East Lyme Commission for the Conservation of Natural Resources
Special Meeting Minutes
Wednesday, September 20, 2017

Present:	Arthur Carlson, Chairman Penny Heller, Secretary Laura Ashburn, Alternate (*seated*)
Absent:	Mark Christiansen, Member Don Danila, Member Marvin Schutt, Member Ron Nichols, Alternate

Selectwoman Rose Ann Hardy, Ex-Officio

FILED
Oct 2 2017 AT 12:00 AM/PM
EAST LYME TOWN CLERK

CALL TO ORDER
Chairman Carlson called the September 20, 2017 Special Meeting of the East Lyme Commission for the Conservation of Natural Resources to order at 7:00 p.m.

Motion (1): Motion made by Chairman Carlson, seconded by Commissioner Heller, to seat Alternate Member Commissioner Ashburn. Discussion: None. Voice vote, 2-0, all in favor. Motion carried.

I. PUBLIC DELEGATIONS – *none*

II. MINUTES

A. Minutes of June 14, 2017

Motion (2): Motion made by Chairman Carlson, seconded by Commissioner Heller, to approve the June 14, 2017 Regular Meeting Minutes of the Conservation of Natural Resources Commission, as presented. Discussion: None. Voice vote, 3-0, all in favor. Motion carried.

III. NEW BUSINESS

A. Goodwin Trail

After considering the opinions of individuals involved in the creation of the Goodwin Trail, Chairman Carlson has agreed, and the Commissioners concurred, to rename the Partners Trail to the Carlson Trail. Chairman Carlson will create a written account of the Trail. A blue and white sign will be made to mark the Trail.

Motion (3): Motion made by Commissioner Heller, seconded by Commissioner Ashburn, to change the name of the trail from Partners Trail to Carlson Trail. Discussion: The Carlson Trail will run from Whistletown Road into the Goodwin Trail. Voice vote, 3-0, all in favor. Motion carried.

B. CT State Water Plan

The Executive Summary included in the Final Draft Report of the Connecticut State Water Plan in June 2017 was submitted for the record. The Summary includes Background Information, Goals, Key Findings and Recommendations, and Steps and Plans for the Future.

IV. OLD BUSINESS

A. Continuation of Water Study

Chairman Carlson proposed that the following additional materials be included in the Water Study:

- An article entitled, "Liquid Assets", from Summer 2017 issue of the *Nature Conservancy* Magazine, which concentrates on the theme, the *Blue Revolution: Rethinking Water on a Thirsty Planet*. The article refers to five (5) large cities — São Paolo, Brazil; Nairobi, Kenya; Albuquerque, New Mexico; San Antonio, Texas, and; Savannah, Georgia — that are investing in upstream conservation in an effort to improve the water quality. The article addresses the need for those who utilize the water to invest in the protection and preservation of that land.
- He also suggested hosting lectures and meeting with Health/Environment/ Energy Reporter Judy Benson, *The Day* Newspaper, to discuss their plans and promote the lectures where they would distribute supporting materials.
- *Cost of Community Services* Report, published in 2013, the author of which should be invited to present a lecture.
- Map indicating the flow of water in the Town
- East Lyme's Survey Results
- Data indicating the amount of salt in the wells – the maximum amount of salt that can be included in the drinking water, legally and/or medically, if any, will be determined.
- Some of the Rules and Stipulations of the Quabbin Reservoir, one of the largest man-made unfiltered water supplies in the United States, to reflect the attention of detail of the State of Massachusetts in their efforts to preserve and protect their resources.
- A section from *The Geology of North America: Hydrology* regarding the significant hydrogeological features and its susceptibility to contamination.

A list of general questions was also provided for future discussion. With the bulk of the materials in line, the Commission will finalize the basic framework and create an outline for the Study and the sections will be divided and assigned to the members.

V. REPORTS AND COMMUNICATION

A. Communications – *none*

B. Agribusiness Subcommittee

Commissioner Heller reported on the Agribusiness Subcommittee for Commissioner Christiansen, who was unable to attend due to the Agribusiness Subcommittee meeting. She presented the amended language to the Regulations to allow local farms to open their property for various public events (*see file copy*). The amended language includes the maximum capacities in relation to the size of the farm, allowances for amplified music, maximum number of events per year, and timeframe within which the events may be held. Upon approval, the permit is valid for one year. The Zoning Commission's Subcommittee has reviewed and approved the draft amendment.

Motion (3): Motion made by Chairman Heller, seconded by Commissioner Ashburn, to accept and endorse the "Draft: Farm Text Amendment 9-20-17" and send the item to the Zoning Commission for review and approval. Discussion: None. Voice vote, 3-0, all in favor. Motion carried.

A very successful Open Farm Day was held with each of the farms being attended by approximately 100 guests. The event could have been even more successful but, due to the Police Department closing the parking lot to the Black Hawk Fishing event, many of the guests were turned away. The Police will be notified in the future regarding the nature of the event, which involves the constant coming and going of guests throughout the day.

East Lyme Bike & BBQ Event Flyers have been distributed on vehicles throughout New Haven.

Commissioner Heller announced that Tom and Nancy Kalal will be hosting a free Open House event titled "WILD ONES: Tour of Sustainability in a Small Farm Operation", sponsored by the Connecticut College Arboretum, on October 14 from 11:00 a.m. to 1:00 p.m. A potluck lunch will follow the tour. Registration is required. The Opening Day of Oswegatchie Hills Nature Preserve, where a ceremony honoring Marvin Schutt and Mike Dunn, will be held the same day from 9:00 to 10:00 a.m. with organized hikes to follow.

She also reported that she, along with Commissioners Danila and Nichols, will be conducting RBV testing at three additional sites, including Cranberry Meadow, in October. The State has requested that the testings take place at pristine sites.

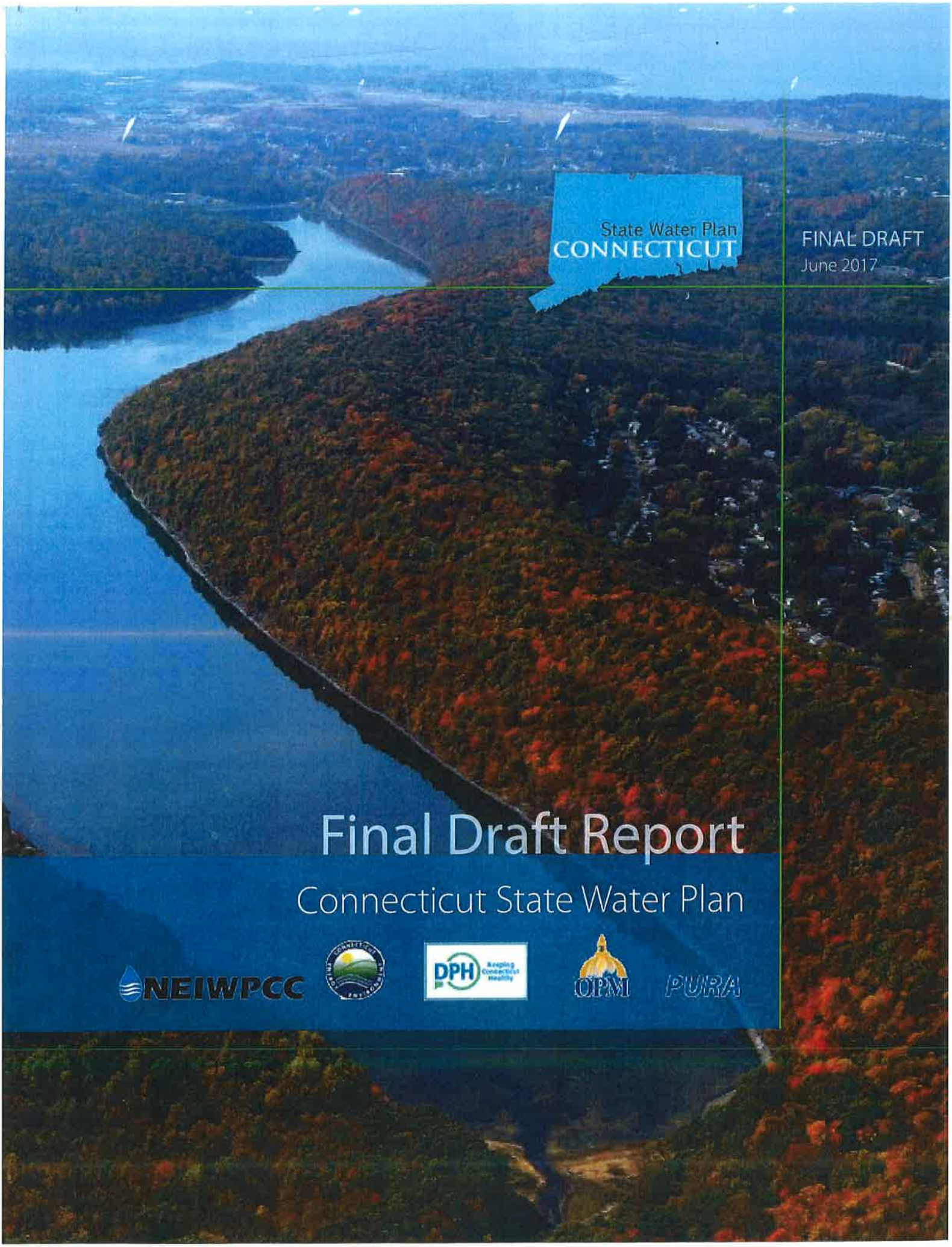
B. Chairman's Report – *no report*

C. Ex-Officio Report – *not present*

VI. ADJOURNMENT

Motion made by Commissioner Ashburn, seconded by Commissioner Heller, to adjourn the meeting at 8:06 p.m.

