yield, that such a withdrawal or withdrawals meets the streamflow criteria and should be permitted.***

   The regulations will also incorporate maps or other representations showing flow depleted subbasins and stating that for those Flow Level 4 and 5 subbasins, conditions to minimize environmental impacts and mitigate flow depletion to the greatest extent feasible shall be implemented pursuant to the special conditions to protect streamflow criteria contained in the permitting section of the WMA regulations.

9. **Safe Yield and Allocations**
   For basins where current allocations (but not current use) are greater than SY, MassDEP will employ a permitting strategy that will ensure, through conditions, that use does not exceed SY through the life of the permit.

DRAFT SAFE YIELD Values

Basin Name	Drainage Area sq mi	Annualized Basin Yield Q90 (MGD)	Draft Reservoir Storage Volumes (MGD)	Draft Safe Yield: 55% of Q90 +Storage (MGD)	Total Annualized Authorized Withdrawals (MGD)	Total Annualized Registered Volume (MGD)	2008 Reported Use (MGD)
Blackstone	357.8	135.6	0	74.6	36.0	25.4	29.0
BH Total	291.6	99.1	0.6	see subbasins	38.6	31.62	28.7
19c BH Weymouth & Weir	106.6	33.8	0.0	18.6	16.6	15.48	16.1
19b BH Neponset	108.9	39.4	0.0	21.7	15.4	9.95	8.3
19a BH Mystic	76.1	25.9	0.6	14.8	6.6	6.19	4.2
Buzzards Bay[A]	374.3	177.5[A]	0	148.0	85.1	74.01	73.7
Cape Cod[A]	394.8	261.1	0	261.1	52.5	33.47	39.9
Charles	310.8	116.9	0.5	64.8	46.5	34.12	34.7
Chicopee	722.2	253.1	214.0	353.2	205.0	201.76	124.1
Concord	399.6	158.9	0	87.4	36.4	28.64	27.1
Connecticut	7,368.6	3,393.5	0	1,866.4	149.2	144.56	115.7
Deerfield	663.5	236.4	0	130.0	3.9	3.77	2.6
Farmington	151.9	46.0	0	25.3	0.0	0	0.0
French	94.7	35.8	0	19.7	4.3	4.22	2.7
Housatonic	500.2	159.2	0.12	87.7	35.6	29.35	18.4
Hudson	219.9	67.2	0	37.0	14.1	10.69	8.6
Ipswich	155.3	53.4	0	29.4	32.8	29.59	24.3
Islands[A]	142.1	94.0	0	94.0	7.4	5.2	6.4
Merrimack	3,902.0	1,667.5	0	917.1	82.3	56.91	57.4
Millers	389.1	120.1	0	66.1	10.9	8.73	7.7
Narr-Mt. Hope Bay	111.9	44.3	12.6	37.0	13.4	12.69	14.3
Nashua	507.8	212.3	138.8	255.6	180.6	167.46	146.4
North Coastal	170.4	46.1	0	25.4	21.9	20.8	18.4
Parker	81.8	26.9	0	14.8	2.5	1.63	2.3
Quinebaug	153.8	57.2	0.4	31.9	5.6	2.69	2.8
Shawsheen	78.1	26.4	0	14.5	5.0	5.01	3.8
South Coastal	240.4	92.9	0	see subbasins	see subbasins	see subbasins	see subbasins
21a North & South Rivers	120.6	42.2	0	23.2	14.4	12.71	13.8
21b South Coastal Shore[A]	119.8	N. A. [A]	0	50.1	33.9	23.97	19.0
Taunton	529.8	244.2	0	134.3	94.2	67.55	67.9
Tenmile	48.6	19.3	0	10.6	12.9	9.99	8.9
Westfield	516.5	152.5	14.9	98.8	56.1	51.1	44.3

[A] Based all or partially on Recharge Method

Table 1: Safe Yield and its Components by Major Basin

2. BIOLOGICAL CATEGORIZATION OF STREAMS

1. **Background**

The SWMI committees agreed that categorizing existing conditions of Massachusetts flowing water habitats, using fish communities as a surrogate for aquatic habitat integrity, is a necessary first step to develop stream flow criteria. The goal of categorization is to use the best available science to describe the current condition of flowing water habitats in Massachusetts. The categorization framework proposed by the interagency workgroup (EOEEA, DFG, DCR, and DEP) and described herein, is informed by the results of the USGS report on Factors influencing riverine fish assemblages in Massachusetts (Armstrong et al., 2011), along with input from both SWMI committees and best professional judgment of state agency staff. The categorization framework was voted on and recommended by the SWMI Technical Subcommittee.

2. **Determination of Biological Categories** (See Appendix C for a full description)

The proposed categorization framework relies on statistical, analyses and best professional judgment-based concepts supported in the scientific literature (e.g. Biological Conditions Gradient, Davies and Jackson, 2006) to describe the current condition of fisheries resources, as representative of flowing water habitat in Massachusetts. This type of categorization, which looks at alteration-ecological response relationships, is a key element of the Ecological Limits of Hydrological Alteration (ELOHA) framework (Poff et al., 2010).