Respectfully Submitted by:Agnes Miyuki, Acting Recording Secretary for the Town of East Lyme



FINAL DRAFT
June 2017

Final Draft Report

Connecticut State Water Plan

NEIWPCC DPH OPM PURA

This report was prepared by CDM Smith and subconsultant Milone & MacBroom.

For more information, please visit ct.gov/water

Executive Summary

State Water Plan
CONNECTICUT

Preview and Summary

This State Water Plan has been prepared to help planners, regulators, and lawmakers make decisions about managing Connecticut's water in a manner that is consistent throughout the state with stakeholder-defined principles and available scientific data. The Plan in and of itself is not the solution to Connecticut's water issues, but it is a collection of scientific information, policy recommendations, and forward-looking steps that should help frame future water management laws, regulations, and resolution of specific local issues.

This is the first time that Connecticut has had so much scientific information about water consolidated in a single document (one of the goals from the outset). Furthermore, it is the first time that the collective will and objectives of stakeholders representing water interests in all sectors has been formulated as consensus-based policy recommendations. These two facets of the Plan, its consolidated scientific information and its expression of broadly agreeable policy directives, should serve as the platform for ANY future water management decision in the State of Connecticut.

Connecticut has long enjoyed plentiful water resources to meet its needs for drinking water, industry, environmental health, agriculture, energy, and recreation. The State's drinking water sources are among the highest quality in the United States, and new regulations to protect flow for aquatic habitat represent steps toward improving the balance between water that is used outside of its natural environment and water that remains in its natural environment. However, with the pending influence of climate change, new information on ecological flow needs, and economic trends, this good fortune will continue only if the water in the State is managed wisely and consistently in the future. This Plan will help provide such a platform for future water management decisions.

While the Plan contains hundreds of specific recommendations and ideas, it can best be summarized by its five most important points, as determined in collaboration with the Water Planning Council:

1. **PLAN FUNCTION:** The information in the Plan is not an answer, but a consistent platform for decision making based on sound science, guiding principles, and clear roadmaps. If the Plan is used thoughtfully by law-makers, regulators, and planners, and with the interpretive guidance and recommendations from the Water Planning Council, future water management decisions can be consistent, defensible, and broadly aimed at statewide stakeholder objectives.

2. **MAINTAIN HIGHEST QUALITY DRINKING WATER:** Connecticut leads the nation in reserving only the highest quality water (Class A) for drinking water purposes – no other state does so as consistently. The Plan reaffirms the state's dedication to this high standard into the future through both water and land protection.

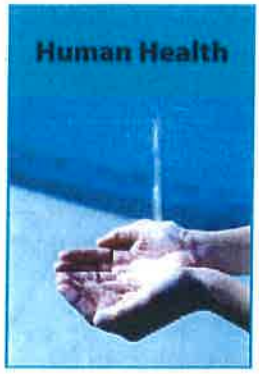
3. **BALANCE:** As discussed below under "Goals of the Plan," the overarching goal of the State Water Plan is to "Balance the use of water to meet all needs." Many river basins in Connecticut have plentiful water, but many others cannot satisfy current needs (instream needs such as ecological health, recreation, and aesthetics, and out-of-stream needs requiring withdrawals) during droughts or even during typical summer conditions. The Plan enhances awareness of both instream and out-of-stream water needs and the necessary balance between them, and offers many ideas for improving this balance. Further planning is needed, however, to formulate equitable response plans to existing and future pressures such as drought, climate change, development, and water diversions.

4. **CONSERVATION:** While Connecticut leads the nation in protections of drinking water quality, the State lags in its water conservation ethic. Many utilities have already taken steps to promote conservation, and EPA's WaterSense program have resulted in a long-term trend of declining water use in Connecticut, but key to preserving the integrity of high quality drinking water into the future is an increased awareness among consumers of its value and vulnerability. Outreach, therefore, including an understanding of the economic impacts of water conservation and the vulnerability of high quality water to climate, is one of the most important recommendations in this Plan.

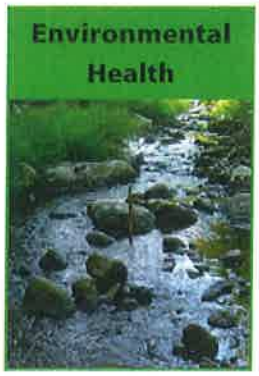
5. **MAINTAIN SCIENTIFIC DATA:** The plan advocates for the collection and use of scientific information that will help fill data gaps and aid in future planning, and the preservation of ongoing data collection enterprises, such as USGS streamflow gaging and water use reporting. The Plan also advocates for centralized access to available water-related data via a single portal.

What Does the Plan Mean by "Balance"?

Item #3 above in the list of the five most important points is based on the overarching goal defined by stakeholders, that the Plan should help improve the balance of water use in Connecticut. During the planning process, this was frequently interpreted to mean the balance of uses that rely on the removal of water from its natural environment (withdrawals, diversions, etc.) and those that require water to remain in its natural environment (for aquatic ecology, recreation, and aesthetics). Most of the information in the Plan, then, is based in part on this principle of balance, and is extended to use the familiar planning tool of the "Triple Bottom Line," where alternatives or decisions are evaluated based on their social, environmental, and economic factors. The paragraphs below help explain exactly how (and where) the Plan strives to improve this balance by promoting human and environmental health, with focused awareness of economic impacts and opportunities.



The Plan focuses significant attention on the preservation of high quality water for public health. Specifically, it strongly reaffirms the state's commitment to using only Class A water (the highest quality water occurring naturally) for human consumption (Section 5.2.3.11). The Plan also endorses land protection measured for both surface water bodies and groundwater aquifers so that this high quality of drinking water can be preserved into the future (Section 5.2.3.1). It is important to note that these land protection measures were deemed to be among the Top-Ten policy recommendations in the Plan. Also among the Top-Ten policy recommendations are three sets of measures aimed at increasing the availability of Class A water in the future, or at least reducing the impact of expanded dependence upon it. The first is increased conservation practices throughout the state, following the example already established by many water utilities (Sections 5.2.3.3 and 5.3.2.1). Second, the Plan recommends that Class B water be considered more routinely for non-potable uses in the future, thereby reducing the consumptive use of Class A water for uses that could be lawfully satisfied with other sources (Section 5.2.3.11). Third, the Plan recommends progressive agricultural practices to help reduce impacts of irrigation on other water needs (Section 5.2.3.6). If these recommendations are codified into policy, laws, and/or regulations, the State of Connecticut will have taken important steps toward securing the highest quality of drinking water in the United States for its citizens well into the future. These steps should be accomplished with the understanding that competing needs for water exist in almost every basin in the state, and that the state's new regulations for reservoir releases to support ecological needs downstream of water supply reservoirs can limit the availability of Class A water for future drinking water needs. The steps recommended here to preserve, protect, and enhance Connecticut's Class A water supply sources would be an effective step in balancing human health with environmental health.