The relative abundance of fluvial fish, as measured through catch per unit effort (CPUE), was used as a surrogate for the current condition of fisheries resources. CPUE is a widely recognized and accepted fisheries statistic and is an index of fish population density. Generally, for two similar habitats (e.g. gradient, geology, watershed size) the one with the higher CPUE, is considered to be of higher quality. The fluvial fish relative abundance model was statistically significant and was the best model that incorporated flow, impervious cover, natural basin characteristics (i.e. drainage area, channel slope, and percent sand and gravel), and was appropriate for use statewide.

The fluvial fish relative abundance model is a linear model and produces smooth curves that do not contain inflection or "break" points. Quantile regression and input from SWMI stakeholders was used to delineate categories for management purposes. The result is a series of categories with breaks that correspond to the decline in fluvial fish relative abundance with changes in flow and/or impervious surface (Figure 1). It is intended that this model be used as a statewide-screening tool.

3. **Description of Biological Categories:**

i. *Category 1 (0 to 5% Alteration of the Range of Fluvial Fish Relative Abundance)*
Represents high quality aquatic habitat in the Commonwealth, relatively un-impacted by human alteration (as expressed by impervious cover and flow alteration).

ii. *Category 2 (5 to 15% Alteration of the Range of Fluvial Fish Relative Abundance)*
represents quality fisheries resources with good species diversity and balanced, adaptive fish communities.

Biological Category	Biological Alteration %
1	< 5%
2	5 to < 15%
3	15 to < 35%
4	35 to < 65%
5	> 65%

Table 2: Biological Categories

iii. *Category 3 (15 to 35% Alteration of the Range of Fluvial Fish Relative Abundance)* represents fish communities that have exhibited considerable change in the structure of the fish community. Sensitive species may still be maintaining populations but at considerably reduced abundances. More tolerant individuals are likely to dominate fish community structure.

iv. *Category 4 (35 to 65% Alteration of the Range of Fluvial Fish Relative Abundance)* represents fish communities that have undergone reductions in sensitive taxa, fluvial species diversity, and substantive reductions to relative abundance.

v. *Category 5 (Greater than to 65% Alteration of the Range of Fluvial Fish Relative Abundance)* Represents fish communities that have undergone severe changes to their structure and function.

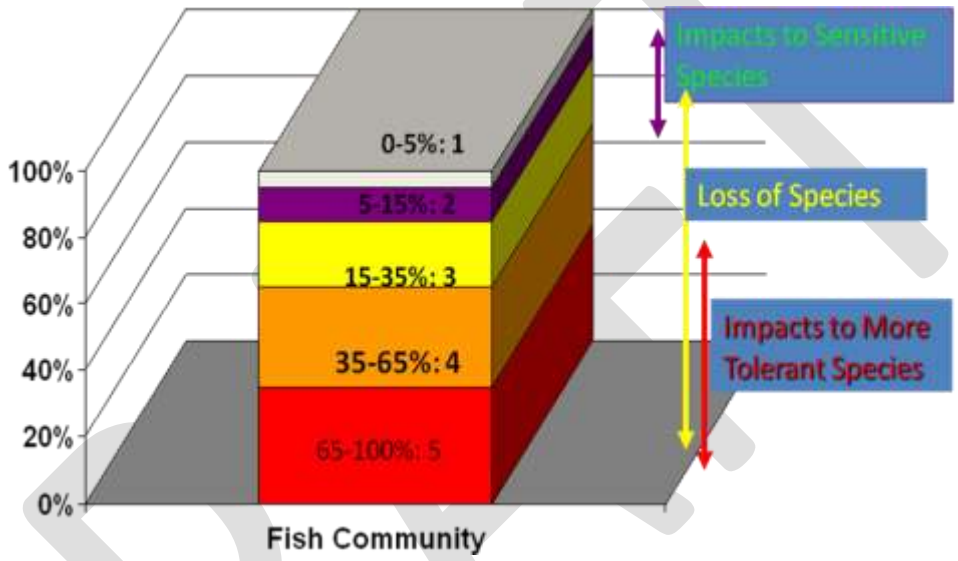

Figure 1: Fish Community Response - % Alteration of the Range of Fluvial Fish Relative Abundance

3. STREAMFLOW CRITERIA - Draft

Stream flow criteria were developed by examining the amount of flow alteration that corresponds to the boundaries between biological categories when Impervious Cover is set to a SWMI-defined background value of 1%. For August, representing the low flow summer period, the variable examined was the same variable included in the Final USGS report (2011) – the percent alteration of August median flow due to groundwater withdrawals. Under conditions of low impervious cover (1%), 3% alteration of the August median corresponded to a shift from Biological Category from 1 to 2; a 10% alteration of the August median corresponded to a shift from Biological Category 2 to 3; a 25% alteration of the August median flow corresponded to a shift in Biological Category from 3 to 4; and a 55% alteration of August median resulted in a shift from Biological Category 4 to 5. These values were then used to illustrate flow levels (see below).