The Plan sheds a great deal of light on new information concerning ecological flow needs in streams throughout the state. In addition to the state's new regulations on Minimum Streamflow Requirements downstream of certain reservoirs, which the Plan endorses in Section 5.2.3.8, the Plan focuses new attention on estimated flow requirements throughout each basin in order to help maintain good ecological health (see Sections 2 and 3, and the Basin Summary Sheets in Appendix E). While the Plan does not recommend that the estimated ecological flow needs be used in a regulatory context beyond the existing Minimum Streamflow Requirements, the Plan does recommend that they be further studied in order to determine potentially allowable variances during periods of drought, and to better understand the impact of maintaining instream flow on water supply yield, margin of safety, and cost (Section 5.3.2.11). It should also be noted that the estimates of ecological flow needs are necessarily generalized at the regional basin level, and specific needs in local reaches would require further study. The Plan further emphasizes the need to preserve environmental health by encouraging the state to render unused diversion registrations (or certain unused portions of registrations) obsolete, thereby protecting water bodies from future increases in withdrawals beyond what is already expected and planned for (Section 5.2.3.7). Also, the conservation initiatives discussed above, in addition to promoting the future adequacy of Class A water supply for human health, will also help ensure that more flow can remain in the streams to satisfy environmental needs (Sections 5.2.3.3 and 5.3.2.1). From a water quality point of view, the Plan recommends certain land management practices aimed at preserving or improving water quality throughout the state (Section 5.2.3.2). While many

of the environmental aspects of the Plan focus on ecological needs, "environmental health" is more broadly addressed in the Plan as the protection of aquatic habitat *and* the protection of natural resources, both land and water, on which human and non-human life depend. With the endorsements in the Plan noted above, the new information on ecological flow needs throughout the state, and recommendations on how to promote improved instream flow and water quality conditions, the State will have taken important steps toward balancing human and environmental health.

The Plan does not specifically aim to increase economic growth and development, but its recommendations do strive to create awareness of the potential economic impacts associated with water management decisions, and also serve as a platform to indicate where water may be plentiful enough to support future economic growth, and it may be wise to review the basin summary sheets and in Appendix E and individual municipal/utility water supply plans with the Connecticut Economic Resource Center (CERC). It also provides a documented basis for implementing progressive water management strategies only where it makes economic sense to do so. Recommendations for better understanding economic impacts of water management are included in Section 5.3.2.5. This section discusses the possibility of an evaluation that compares the implementation of the Plan to NOT implementing the Plan, using either purely financial metrics, or applying Triple Bottom Line methods (social, environmental, and economic), following the example of this section. The Plan also recommends that the WPC determine if there is a consistent way to associate financial value of water for the needs represented in the Plan (including recreational and environmental) and the different types of utility ownership throughout the state. This section also recommends partnerships with Sustainable Connecticut and colleges and universities to address these informational and analytical needs, and concludes by recommending that the WPC formulate a template such that all water-related proposals offered for legislative consideration are accompanied by a consistent financial analysis. In other areas of the report, the Plan recommends that specific economic impacts associated with policy recommendations or next steps be considered. Section 5.3.2.11 recommends that the WPC study the financial impacts of regulatory reservoir releases associated with Minimum Streamflow Requirements. Section 5.3.2.7, which recommends consideration of Class B water for non-potable uses, clearly states that current any potential uses (new or conversions) should be evaluated for cost-effectiveness, and that case studies should be developed to better understand the potential costs (or cost savings) of infrastructure and treatment. Section 5.3.2.2 makes similar recommendations with respect to the possible case-by-case evaluations of regionalizing water systems. Likewise, Section 5.3.2.1 recommends further examination of the economic viability and potential benefits of conservation incentives and changes in billing frequency.

Background

On July 1, 2014, Public Act 14-163, "An Act Concerning the Responsibilities of the Water Planning Council," became effective in the State of Connecticut. The Act directs the state's Water Planning Council to develop a State Water Plan in accordance with 17 specific requirements:

"Not later than July 1, 2017, the Water Planning Council, established pursuant to section 25-33, as amended by this act, shall, within available appropriations, prepare a state water plan for the management of the water resources of the state."

The Water Planning Council (WPC) is comprised of representatives of the four state agencies with oversight or regulatory responsibility for water management:

- Department of Energy and Environmental Protection (DEEP)
- Department of Public Health (DPH)
- Office of Policy and Management (OPM)
- Public Utilities Regulatory Authority (PURA)

The WPC responded to Public Act 14-163 by reviewing methods by which other states had developed statewide water plans, evaluating current practices, future challenges, and opportunities within Connecticut's water management framework, and focusing the work of its Policy Committee, Science and Technical Committee, and Advisory Group on the elements and outline of the Plan. In May of 2016, the Water Planning Council, acting through the New England Interstate Water Pollution Control Commission (NEIWPCC), contracted with CDM Smith and subconsultant Milone and MacBroom to provide professional consultation and facilitation services throughout the development of the Connecticut State Water Plan (the "Plan").

Historically, Connecticut has enjoyed a bountiful supply of fresh water to meet the needs of households and businesses, agriculture, the

Requirements of the State Water Plan

1. Identify the quantities/qualities of water available
2. Identify present/projected demands for water
3. Recommend utilization of water resources to balance public water supply, economic development, recreation and ecological health
4. Recommend steps to increase the climate resiliency of existing water resources and infrastructure
5. Recommend technology and infrastructure upgrades, interconnections and/or major engineering works
6. Recommend land use and other measures to ensure the desired water quality/abundance and promote development in concert with available water resources
7. Take into account desired ecological, recreational, agricultural, industrial and commercial use of water bodies
8. Inform state residents on the importance of water resource stewardship/conservation
9. Establish conservation guidelines/incentives for water conservation with energy efficiency consideration
10. Develop a water reuse policy with incentives for matching the water quality to the use
11. Meet data collection and analysis needs to provide for data driven decisions
12. Account for the ecological, environmental, public health/safety and economic impact implementation will have on the state
13. Include short and long-range objectives/strategies to communicate and implement the plan
14. Incorporate regional and local plans/programs for water use and management
15. Promote intra-regional solutions and sharing of water resources
16. Develop and recommend strategies to address climate resiliency
17. Identify modifications to laws/regulations necessary in order to implement recommendations

environment, energy, and industry. According to a report on a Situation Assessment[1] from 2015:

> **"According to a water allocation model done in the 1980s, less than 20% of water is used for actual consumptive use. Per person usage has declined dramatically in the recent past, possibly due to water-efficient appliances, conservation, and consciousness of water usage. However, some suggested that peak water usage associated with turf or lawn watering is increasing."**

While Connecticut has historically enjoyed plentiful, clean water, unique factors in the state have combined to warrant an evaluation of water management options in the future:

- The recent drought in 2016 raised awareness, even in Connecticut, river basins can become depleted.
- Connecticut is the only state in the U.S. that prohibits wastewater discharges to drinking water sources, preserving our highest quality waters for drinking (Class A). This maximizes health benefits and minimizes treatment costs. This could, however, limit future drinking water sources.
- New state streamflow requirements downstream of water supply reservoirs are highlighting the ecological need for water, which must be balanced with other water needs.
- Future climate trends in the northeast are uncertain, and planning for adaptation is essential.

It is because of these unique characteristics and uncertainties that a State Water Plan is needed for Connecticut. Ensuring that all needs for water in the future are satisfied involves focusing on new and emerging challenges.

1 Situation Assessment in Support of State Water Planning Workshop, Podziba Policy Mediation, June 25, 2015.

Goals of the Water Plan

The overarching goal of the Plan, as defined by participating stakeholders in the first workshop of the planning process, has been to "Balance the use of water to meet all needs." More specifically, the goals included protection of public health and quality of life, protection of the environment, cost-effective water management, preparation for uncertain future climate conditions, reliance on science and data, and inclusion of Connecticut citizens in water management. **Phrased together, the Plan aims to protect water quantity and quality for all of its current and future uses when regulations, climate, and economic conditions are changing. To do so, it provides technical information and policy recommendations to help inform legislative and regulatory decisions.**

The Plan does **not** attempt to prioritize any particular water use or water use category over others; that is, instream needs and out-of-stream needs are not prioritized but are accounted for in each basin's ability to provide for these needs with naturally available water. Likewise, the value of specific uses of water, if currently authorized by state policies and law, are neither advocated nor diminished relative to other uses. Instead, the Plan provides technical information and guiding principles that may be used to inform decisions across the state on a case-by-case basis, or in the form of future legislation.

Stakeholder-Defined Goals for the State Water Plan

- Provide reliable and resilient supply for all uses
- Promote public health and quality of life with high quality water
- Protect the Environment
- Manage water cost-effectively for all uses
- Develop an implementable plan
- Prepare for uncertain future climate
- Use science and data to recommend action
- Involve Connecticut citizens in water management

In compliance with the statute authorizing the Plan's development, the Plan aims to satisfy all 17 requirements as specified. Some of these are accomplished fully in this report itself, while others can only be satisfied with ongoing collaboration, scientific evaluations, etc. At a minimum, the Plan provides information and a framework to move forward to address each of the 17 requirements in the State Statute. See Section 1.4.2 of the report for a comprehensive discussion of these requirements and how the Plan addresses each one.