The August values were then used to develop flow criteria for 3 other months to maintain the magnitude and timing of the natural flow regime through the year: October represents the fall flow period when anadromous fish are migrating out of river systems to the sea and stream flows are recovering from August lows; January represents moderate flows in the winter; and April represents the high flow spring period. The seasonal numbers illustrate that summer represents the peak of current water use and lowest stream flows, resulting in higher percentages of alteration than other seasons. In general, draft seasonal stream flow criteria for non-summer seasons was set at one flow level less (for example, January and April flow level 2 criteria are set to an August flow level 1 of 3%). October Flow Level Criteria for Flow Level 2 and 3 were set at 5% and 15% respectively, in recognition that typical October flow alterations are currently somewhat larger than alterations in January and April. Quantitative seasonal alteration criteria were not developed for flow levels 4 and 5. The qualitative criterion for these more altered areas is "feasible mitigation and improvement". For details on the methodology see Appendix D.

		Seasonal Streamflow Criteria			
Flow Levels	August Flow Level (Range of % Alteration due to groundwater withdrawal)	% allowable alteration of estimated unimpacted median flow			
		Aug	**Oct**	**Jan**	**April**
1	0 to < 3%	3%	3%	3%	3%
2	3 to <10%	10%	5%	3%	3%
3	10 to < 25%	25%	15%	10%	10%
4	25 to <55%	feasible mitigation and improvement			
5	55% or greater				
Streamflow Criteria Narrative: Existing sources in subbasins with alteration levels higher than those shown will be required to minimize existing impacts to the greatest extent feasible and mitigate additional withdrawal commensurate with impact.					

Table 3: Draft Streamflow Criteria

4. WATER MANAGEMENT ACT PERMITTING

Safe Yield and Streamflow Criteria
The total of all allocations and use within the major basin would be compared to determine whether safe yield is exceeded. In addition, more focused site-specific, smaller sub-basin scale and temporal–specific allocation decisions would be made during permitting after considering the particulars of the sub-basin, using streamflow criteria, and the permitting tiers framework outlined below.

I. Water Management Act Permitting for Groundwater
Biological Categories and Streamflow Criteria would be incorporated into the Water Management Act regulations as outlined in the Permit Review Tiers Table and the Offsets/Mitigation Table (see Tables 4 and 6). Each request for water by a water supplier or user will put the user in a Tier depending on the amount of additional water withdrawal above baseline. It will not be based on the net withdrawal (i.e., withdrawal plus up-front mitigation/returns).

Baseline: Baseline is a reference point against which a withdrawal would be compared. It is being used to define what can be considered as a new or increasing withdrawal. The proposed alternative method for defining baseline would continue to use the same years used in the existing methodology for baseline[1] in determining the new baseline. The new baseline proposal would add 5% to the higher of 2003-2005 average use, or 2005 use. Proponents may be able to add up to 8% to the 2003-2005 average or 2005 use provided it can be demonstrated that the additional increase would not result in a drop in Flow Level. If baseline is the registered volume, no additional percentage can be added. In either (5% or 8%) case, the following qualifiers are still in effect: 1) baseline cannot be lower than the registered volume; 2) baseline must be in compliance with existing permitted volume; 3) baseline cannot be more than the new twenty year demand projections. Specific criteria for such increases need to be established. Also, for PWS in multiple basins they will have separate baselines for each basin calculated as outlined above, and have a total allocation allowing no more than these two values combined system-wide increase with the additional qualifiers. If either value is exceeded, the baseline condition would be considered to have been triggered.

The WMA Permitting Tiers Table Principles: The tiers table reflects the following principles:

a. A framework is preferable for all parties as it creates more certainty and predictability.

b. For FL 4 and 5 basins minimize existing water withdrawal impacts to the greatest extent feasible*.

c. Minimize and Mitigate increased withdrawals commensurate with impact: Requests for increased withdrawals (above DEP baseline) would be expected to minimize their impacts and would be associated with increasing review and mitigation requirements, commensurate with the impact from the proposed additional withdrawal, especially in quality natural resource areas, and in Flow Levels 4 and 5.

d. Avoid backsliding out of Flow Level or Biological Category: Tiers 1, 2, and 3 reflect the principle of avoiding backsliding i.e. stay within existing flow level and biological category.

[1] Baseline is currently defined as the volume withdrawn in compliance with the Act during the calendar year 2005, the average volume withdrawn in compliance with the Act from 2003 to 2005, or the registered volume, whichever is the highest

e. Protect Quality habitats: The highest level of review is required for areas with high quality natural resources. As the amount of additional water requested increases, the impact that the withdrawal will have on certain basins, such as basins categorized as Biological Category 1, 2 or 3, and basins with cold water fisheries (see Appendix G for definition of CFR) will be more heavily scrutinized, and mitigation options to avoid and minimize the additional withdrawal will be recommended accordingly.

f. Acknowledge Existing Water Supply: Existing water supply areas i.e., subbasins in the state that are currently providing public water supply (approximately 492 small subbasins out of 1395 or 35%) are considered as critical areas. These areas are incorporated in the Water Management Act permit review and mitigation tiers table as follows:
   - Tier 1 includes communities that are not asking for more water above their baselines. Tier 1 acknowledges public water supplies as an existing use and does not require achievement of numerical streamflow criteria but, these systems would be expected to implement standard permit conditions 1-8 (see Appendix H) and to minimize existing impacts to the greatest extent feasible*. Also, if a cold water fishery resource (CFR) is present in these areas, a desktop evaluation of pumping optimization would be required to assess if the impact of the withdrawal on the streamflow in the CFR can be decreased. In a Tier 1 application, for withdrawals in a CFR area, MassDEP will consider the demonstration of healthy and abundant fish populations as favorable information during permitting.
   - Tier 4 provides the possibility of backsliding from one flow level or biological category to another, but with a higher level of review and mitigation, commensurate with the impact of the increased withdrawal. This is in recognition of the legitimate potential future water supply needs where a user may need additional water and may have no feasible alternative sources that are less environmentally harmful.

* In determining if a mitigation or offsets action is **feasible**, the following should be taken into consideration,
- Cost
- Level of improvement
- The purview that is under the authority of the permittee
- Adaptive Management

NOTE: The biological categories are based in part on a statewide model (using actual data) that has been scientifically peer reviewed and validated. However, the variables within the model are either measured from GIS large-scale overlays (impervious surface, watershed area, wetland area) or themselves modeled (August flow alteration). We recognize that there may be particular sub-basins in which the variables within the model are less certain and can be groundtruthed. Regulations which are derived from this proposal will give the applicant an opportunity to demonstrate that the model has placed a particular location in an incorrect category, and we will develop guidance on how such site specific work should be done.

II. Transition Rule for Surface Water

Recognizing that current data and tools do not allow the inclusion of precise surface water reservoir influences in estimates of monthly flow alteration, surface water withdrawal applications shall be evaluated separately from groundwater withdrawals. The following is a proposed transition rule until surface water impacts are more specifically addressed:

For withdrawal requests, applicants shall be required to comply with standard conditions 1-8. Applicants who wish to develop watering restrictions different from those described in those conditions will be required to develop a drought and demand management plan and evaluate the feasibility of implementing releases. For requests above baseline, in addition to standard conditions 1-8, mitigate impacts commensurate with impact from withdrawal (from the offset and mitigation table), in consultation with agencies and develop a drought and demand management plan and evaluate the feasibility of implementing releases.

III. Summary of Preliminary Permitting Steps
For a Community that comes to DEP with a request for additional water or a community whose permit is up for renewal –

STEP	ACTION
Step 1.	DCR develop 20-year Water Needs Forecast
Step 2.	DEP will check the volume requested against the DCR projections and the safe yield for the basin to determine whether the total of all existing permit applications and additional requests in the basin will exceed Safe Yield. For basins where current allocations (but not current use) are greater than SY, MassDEP will employ a permitting strategy that will ensure, through conditions, that use does not exceed SY through the life of the permit.
Step 3.	DEP will determine if the volume requested is greater than the DEP-established Baseline volume for the community
Step 4a.	If Baseline is not exceeded, community will refer to Tier 1 in the Tiers table; - Communities with FL 4/5 subbasins will minimize existing impacts to the greatest extent feasible - Communities with surface water sources refer to transition rule – standard conditions 1-8, drought-demand management plant, evaluate feasibility of releases
Step 4b.	If Baseline is exceeded, For Communities with groundwater sources, depending on amount of request: Small additional request but no change in BC/FL= Tier 2 Large additional request but no change in BC/FL= Tier 3 Change in BC/FL i.e. Backsliding occurs = Tier 4 For Communities with surface water sources refer to transition rule – standard conditions 1-8, mitigate commensurate with withdrawals, drought-demand management plan, evaluate feasibility of releases
Step 5.	Check if quality natural resources exist i.e. if source is in BC 1, 2, 3 or CFR area, and if so, consult with environmental agencies on mitigation requirements. Apply conditions as outlined in the Tiers table
Step 6.	Determine if any wastewater returns exist, and the volume returned
Step 7.	If Tier 2, 3, or 4 community will mitigate commensurate with impact from withdrawals – refer to Offsets/Mitigation table. Note: Amount returned through treated wastewater recharge will determine extent of mitigation.

Table 4: Water Management Act Permitting Steps - Draft

IV. Offsets/Mitigation Table and Consultation
The WMA permit tiers require mitigation of impacts commensurate with impact from additional withdrawal. The draft table below contains a menu of offset/mitigation actions within the following six different mitigation categories:

- instream flow improvement
- habitat improvement
- wastewater improvement
- stormwater/impervious cover
- water supply management, and
- demand management

Proponents able to quantify their offset/mitigation measures and demonstrate a gallon-for-gallon replacement will be presumed to satisfy the "mitigation commensurate with impact" requirement. For measures where precise quantification is more difficult, proponents will consult with the state agencies to ensure that the measures are commensurate with the impact of the withdrawal. While some of the items on the table may be more difficult to quantify, they appear on the table in recognition of the potential benefit they provide in their categories, and proponents are encouraged to consider those measures. Proponents have the option of proposing actions not on the table which would be reviewed and approved through the consultation process with the agencies.