Future Water Management Options to help Achieve Plan Goals

Policy and Planning Options

- Land use practices and protection
- Water conservation, incentives, rate structure
- Incorporation of existing local and state plans (i.e., water supply, energy, land, conservation)
- Regionalization of water supply and appropriate interconnections
- Identify funding mechanisms for Plan implementation and updates
- Develop monitoring plan for Plan implementation
- Statewide drought planning and mechanisms to enforce water restrictions
- Future Class B water for non-potable uses
- Water use accounting
- Ground water and private well monitoring and protection

Technology Options

- Technology and facility improvements / replacement
- Water reuse and greywater use
- Wastewater management
- Stormwater management
- Desalination
- Flood management
- Leak detection
- Real-time flow monitoring

Regulatory Options

- Address registered diversions
- Implement instream flow regulations
- Changes to laws / regulations

Outreach Options

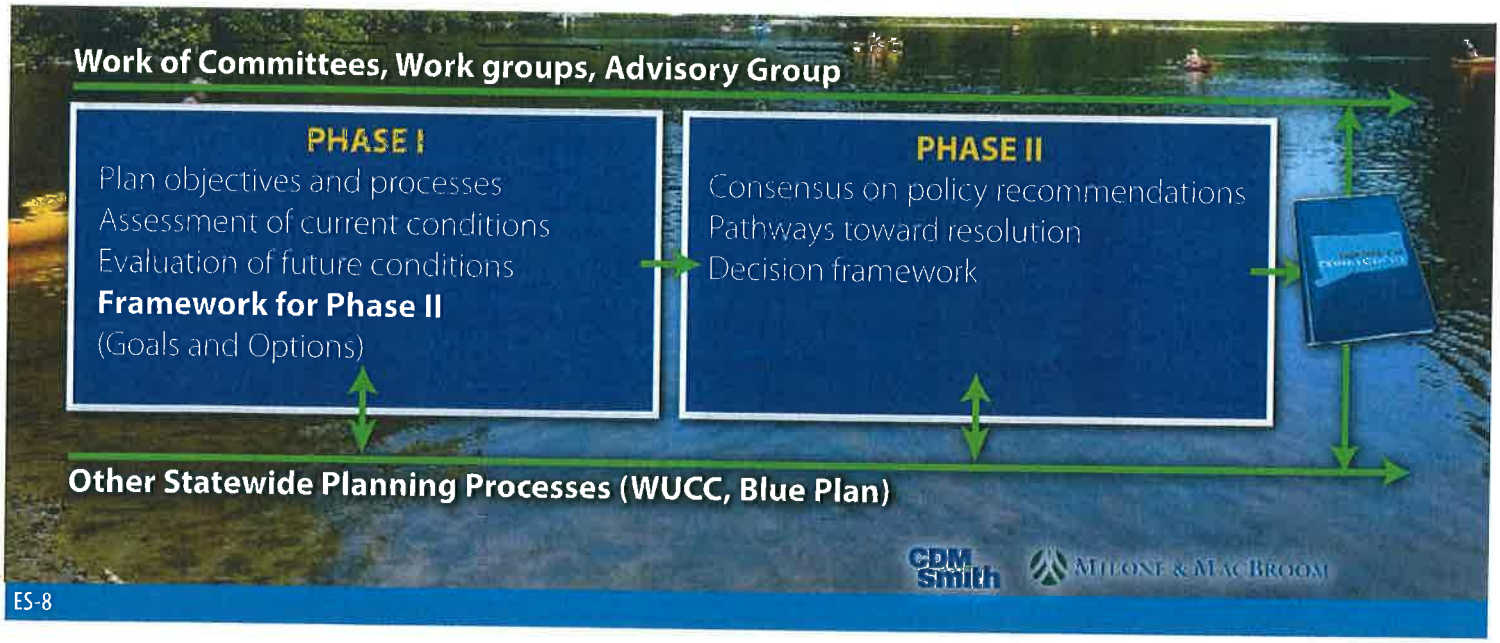
- Public education (short and long term goals)

What the Plan Contains and Does Not Contain

This report is the final report of the Plan development process, and will be turned over to the WPC to finalize it by December 31, 2017. As such, it contains the following:

- Overview of the Goals and Planning Process (Sections 1 and 4)
- Current Condition Assessment (Technical and Policy – See Section 2)
  - Current water use patterns and natural water availability
  - Current water quality
  - Current water policies and management structure
  - Assessment of land conservation and economic conditions
- Future Condition Evaluation (Technical and Policy – See Section 3)
  - Future water needs compared with natural water availability
  - Potential impacts of climate change on future water availability
  - Potential effectiveness of water conservation strategies
  - Future options for progressive water management
  - Challenges to meeting future water needs and/or applying the progressive options
- Recommended Policies for legislative and regulatory guidance, developed by stakeholder consensus (Section 5)
- Recommended roles for the WPC, its committees, and conflict resolution strategies (Section 5)
- Pathways toward resolution for issues that require more information, more outreach, or consensus-building before consensus-based recommendations can be made (Section 5)
- Implementation Guidelines, including funding strategies, local participation, use of technical information, adaptive water management, tracking against the Plan's goals, etc. (Section 6)

Understanding what the Plan does is equally important to understanding what this Plan does NOT attempt to do. The Plan is not the solution to all of Connecticut's water issues, nor is it an attempt to resolve them all. Rather, it is a framework for future decision making; technical information combined with policy recommendations and recommended next steps for data expansion and outreach should serve collectively to inform legislative and regulatory decisions, as well as project-specific decisions. The Plan does not rule out any specific water use, nor does it elevate or diminish the value of any particular use relative to other uses. Instead, it will help decision-makers determine the viability of future water needs and uses scientifically, and with consistent guiding principles.



How to Use This Plan

This is the first time that Connecticut has had so much scientific information about water consolidated in a single document. Furthermore, it is the first time that the collective will and objectives of stakeholders representing water interests in all sectors has been formulated as consensus-based policy recommendations. These two facets of the Plan, its consolidated scientific information and its expression of broadly agreeable policy directives, should serve as a guide for future water management decision-making in the State of Connecticut.

The Plan provides technical information and guiding principles that may be used to inform decisions across the state or on a case-by-case basis. The Plan's information may be used by:

- Lawmakers to collaborate with the Water Planning Council and formulate future legislation
- Regulators to adapt water and land regulations to changing needs and conditions
- Utilities, river basin planning groups, and other water users as a framework for decisions
- The Water Planning Council to inform decisions and recommend legislation.
- Citizens of Connecticut to better understand the water needs and availability at the regional basin scale, and to understand the consensus-based principles of the stakeholders who represent Connecticut's water interests.

The Plan does not attempt to prioritize any particular water use or water use category over others. Likewise, specific uses of water, if currently authorized by state law and regulation, are neither advocated nor diminished relative to other uses, and the Plan does not attempt to resolve site-specific or situational issues.

Specifically, the Plan includes maps and data summary sheets on each of the state's 44 regional river basins and compares water that is naturally available in each basin to the current and future needs for water in and out of the streams. These tools are not definitive statements about the adequacy of water to meet all needs, but rather, they are screening tools to indicate where risk is higher or lower regarding a basin's ability to meet all needs into the future. As such, they have been used (and may continue to be used) to help establish priorities for specific initiatives and future legislation. Examining the balance between water availability and all of the water needs in a basin under average and hydrologically stressed conditions can inform decisions scientifically, establish legislative priorities, and help promote awareness of water as a limited resource. Examples of how to interpret the technical information are included below in this Executive Summary under the heading, "Technical Findings."

Additionally, the Plan is a repository of consensus-based values of the stakeholders who participated in the development of the Plan. Its policy recommendations reflect their collective objectives for water management, and are intended to provide a basis for legislation, regulations, and situational decisions that consistently apply the views of stakeholders across the state.

A Collaborative Approach to Planning

As many other states have discovered, a central tenet to successful planning is the building of consensus for recommendations. Because consensus building is so important to an implementable plan, Connecticut's process included six workshops with stakeholders representing a broad variety of water interests, including (but not limited to) those in the box on the left.

Stakeholders

- State regulatory authorities
- Environmental advocacy groups
- Watershed groups
- Water utilities (public and private)
- Agriculture
- Industry
- Energy
- Golf courses
- Academia and science
- Public health officials
- Council of governments (COGs)
- Wastewater

These stakeholders participated in six facilitated workshops during the planning process, as outlined in the workshop plan shown on the right. These workshops were open to the public, and in addition to facilitated discussions with stakeholders, each workshop allocated time for public comment. The figure also indicates that public outreach is being accomplished through a series of public meetings, during which citizens of the state offered ideas, asked questions, voiced concerns, and engaged in direct dialogue with state officials and the planning consultants.