In general, priority will be give to mitigation/improvement projects that are on-site vs. offsite and that improve streamflow conditions vs. habitat (water quality, connectivity, and geomorphology), Mitigation/improvement projects implemented within the previous 5-year period will be considered, consistent with the principles identified in this section.

Steps

The general sequence of steps is envisioned as follows:

1) Evaluate wastewater returns to determine whether any mitigation credit can be given. **("Staff still working on the details of how the wastewater will be factored in")**

   For NPDES surface water discharges, staff proposes the following as an interim approach:
   a.) Evaluation will be provided by agency staff on a case by case basis as part of permitting
   b.) GW withdrawal must be downstream of NPDES return and near the river segment that is receiving the return
   c.) Credit will be capped at 100% estimated natural August median flow or less. If a segment is surcharged beyond 100%, the additional credit above 100% cannot be applied.
   d.) The NPDES "credit" is proposed to be given AFTER flow level and permitting tiers assignment.

2) Consult offset/mitigation table to develop a proposal for one or more mitigation actions to meet remaining required mitigation measures and quantify offset/mitigation volumes, where possible.

3) Consult with agencies on proposed approach.

		FEASIBLE MITIGATION AND IMPROVEMENT		
		STANDARD CONDITIONS	SPECIAL CONDITIONS	
PERMIT REVIEW TIERS	**REVIEW THRESHOLDS**	**FLOW LEVELS 1-5**	**QUALITY NATURAL RESOURCES[A]**	**FLOW LEVELS 4 and 5**
Tier 1	No additional withdrawal request above baseline	Conditions 1-8	Conduct desktop pumping evaluation if CFR present in FL 4 and 5	Overall Concept: Minimize existing impacts to the greatest extent feasible[B] I. Evaluate the following potential actions to develop a plan based on improvement and feasibility: 1) optimization of existing resources; 2) use of alternative sources, including sources available to meet seasonal needs; 3) interconnections with other communities or suppliers; 4) releases from surface water impoundments; 5) outdoor water restrictions tied to streamflow triggers; 6)-implementation of reasonable conservation measures consistent with health and safety; 7) New England Water Works Assoc. BMP toolbox; 8) other measures that return water to the sub-basin or basin intended to improve flow. II. Implement the plan
Tier 2	Additional withdrawal request above baseline is small[C], and No change in flow level[D], and No change in biological category[E]	Conditions 1-8	Consult with agencies if CFR is present or in BC 1 to explore measures to minimize impacts to these resources, commensurate with impact from additional withdrawal to ensure that streamflow criteria are met	In addition to Tier 1 conditions, mitigate impacts commensurate with impact from additional withdrawal[F], in consultation with agencies
Tier 3	Additional withdrawal request above baseline is large[C], and No change in flow level[D], and No change in biological category[E]	Conditions 1-8	Consult with agencies if CFR is present or if in BC 1, 2, or 3 to evaluate and implement feasible mitigation[F], commensurate with the impact from the additional withdrawal to ensure that streamflow criteria are met	Demonstrate no feasible alternative source that is less environmentally harmful[G] In addition to Tier 1 conditions, mitigate impacts commensurate with impact from additional withdrawal[F], in consultation with agencies
Tier 4	Additional withdrawal request above baseline, and	Conditions 1-8	Highest Level of Review	In addition to Tier 1 conditions, mitigate impacts commensurate with impact from additional withdrawal[F], in consultation with agencies
	Flow level and/or biological category will change	Demonstrate no feasible alternative source that is less environmentally harmful[G]	BC 1, 2 or 3, or CFR evaluate and implement feasible mitigation[F], commensurate with impact from additional withdrawal, based on consultation with agencies	

A) Quality natural resources are biological categories (BC) 1, 2 and 3, and coldwater fisheries resources (CFR)

B) In determining if an action is feasible, the following should be taken into consideration: costs; level of improvement; the purview that is under the authority of the permitee, and adaptive management

C) 5% alteration of unimpacted August median flow was selected to distinguish large withdrawal requests from smaller withdrawal requests

D) Seasonal Streamflow Criteria- see Table 3

E) Biological Categories- see Table 2

F) From Offsets/Mitigation Table - see Table 6

G) ".....source that is less environmentally harmful" is defined as a source that is not in a flow level 4 or 5 (depleted), and with excess capacity where additional withdrawal would not result in backsliding to a more altered flow level (e.g., flow level 2 to flow level 3).