The workshops, supported also by WPC subcommittee meetings, resulted in consensus on policy recommendations (Section 5), as well as next steps, or "Pathways Forward" on issues for which consensus could not reasonably be achieved within the one-year time frame. The Pathways Forward (also in Section 5) include suggested ways to enhance available information, increase outreach, and establish partnerships to further the collective understanding of water strategies. As these issues mature, the WPC can shepherd them through a formal decision process by which they can result in additional policy recommendations.

A full discussion of the stakeholder and public outreach efforts is presented in Section 4 of this report. Additionally, a State Water Plan Fact Sheet is included as Appendix A. This fact sheet has been distributed at meetings and workshops, and is also available online via the Water Planning Council website (http://www.ct.gov/water).

Facilitated Workshops to Support Plan Development

PHASE I

Workshop #1: Plan Framework
Goals and Water Management Options

Public Meeting Eastern CT | Public Meeting Central CT | Public Meeting Western CT

PHASE II

Workshop #2:
Refinement of Options

Workshop #3:
Policies vs. Pathways

Public Meeting

Workshop #4:
Paths Forward / Decision Framework(s)

Workshop #5:
Policy Recommendations

Public Meeting

Public Meeting

Workshop #6:
Plan Recommendations

Summary of Key Findings and Recommendations

Technical Assessment

Key to making informed decisions about future water management is a sound technical understanding of the condition of Connecticut's river basins, including the amounts of water flowing in each, and the competing demands for this water. This plan does not evaluate each municipality or water utility on its own, but rather, evaluates water availability and use patterns on a regional basis, delineated by the tributary basins to the major rivers in Connecticut. Figure ES-1 illustrates the major basins in the state, and also outlines the 44 regional basins that are tributary to these basins, and for which technical assessments are presented in this report.

Each of the 44 river basins was evaluated for water availability (surface water and potential groundwater recharge), as well as current and future water needs, both out-of-stream and instream. For the purposes of this report, the term "out-of-stream" water use refers to water that is removed from a stream or aquifer, some of which may be returned as wastewater at another location. These are sometimes referred to as "consumptive" water uses. Private residential wells are an out-of-stream water use, and about 23% of the state's population use private residential wells. "Instream" water use refers to water that remains in its natural environment (generally streams or lakes) for ecological, recreational, or aesthetic purposes. Instream uses are also sometimes referred to as "non-consumptive" water uses.

The goal of the technical assessment was to provide a relative basis for determining which river basins may be at risk of not being able to satisfy all instream and out-of-stream needs, either now or in the future. Likewise, the evaluation identified river basins that are likely to have an abundance of water – different management policies may apply to basins with different levels of risk. Figures ES-2 and ES-3 provide an illustrative example of one way in which indicators of

Figure ES-1: Regional River Basins in Connecticut Evaluated in this Plan

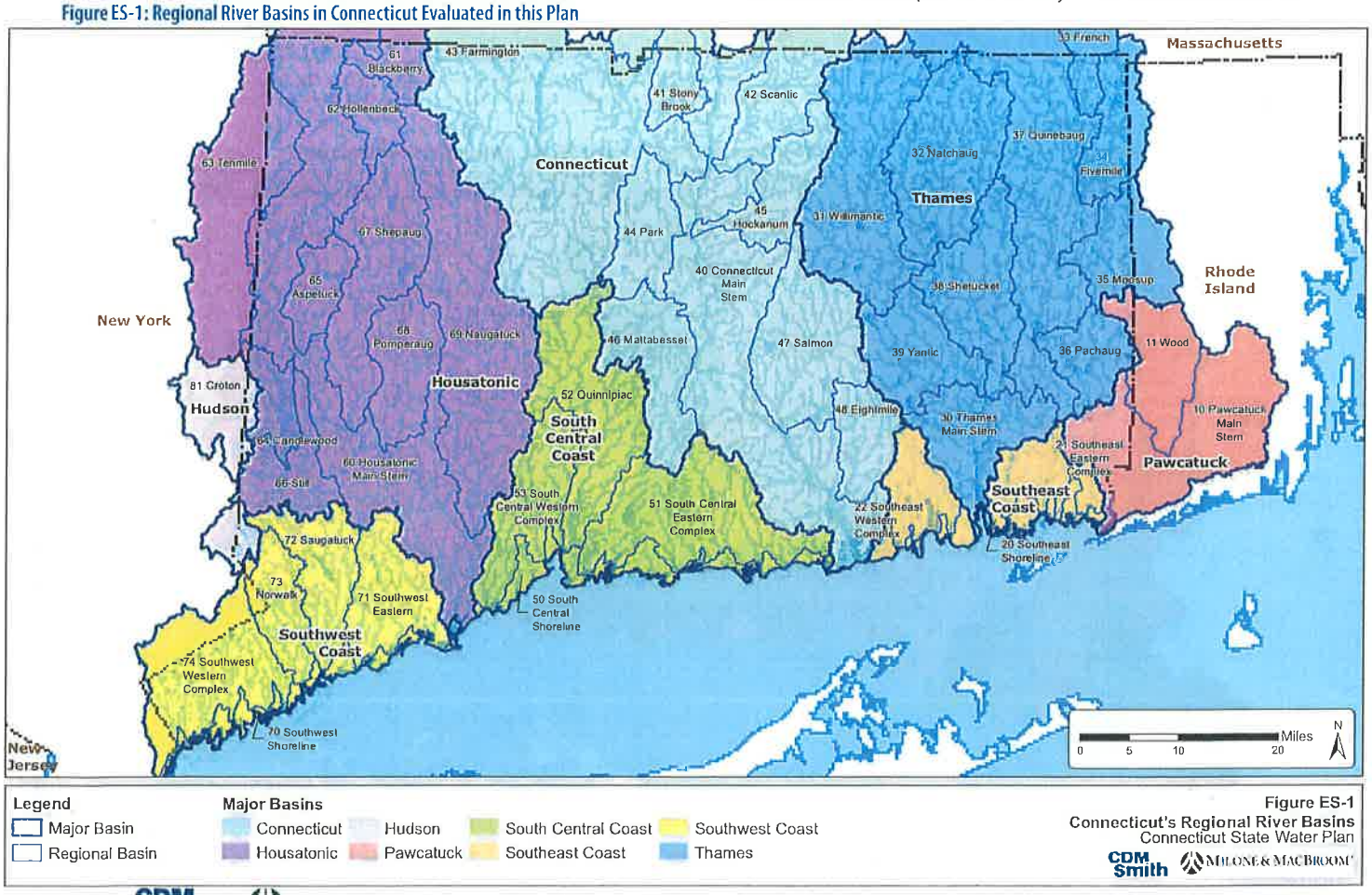
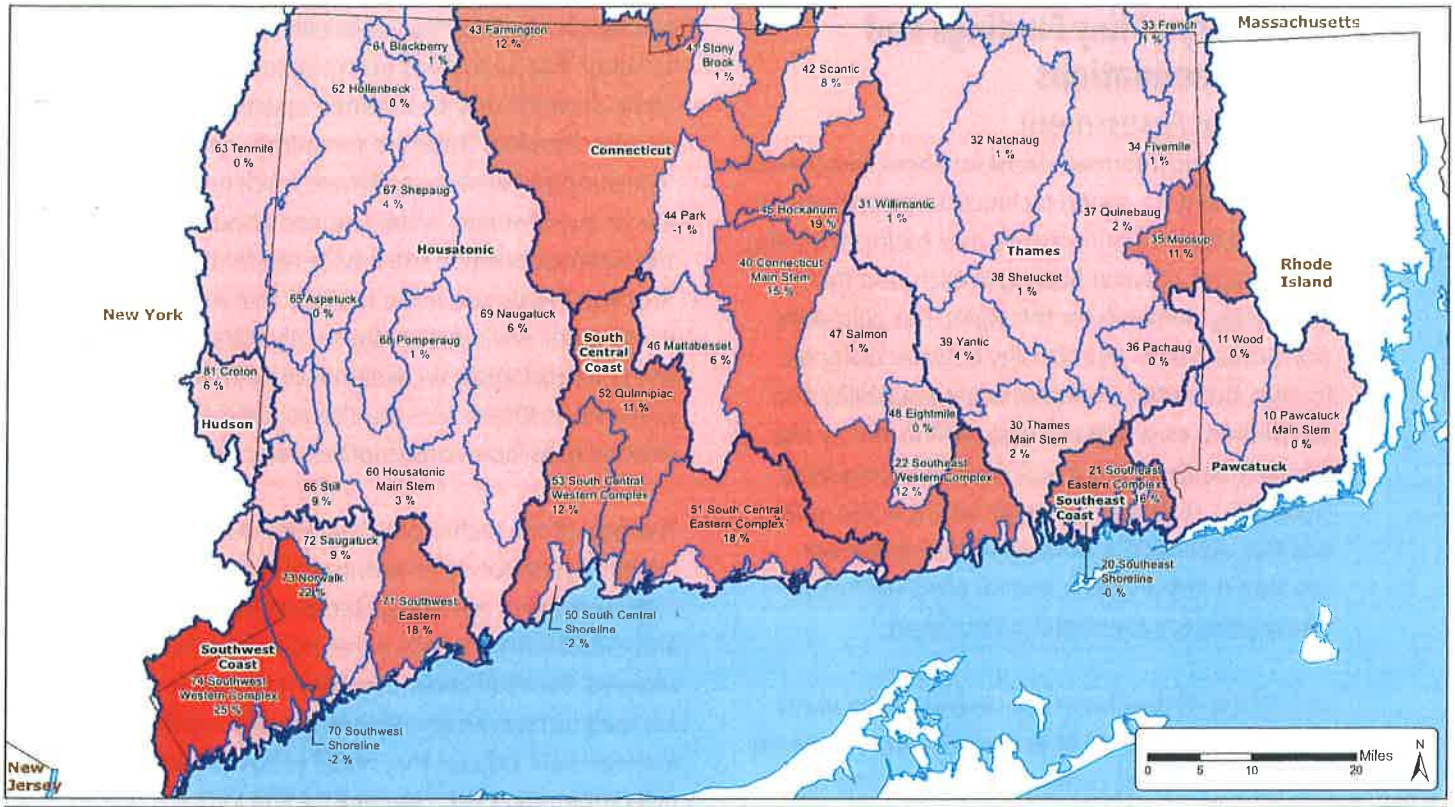