Table 5: Water Management Act Permit Tiers for Groundwater Withdrawals - DRAFT

CATEGORY	OFFSET / MITIGATION ACTION
INSTREAM FLOW	For surface water withdrawals downstream releases of at least August Q75 flows from May to September (w/o affecting ability to meet demands)
	For surface water withdrawals downstream releases of at least August Q90 flows from May to September (w/o affecting ability to meet demands)
	DFG-approved releases in non-summer months to support fish migration
WASTEWATER IMPROVEMENT - NEW	Additional wastewater recharge through septic or treated groundwater discharge
	I/I removal
STORMWATER / IMPERVIOUS COVER IMPROVEMENT	Recharge stormwater (through approaches such as LID, urban tree planting, etc.)
	Adopt a stormwater utility
	Adopt MS4 requirements for municipality not subject to MS4
	Implement MS4 requirements for municipality subject to MS4
	Remove impervious cover or disconnect effective impervious area
WATER SUPPLY IMPROVEMENT	Adopt an Enterprise Account
HABITAT IMPROVEMENT	Install and maintain a fish ladder
	Remove a dam or other flow barrier
	Acquire/protect water supply or high quality natural resource lands
	Replace/resize identified culverts to improve habitat connectivity
	Restore stream buffers
	Establish and/or contribute into a mitigation fund for aquatic habitat restoration
DEMAND MANAGEMENT	Adopt ban on non-essential seasonal water use
	Adopt a water bank
	Adopt bylaw to extend water use restrictions to private wells (if the community has a large number [> x%] of private wells)
	Adopt DEP-approved conservation water rates
	Increase billing frequency based on actual meter readings to monthly billing
	Install new radio-read (remote) water meters
	Reuse wastewater
	Achieve higher rates of water efficiency: 50/55/60 rgpcd
	Adopt best available technology bylaw for irrigation systems
	Provide water saving devices (faucet aerators & low flow showerheads)
	Provide rebates for watersmart appliances
	Adopt 1 day/week calendar or 0 day/week streamflow trigger
	Increase billing frequency based on actual meter readings from less than quarterly to
Other	Industrial, Commercial or Institutional Water Conservation Program
OTHER	Implement project(s) as scoped and coordinated with environmental agencies
	Additional action(s) proposed by community with points determined through the consultation process

* depending on location and amount

Note: Credits will be considered for measures implemented within the previous 5-year period. Credits will also be considered if measures were implemented previously and are still in effect

Table 6: Offset/Mitigation Actions - DRAFT

V. Application of a low-flow statistic for non-essential outdoor water use restrictions in WMA permits (Replacing existing Standard Permit Condition 6)

Concept: To increase sensitivity to streamflow impacts, consider relying on a low-flow statistic instead of the current drought advisory declaration to trigger more appropriate non-essential outdoor water use restrictions.

Background: Currently, those public water supplies (PWS) choosing to use the Calendar Trigger for implementing water use restrictions are also subject to a drought trigger that results in greater restrictions for those PWS not meeting the limit on residential water use of 65 gallons per capita per day (RGPCD) (i.e. drop from 2 days to 1 day of non-essential outdoor watering per week). The current drought trigger is based on the state's Drought Management Plan and it requires more stringent measures when a Drought Advisory or higher is declared. The current drought declaration process includes review of seven indices including monthly streamflow, ground water levels, fire danger, and crop moisture index, which can sometimes result in a drought declaration that is less responsive (i.e. slower to go into effect) than it might be if it considered streamflows alone by relying on a low-flow statistic.

Low-flow statistics: Four low-flow statistics were evaluated by SWMI staff and the evaluation concluded that the 7-day low-flow statistic (7-day LF) for a local USGS stream gage is recommended. The 7-day LF is the median value of annual 7-day low flows for the period of record for a gage.

CURRENT APPROACH

	CALENDAR		STREAMFLOW		
	starting on May 1	**If Drought Advisory Declared**	**flow above ABF**	**flow below ABF**	**If Drought Advisory Declared**
Below 65*	7 days, no 9 to 5	7 days, no 9 to 5	7 days, 24hrs	7 days, no 9 to 5	7 days, no 9 to 5
Above 65*	2 days, no 9 to 5	1 day, no 9 to 5	7 days, 24hrs	1 day, no 9 to 5	1 day, no 9 to 5

PROPOSED ALTERNATIVE**

	CALENDAR		STREAMFLOW		
	starting on May 1	**Low Flow Trigger activated*****	**flow above ABF**	**flow below ABF**	**Low Flow Trigger activated*****
Below 65*	7 days, no 9 to 5	1 day, no 9 to 5	7 days, 24hrs	7 days, no 9 to 5	1 day, no 9 to 5
Above 65*	2 days, no 9 to 5	1 day, no 9 to 5	7 days, 24hrs	2 days, no 9 to 5	1 day, no 9 to 5

Table 7: Outdoor Water Use Restrictions – Current and Proposed Approaches

*Based on reported RGPCD from previous year annual statistical report

**Surface water suppliers with a DEP-approved drought management plan that includes environmental considerations shall implement restrictions based on those approved in that plan. Those with existing permit conditions requiring water use restrictions more restrictive than those proposed above may be required to maintain existing permit conditions.

*** Proposed low-flow trigger is annual 7 day low-flow, calculated from period of record for local gage

VI. Redundant Wells

To facilitate public water system development of "redundant" sources that address public health and safety concerns or provide environmental benefits through optimization.

Definition

This permit applies only to registered-only users seeking to develop a redundant well. To be considered a redundant well the source must either address a particular public health and safety concern (and not cause any additional environmental impact) or provide a net environmental benefit and does not increase overall withdrawal volumes. A redundant well is not a replacement well as defined by Chapter 4 of the Drinking Water Guidelines. Redundant wells must be located within the subwatershed (defined at the Hydrologic Unit Code 12 scale (HUC-12)). Redundant well permit applications shall be reviewed and implemented under the Water Management Act in the manner described below.