Figure ES-2*: Current River Basin Risk Indicators** - Annual Average Basis

**This also appears in Section 2 as Figure 2-6. ** "Risk" refers to a basin's ability to satisfy water needs, in this case, instream and out-of-stream needs.*



Legend

- Major Basin
- Regional Basin

Total water demand as a percent of average annual streamflow (%)

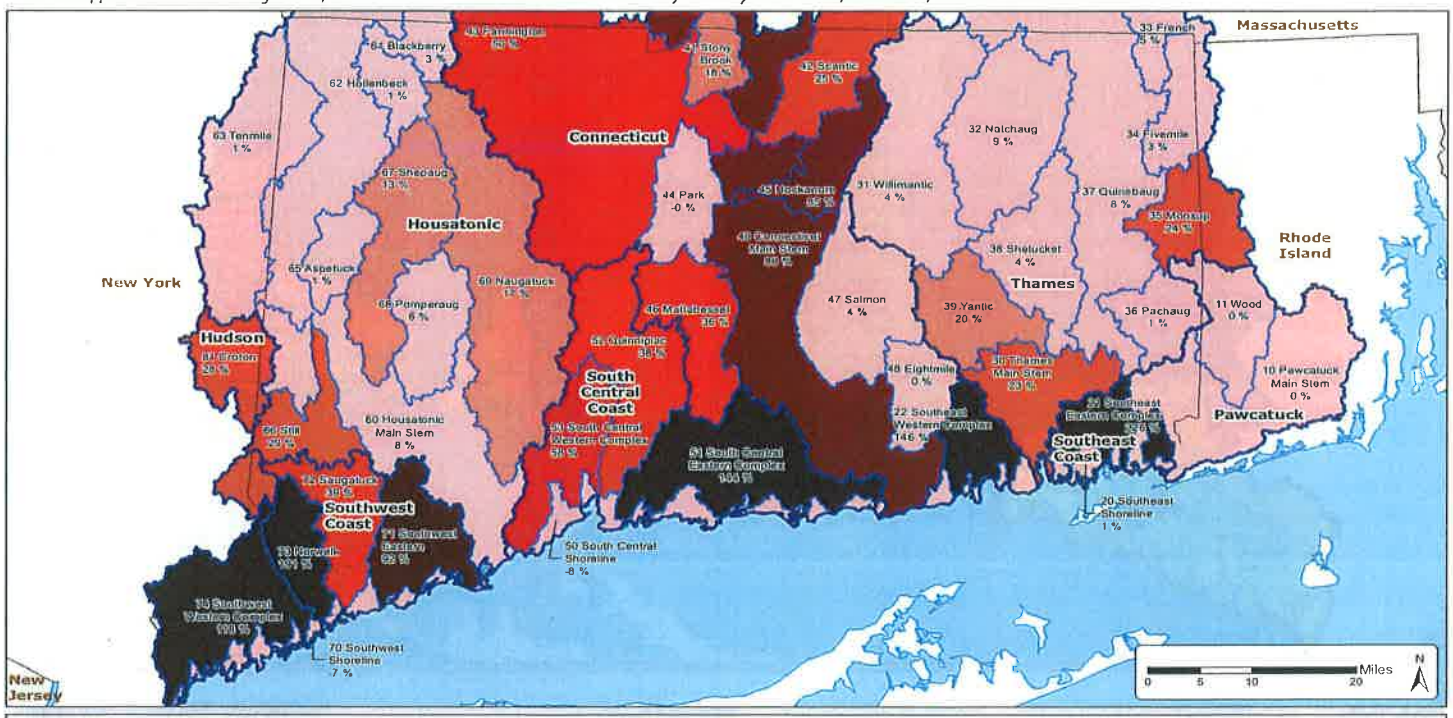
< 10 | 10 - 20 | 20 - 30 | 30 - 40 | 40 - 50 | 50 - 60 | 60 - 70 | 70 - 80 | 80 -90 | 90 - 100

Figure ES-2
Total Water Demand as a Percent of Average Annual Streamflow
Connecticut State Water Plan

CDM Smith | Milone & MacBroom

Figure ES-3*: Current River Basin Risk Indicators** - Typical Summer Conditions

**This also appears in Section 2 as Figure 2-9, as listed above. ** "Risk" refers to a basin's ability to satisfy water needs, in this case, instream and out-of-stream needs.*



Legend

- Major Basin
- Regional Basin

Total July water demand as a percent of July streamflow (%)

< 10 | 10 - 20 | 20 - 30 | 30 - 40 | 40 - 50 | 50 - 60 | 60 - 70 | 70 - 80 | 80 - 90 | 90 - 100 | > 100

Figure ES-3
Total July Water Demand as a Percent of July Streamflow
Connecticut State Water Plan