Implementation

Applicants for redundant wells will need to complete the standard required elements of the Source Approval Process and Water Management Program as outlined in Chapter 4 and Chapter 10 of the Drinking Water Guidelines. The information necessary to complete the Source Approval process addresses many of the issues considered in the Water Management Permit application process. Included in this review will be an evaluation of the redundant well's compliance with the streamflow criteria and its ability to improve the streamflow impacts of the applicant's existing authorized sources. These reviews occur concurrently and, as such, Water Management Act permit applications must be submitted at the same time as the Source Final Report. During the Water Management application review process the project proponent shall make a demonstration that the redundant well is necessary to address public health and safety concerns (and will not cause any additional environmental impact) or provides a net environmental benefit.

Conditions to address site specific environmental concerns identified in the permit process may be applied to redundant wells as necessary, as has historically been done in Water Management Act Permits. The volume of withdrawals from the redundant well in combination with the existing wells shall not exceed the three year rolling annual average of withdrawals from the registered source(s) within the HUC 12. The three year rolling annual average shall be determined based on the three calendar years preceding the date of application for a redundant well.

This permit applies only to registered users seeking to develop a redundant well moving forward. Existing permittees with sources that may now be considered redundant and with no additional volumes allocated in their permit will continue to be subject to the system-wide conditions included in their permit now or as amended.

[1] MassDEP is considering modification of Chapter 4 of the Guidelines and Policies for Public Water Systems to facilitate siting of replacement wells. A well that is installed within 50-500 feet of an existing well may be permitted as a replacement well project, which receives a simplified Source Approval permitting process, as described in Section 4.15 of the Guidance.

5. PILOT APPLICATION OF SWMI

Goal

The goal of the pilot analyses is to evaluate how the SWMI framework will be applied to a diverse and select group of communities so that opportunities and costs of potential actions will be better known to the communities and agencies. The process of developing regulations will occur on a parallel track. As the regulations will codify how the SWMI framework will be implemented, the pilot analyses can inform and guide their development.

Proposed Pilot Communities

SWMI staff proposes to identify communities for the pilot and will include representatives of the communities as the pilot commences.

Scope of the Pilot

The scope of the pilot should address:

I. Are the variables in the model properly estimated for the local conditions? What additional information would be helpful to gather?
II. What will minimization and mitigation look like for different permitting scenarios?
III. What are the costs associated with minimization and mitigation?
IV. What are the benefits achieved by minimization and mitigation?

Proposed Analyses to Provide to Towns

- Provide WNF 5-year permit block allocations and 20-year projection volume with buffer
- Determine DEP Baseline volume
- Determine Biological Category and Flow Level at start and end of 20-year WMA permit. If data are available, SWMI staff will run the stream deplete function in SYE to provide additional information on flow level.
- Determine expected WMA Permit Tier for the 20-year permit.
- Estimate point in 20-year permit when community is expected to go over baseline if applicable. (Communities below baseline are expected to implement DEP WMA standard permit conditions 1 through 8. Those with sources in flow levels 4/5 are expected to minimize existing impacts to the greatest extent feasible and plan for mitigation if projections indicate they will exceed baseline within the 20-year permit timeline. Communities above baseline are expected to mitigate impacts commensurate with impact from additional withdrawal.)
- Evaluate treated wastewater returns
- Evaluate minimization options (Items 1-7 from Tier 1, Table 4)
- Evaluate mitigation options (from the Offsets and Mitigation Table, Table 6)
- Conduct desktop pumping evaluation if CFR present

In addressing the issues above, the Pilot may also consider the following questions, as appropriate:

1. Are the flow alteration, impervious surface, and other variables calculated correctly or appropriate for the basin? For example, if your water use does not follow the annual demand curve generated by USGS, your actual August alteration might be lower or higher than the estimate.
2. Do USGS indicators and SYE accurately determine flow conditions and thus flow levels in a given stream?
3. Is flow data available at local locations?
4. What are current and expected water withdrawals in a sub-basin and what impacts are they anticipated to have on flows?
5. What is the baseline for this town/system?
6. What are the upgradient and downgradient withdrawals?
7. Do the actual current return flows match the permitted amounts?
8. Are there current flow returns to the sub-basin or basin that are not captured by flow models?
9. What does a desktop pumping evaluation look like and cost? Who will be reviewing the desktop pumping evaluation?
10. What would a plan to minimize existing impacts look like and cost?
11. What streamlining or incentives could be offered to a permittee who comes forward with a plan to offset the impacts of proposed withdrawal at the time of permitting?
12. What decision making would go into determining feasible measures to minimize existing impacts?
13. What would a plan to offset impacts of new withdrawals look like? Look at and costs and benefits.
14. How would new safe yield determination impact permitting?
15. How are the WMA factors balanced in the permitting framework? (including economic development considerations)
16. How valuable is the subbasin for water supply? (consideration of the Public Water Supply Metric)
17. Who are community interests involved in the process and how is their input incorporated?
18. How would the low flow metric impact permitting and implementation of water use restrictions?
19. What would the environmental benefit of the low flow metric be?
20. What would the cost impacts of the low flow metric be on ratepayers?
21. What would measures and feasible mitigation to minimize impacts to CFR, and Biological categories 1, 2 or 3 look like and cost?
22. How would a system demonstrate no feasible alternative source that is less environmentally harmful and what would that cost?
23. How would costs, level of improvement, purview under authority of the permitee and adaptive management be applied to determining feasibility?
24. How can "water banking" play a role in water resource management?

6. INCENTIVES

Background
EEA and its agencies propose to facilitate the implementation of the Sustainable Water Management Initiative through the use of financial incentives.

Role of Incentives
Incentives will provide communities or water suppliers with assistance to implement measures that are otherwise costly and that can motivate implementation of other measures that support sustainable water management and aquatic habitat - such as removal of a dam that is not used for a water supply reservoir.

Types of Incentives:

I. **Potential Mitigation Financing Sources**: EEA and its agencies agree with the SWMI Advisory Committee that it would be most desirable to identify sources of funding to support implementation of SWMI related projects, such as habitat or streamflow improvement and mitigation. EEA will work to identify possible new sources of funds for this effort. EEA will also work with the Legislature to include authorizing language for capital expenditures in a future version of the Environmental Bond Bill.

   Even without a source of new funding, there are numerous existing sources of funding that could be used to incentivize implementation of certain practices or projects by municipalities or water suppliers.

   FY12: Up to $960,000 potentially available for SWMI

II. **Go-With-The-Flow:** EEA and its agencies support the concept of the Go-with-the-Flow program, proposed to the SWMI Advisory Committee by Massachusetts Water Works Association. Ideally, the program would be modeled after the Commonwealth's Green Communities Program with eligibility requirements for participation and funding for participants to implement measures that protect, enhance and restore rivers and streams in Massachusetts. Alternatively, the program could use a preferential scoring system to direct funding to those municipalities or water suppliers who meet specific criteria. This is similar to the past practice of using Commonwealth Capital scores in the awarding of MA grants and loans. A short description of the Go-With-the-flow Program follows.

"Go with the Flow Program" Proposal

Background:
Go with the Flow (GWTF) was proposed to the Sustainable Water Management Initiative's (SWMI) Policy Committee by Massachusetts Water Works Association. A subset of the Tools Implementation Subcommittee was tasked to meet and discuss the merits of such a program. The subgroup met several times during November and December 2010 to discuss the details and was in agreement that GWTF should be pursued further. The program would be modeled after the Commonwealth's very successful Green Communities Program and the concept is to develop an incentive based program to protect, enhance and restore rivers and streams in Massachusetts. There would be certain eligibility requirements for communities to meet; suggested criteria include passage of a low impact development bylaw and development of an integrated water resources management plan (IWRMP). Once approved by the agencies, a community would attain GWTF status. The community would be required to implement certain measures every five years to maintain its eligibility and in return for being a GWTF community, it would be eligible for financial incentives (e.g., access to grant funds) and/or relief from certain regulatory requirements (e.g., extended compliance timelines for WMA permit conditions).

Possible measures that might be selected by Communities to maintain their GWTF status include:

Sustainable Water Management: Develop and implement a regional cooperative water resources plan with other municipalities sharing subwatershed resources; measurably reduce inflow/infiltration within wastewater collection systems; fund a water resource coordinator position; establish Aquifer Protection Overlay Districts within the community and/or regionally with neighboring communities as aquifer boundaries require; implement recommendations of approved IWRMP.

Flow: remove a dam; manage an impoundment to improve downstream flow regimes and improve aquatic habitat; implement stream channel modifications to improve aquatic habitat; abandon use of an existing, streamside well by ongoing conservation measures or replacement with one having less impact; install and maintain or take over financial costs of a stream gage suitable for inclusion in USGS/Massachusetts network; construct storage reservoirs to manage water by capturing high flows to reduce flooding and releasing waters during low flow periods to improve streamflow (include management plan with reservoir development).

Water Quality: through partnerships advance implementation of BMP's with agricultural communities; implement measures to address site specific water quality issues such as nutrients, sediment and invasive plants through in-lake treatment or watershed based BMP's.

Stormwater: reduce effective impervious area; install and manage stormwater management structures to treat stormwater and recharge (scale to be determined); incorporate enhanced stormwater recharge design into road improvement projects; retrofit an existing development with LID structures.

Open Space Protection: purchase and permanently protect as natural open space land that includes recharge areas or riparian corridors.

Possible Financial Incentives Include:

- A dedicated grant program open to approved GWTF communities
- Preferential access to existing loan/grant programs such as: SRF; Water Conservation Grants; Drinking Water Supply Protection Grants; Section 319 Implementation Grants; Section 604b Assessment Grants; Massachusetts Environmental Trust (pending approval of the MET Board); and other energy related grants for water, wastewater and stormwater funding programs.
- More favorable interest rates for SRF loans for eligible projects.