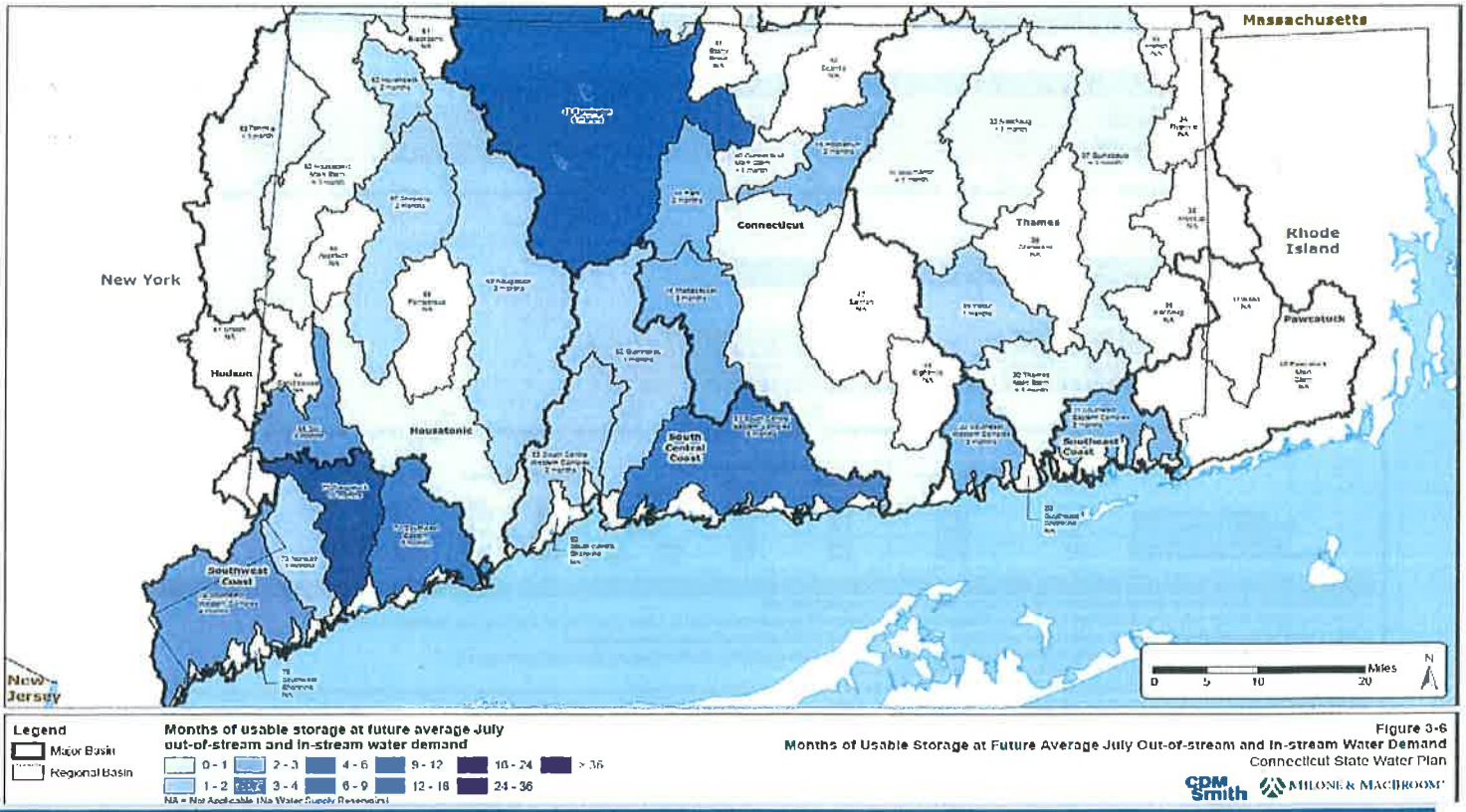
CDM Smith | Milone & MacBroom

basin risk are characterized in this report. For planning purposes, this risk is defined as the possibility that a basin may not satisfy all instream and out-of-stream needs under all conditions, and is measured as the percentage of available water for which there is documented demand or need. It does not necessarily suggest that a basin is at risk of overuse, but indicates on a relative basis which basins are using more of their available water than others, and by how much. Figure ES-2 presents a current condition assessment based on annual average statistics, and Figure ES-3 presents a current condition assessment based on typical summer conditions, during which demands are generally higher and natural water flows are usually at their lowest. The report also presents results for year 2040. Detailed studies and river basin models would characterize the dynamics of specific basins in more detail (and the Plan suggests ways of accomplishing this in Section 3 and again in Section 6), but the results in this report can be used to screen basins for management activity based on their relative potential for use and overuse.

These maps clearly indicate that while many basins in the state appear to have plentiful water under average annual and typical summer conditions, other basins may not be able to satisfy all water needs all the time (including both instream and out-of-stream needs). The overarching goal of this Plan is to recommend policies and strategies aimed at improving the balance of meeting these needs under all conditions.

Certain caveats are important when considering the maps of basin risk. First, the results are generalized to the basin scale, and are not indicative of potential risks to small tributaries, river reaches with localized well fields nearby, or other local subsystems of the basin. Second, many of the basins contain reservoirs, and stored water can be an effective buffer against the basin's risk of not satisfying all needs under all conditions. To address this in the report, maps of total storage in each basin are included (Figures 2-10 through 2-12), and an example is shown below as Figure ES-4. Third, some basins may include additional water flowing in from upstream basins, whose quality may be suitable for certain non-potable needs and instream needs, but not necessarily all water needs. Fourth, drought conditions are often worse than typical summer conditions, and normal summer risks may be amplified during droughts.

Figure ES-4*: Example Storage Map for July Demand Levels
**This also appears in Section 3 as Figure 3-6.*



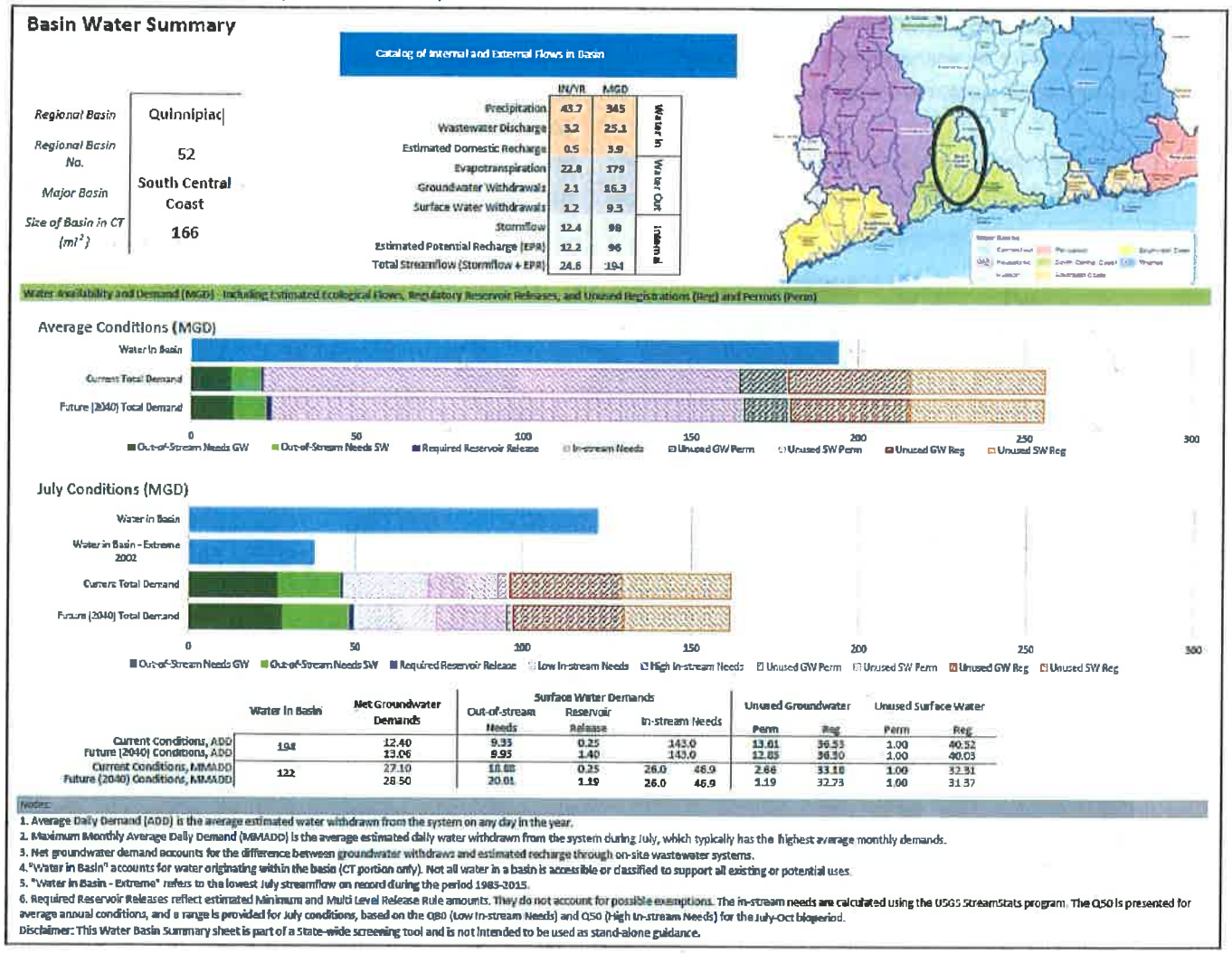
Because of these caveats, the maps and diagrams in this report are intended to be used as screening tools only – that is, tools to compare the potential risks in basins relative to each other, but not to definitively determine if or where a river basin may be unable to satisfy all of its water needs.

To help address the fourth caveat above, and to illustrate the water use patterns in each basin in comparison to water available for these uses, basin summary sheets were created for all 44 regional basins in Connecticut. The summary sheets are included in Appendix E, and tabulate and illustrate the available water under average annual, typical summer, and "worst-case" summer conditions, where "worst case" is approximated as the historical month of July in the past thirty years with the lowest recorded flow. In total, these summary sheets include:

- Water that originates and occurs naturally within the basin
- All documented out-of-stream water uses (water withdrawals from surface water or groundwater)
- All required reservoir releases, historic or pending (site specific)
- Estimated ecological flow needs (basin-wide)
- Unused diversion registrations and permit volumes (water that is administratively allowed to be withdrawn, but has not been taken historically).

An example summary sheet, Figure ES-5 for the Quinnipiac basin, a good example because it

Figure ES-5: Example Basin Summary Sheet for the Quinnipiac Basin



Basin Water Summary

Regional Basin	Quinnipiac
Regional Basin No.	52
Major Basin	South Central Coast
Size of Basin in CT (mi^2)	166

Catalog of Internal and External Flows in Basin

	IN/YR	MGD	
Precipitation	43.7	345	Water In
Wastewater Discharge	3.2	25.1	
Estimated Domestic Recharge	0.5	3.9	
Evapotranspiration	22.8	179	Water Out
Groundwater Withdrawals	2.1	16.3	
Surface Water Withdrawals	1.2	9.3	
Stormflow	12.4	98	Internal
Estimated Potential Recharge (EPR)	12.2	96	
Total Streamflow (Stormflow + EPR)	24.6	194	

Water Availability and Demand (MGD) - Including Estimated Ecological Flows, Regulatory Reservoir Releases, and Unused Registrations (Reg) and Permits (Perm)

Average Conditions (MGD)

July Conditions (MGD)

	Water In Basin	Net Groundwater Demands	Surface Water Demands: Out-of-stream Needs	Surface Water Demands: Reservoir Release	Surface Water Demands: In-stream Needs		Unused Groundwater: Perm	Unused Groundwater: Reg	Unused Surface Water: Perm	Unused Surface Water: Reg
Current Conditions, ADD	194	12.40	9.33	0.25	143.0		13.01	36.53	1.00	40.52
Future (2040) Conditions, ADD		13.06	9.93	1.40	143.0		12.03	36.50	1.00	40.03
Current Conditions, MMADD	122	27.10	18.88	0.25	26.0	46.9	2.66	33.18	1.00	32.31
Future (2040) Conditions, MMADD		28.50	20.01	1.19	26.0	46.9	1.19	32.73	1.00	31.37

Notes:
1. Average Daily Demand (ADD) is the average estimated water withdrawn from the system on any day in the year.
2. Maximum Monthly Average Daily Demand (MMADD) is the average estimated daily water withdrawn from the system during July, which typically has the highest average monthly demands.
3. Net groundwater demand accounts for the difference between groundwater withdraws and estimated recharge through on-site wastewater systems.
4. "Water in Basin" accounts for water originating within the basin (CT portion only). Not all water in a basin is accessible or classified to support all existing or potential uses.
5. "Water in Basin - Extreme" refers to the lowest July streamflow on record during the period 1983-2015.
6. Required Reservoir Releases reflect estimated Minimum and Multi Level Release Rule amounts. They do not account for possible exemptions. The in-stream needs are calculated using the USGS StreamStats program. The Q50 is presented for average annual conditions, and a range is provided for July conditions, based on the Q80 (Low In-stream Needs) and Q50 (High In-stream Needs) for the July-Oct bioperiod.

Disclaimer: This Water Basin Summary sheet is part of a State-wide screening tool and is not intended to be used as stand-alone guidance.

includes all of the elements listed above, and demonstrates potential risks under certain conditions. A guide to understanding the summary sheets is included in Appendix E, and the calculations are discussed in Sections 2 and 3.

As an example for how the basin summary sheets can be interpreted, Figure ES-5 illustrates that on an average annual basis, there is sufficient water in the basin to satisfy current instream and out-of-stream needs (solid bars), but that if all unused registrations and permits were exercised in the future, the available water would be insufficient. We can draw the same conclusion for typical summer conditions, but note that for extremely dry conditions (the shortest blue bar), there is not sufficient water even for documented out-of-stream water needs in this basin. This was evidenced during the 2016 drought, during which portions of the upstream river were nearly dry.

These screening tools were vetted using some of the recent knowledge about impacts to river basins during the 2016 drought. Several examples are discussed briefly here:

Quinnipiac River Basin: The maps and summary sheet, discussed previously, suggest a moderate-to-high risk that the Quinnipiac Basin may not be able to support all of its needs during average annual conditions or typical summer conditions. However, there are 1-2 months of storage in the basin that can partially offset concerns about short-term seasonal droughts. The basin summary sheet, however, suggests that during severe drought conditions, there will not likely be sufficient water in the basin even to satisfy all out-of-stream needs (though the tools do not indicate specifically where such problems might occur). Indeed, during 2016, flow in the mainstem Quinnipiac dropped to approximately 1 cfs near the town of Southington.

Pomperaug River Basin: The maps show that under average conditions and typical summer conditions, the Pomperaug River Basin can likely satisfy its instream and out-of-stream needs (requiring ~55% - 65% of naturally occurring water). However, the basin summary sheet for the Pomperaug Basin suggests that during significant drought conditions (similar to 2016), the out-of-stream needs amount to ~80% of available water, and there would not be enough remaining water expected to satisfy instream needs. Indeed, during 2016, anecdotal evidence suggests that certain reaches in the basin were nearly dry. Again, the screening methodology does not pinpoint the location or severity of stream or aquifer depletion, but the tools can be used to identify the relative level of risk under various conditions.

Farmington River Basin: Similar to the Pomeraug, the Farmington Basin shows only moderate risk during average conditions, but the risk rises sharply during typical summer conditions. During severe drought conditions, it is not expected that there will be enough water flowing naturally in the basin to satisfy all needs, or even the out-of-stream needs on their own. However, much of the storage in the state is located in the Farmington basin, and the storage map in Section 3 indicates that the basin can store between 6 and 9 months of supply at expected July demand levels. This would be an effective offset to concern about seasonal drought, though the findings suggest that even this basin could be susceptible to multi-year droughts. And to vet the screening process, most of the basin was sufficiently supplied during the 2016 drought, but (as suggested by the comparison of available water to out-of-stream needs), the Coppermine Brook (a tributary) did run dry in 2016. This is a good example of how the screening tools can be used to indicate the presence of risk, but not pinpoint the specific location, and also to illustrate potential offsets on a spatially-averaged basis.

In summary, Table ES-1 helps explain how many basins in Connecticut may be at risk over the next 25 years of not meeting all of the water needs (again, the "balanced" needs of instream and out-of-stream uses). While generally, the results suggest that most basins can supply adequate and safe drinking water under most conditions (especially with the benefits of storage, which is not accounted for in the table),

Table ES-1: Number of Basins at Risk of Not Satisfying Water Needs*

Hydrology and Demand Conditions (Today through 2040)**	Approximate Number of Regional Basins Potentially at Risk of Not Satisfying Needs (out of 44)		
	Out-of-Stream AND Instream Needs	Out-of-Stream Needs Only	Instream Needs Only
Average Annual	4	0	1
Typical Summer	13	7	1
Severe Drought Month	44***	22	44***
Average Annual, with all unused registered diversions**** exercised	22	15	NA

*This table does NOT account for storage, which can offset short-term seasonal risks significantly

**No major changes in demand are expected between now and 2040. Climate change results suggest only slightly less water availability in the summer, which may be offset by storing projected higher runoff values earlier in the year.

***This does NOT mean that 100% of rivers or river reaches are at risk, but rather, that there may be tributary reaches in each basin that could be at risk.

**** Most water diversions in Connecticut were grandfathered from permitting through a registration process. Registered volumes do not necessarily represent actual overallocation of water as many remain unused or underutilized. Although there may be practical limitations to using their maximum capacity, full use of some unused registrations could put rivers in jeopardy of not meeting all instream and out-of-stream needs. See Sections 5.2.3.7 and 5.3.2.3 for recommendations.

they also demonstrate that some basins may not be able to satisfy all instream and out-of-stream needs in all locations and at all times under all circumstances (potential stress is likely to be localized, and not universal throughout any basins). Further discussion is available in Section 7.

Further technical analysis was conducted to estimate potential ways in which the balance of water needs and water availability could be affected by **climate change** (a future unknown), and by **water conservation** (a way of hedging against known or unknown future conditions, and a consensus-based theme of several policy recommendations in this Plan).

Climate Change: The technical study evaluated the potential range of future climate trends as they could be manifest in monthly precipitation, monthly temperatures, and monthly streamflow throughout the state. Methods and results for all 44 basins are presented in Section 3.1.4 and Appendix F. Again, using the Quinnipiac Basin as an example, Figure ES-6 illustrates an important finding. Results from more than 100 Global Climate Models (GCMs) averaged into four possible future scenarios were used to define the ranges of possible future conditions in Connecticut, and the trends consistently suggested that on average, annual rainfall and runoff will be higher in 2040 than they are today. On a monthly basis, however, changes are distributed throughout the year; Runoff is likely to be significantly higher in the future in winter months, and maybe only modestly lower in summer months. Additionally, the potential for reservoir refill from higher winter runoff could positively affect the reliability of certain water supplies. These results, fairly consistent across the state, suggest that future flood risks could increase, and also serves as a warning of potentially drier summer conditions even though more rain is expected annually. Additional work is recommended to address the following:

Figure ES-6: Example Climate Change Impacts on Runoff in the Quinnipiac Basin by 2040