



**ASSESSMENT OF WATER RESOURCES TO SUPPORT
A REVIEW OF ONTARIO'S WATER QUANTITY**

**MANAGEMENT FRAMEWORK:
JURISDICTIONAL REVIEW REPORT**

Submitted to:

Government of Ontario
Ministry of the Environment, Conservation and Parks
Standards Development Branch
7th Floor, 40 St Clair Avenue West
Toronto, ON M4V 1M2

Prepared by:

BluMetric Environmental Inc.
171 Victoria Street North
Kitchener, ON N2H 5C5

Project Number: 180107
Submission Date: 28 September 2018

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EXECUTIVE SUMMARY

The growing worldwide attention on water security¹ is shared by the Province of Ontario. Projected population growth, economic growth, cumulative effects from changes in land uses and increased takings, and climate change with the projected intensification of drought conditions, collectively will impact Ontario's water resources in the future. The Province must prepare to manage the challenges and opportunities associated with these impacts. These changes, some anticipated and some already realized, may affect not only the health and integrity of Ontario communities, but also its ecosystems. Given the nature of these pressures on water resources in Ontario, there are significant challenges to managing water use and water quantity, particularly when it comes to implementing appropriate and effective legislative and policy changes. This study characterizes the approaches to water quantity management taken by other jurisdictions in order for the Ontario Ministry of the Environment, Conservation and Parks (MECP) to gain an improved understanding of a variety of policy and legislative options to consider when reviewing Ontario's approach to water quantity management.

In order to characterize different approaches to water quantity management, aspects of water management policy and legislation in various jurisdictions were compiled, assessed and summarized. This jurisdictional review had two major phases. In the first phase, data was collected on a specified set of attributes related to water quantity management for 21 jurisdictions, including Canadian jurisdictions (British Columbia, Manitoba, New Brunswick, Quebec, Prince Edward Island, Yukon), American jurisdictions (California, Indiana, Illinois, Florida, Michigan, Minnesota, Montana, New York, North Carolina, Ohio, Pennsylvania, Wisconsin), and three international jurisdictions (England/Wales, New Zealand (Waikato Region), South Australia). The jurisdictions were selected in order to capture a geographically diverse sample of jurisdictions from Canadian, American, Great Lakes, and international locations, and which were known to address a range of specific topics such as: integrated water management principles, environmental flow requirements, formal conservation measures, prioritization among water users, conflict resolution, etc. For each of

¹ Water security is interpreted in this report as the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, and for preserving ecosystems in a climate of peace and political stability (United Nations-Water, 2013)



these jurisdictions, water quantity management approaches were documented, organized, and compared using common attributes.

In the second phase, the information available for each of the 21 jurisdictions was screened according to a pre-defined list of questions dealing with various aspects of water quantity management. Jurisdictions that had information addressing the greatest number of questions and to the greatest depth were shortlisted, and, in consultation with the MECP, five jurisdictions were selected for in-depth review, based in part on their applicability to Ontario and their relevance to current policy. The following five jurisdictions were selected for follow-up review for a better understanding of these jurisdictions and to gather additional information: Minnesota, Florida, Michigan, Montana, and New Zealand (Waikato Region). This phase began with telephone and email follow-up with 2-3 representatives from each of the five jurisdictions. Each representative had direct and senior operational knowledge of water quantity management in order to verify information collected and was asked detailed questions on topics of inquiry provided herein. Using the information collected from Phase One data, and the information provided by representatives in Phase Two, the five focus jurisdictions were examined in terms of legislative tools, jurisdictional system, management practice, policy, innovation, and/or governance processes. The five jurisdictions were then characterized according to eight broad topics of inquiry.



The main findings for these five jurisdictions for each water quantity management topic of inquiry included the following:

- The **legal frameworks** of riparian rights, prior allocation, and prior appropriation² are generally thought of as the three types of water right doctrines that overarch water allocation in North America. New Zealand and Montana are informed primarily by prior appropriation, while regulated riparianism and common law largely inform Florida, Michigan, and Minnesota. Water users are identified by volume in Florida, Michigan and Minnesota, and in Montana and New Zealand water users are identified by both water use type and volume. Among the five jurisdictions, fee structures for each are quite different in terms of types of use and amount. Michigan and Florida have explicit regulations and considerations for water bottler appropriations, while water bottlers in Montana and Minnesota are not considered differently than other purposes. Water bottlers are not noted in New Zealand water quantity management policy.
- In terms of **integrated water management and cumulative effects**, all five jurisdictions consider groundwater and surface water interactions in allocation statute/policy. Notably, Michigan's Water Withdrawal Assessment Tool uses a threefold model system focused on groundwater, stream flow, and fish impacts to make assessments; Minnesota has the ability to designate groundwater protection areas and apply a sustainability standard to combat integrated risks. Interactions of water quality and quantity are considered by all five jurisdictions in decision making through varying monitoring, sampling and analysis procedures in cooperation with other departments and agencies focused on water quality and pollution concerns. Michigan and Minnesota, as signatories to the Great Lakes St. Lawrence River Basin Sustainable Water Resources Compact must consider cumulative effects in appropriation decisions. Florida and Montana cumulative effects consideration are minimal and less formalized in statute compared to the other jurisdictions. New Zealand -Waikato Region considers cumulative effects in water taking at length, including formal recognition for Indigenous uses and values in assessments.

² In the doctrine of **prior appropriation**, the first user to take a quantity of water and put it to beneficial use has a higher priority of right than a subsequent user (National Agricultural Law Center, n.d.). **Riparian rights** are the legal water rights of a person owning land containing or bordering on a water course or other body of water in or to its banks, bed, or waters (National Agricultural Law Center, n.d.). A **prior allocation** system is described as a government-controlled system, where water rights are issued to individual users for specific volumes and purposes, and where priority among users is also based on first in time, first in right, with seniority based on the date of application (AMEC, 2008).



- **Adaptive management** in the five jurisdictions appears minimally in legislation, particularly in Montana and New Zealand. However, in Florida explicit adaptive management protocols have been outlined for certain activities or areas and in Michigan, adaptive management is limited to incorporating changes through the process of water withdrawal assessment and water user committees. Finally, Minnesota has the authority to limit or cancel permits to protect the public interest and requires Local Water Supply Plans to be updated on ten-year cycles and used as an assessment tool when viewing changes to allocation.
- **Ecosystem protection** in the form of specific regulation guaranteeing water for the environment is available for all five jurisdictions. However, there is variation in the degree of requirement ranging from policy supporting a comprehensive environmental flow regime method to a requirement only for minimum flow levels. In Michigan, this flow need is connected to ecosystem or fish needs specifically. Florida, Minnesota, and New Zealand use a percentage-based minimum flow and water level based on a low flow record within a set number of years is used as a guide. Monitoring protocols are required across all jurisdictions to varying degrees. Florida has a notable priority process at the district level where minimum flows and levels are set based on an annually developed list of priority streams. Enforcement of environmental flows is not explicitly addressed in legislation for any of the five jurisdictions. All five jurisdictions use slightly different methods to determine environmental flow levels.
- **Drought management** is an explicit concern of all five jurisdictions. Each has drought plans which outline a wide range of action plans for times of shortage, drought thresholds, flow releases, monitoring and reporting, as well as conservation measures for the restriction of water allocation that are specified in either statutes/legislation, policy and/or in the drought plan. Each of the drought plans are context specific, and Minnesota and Florida have the most up-to-date drought plans. **Water quantity stress** is not used by most jurisdictions, and therefore no comparative definitions emerged from the review. However, in Michigan, stress areas are identified in legislation as a part of “zones of risk”.
- **Prioritization of water use** is employed in Minnesota, New Zealand, and Florida, each of which assign priority to different water users in times of shortage/stress. Montana does have a water use priority system which is based on “first in time, first in right” and even higher priority is given to those who appropriated prior to 1973, the time of a key legislative change.



- **Conflict resolution mechanisms** of various forms are in place through legislation or policy in all five jurisdictions. Notably, Montana and New Zealand each have dedicated water/environmental courts for the adjudication of water rights.
- **Collaborative approaches** are codified/legislated in all five jurisdictions, in particular for stakeholder engagement/public engagement for various aspects of water allocation decisions. In Michigan, additional requirements exist for public consultation before approval for bottled water withdrawal. While none of the jurisdictions legislate the incorporation of Indigenous knowledge systems into allocation decisions, each jurisdiction addresses Indigenous involvement or engagement on decision making on water. In particular, the Waikato Region (NZ) has numerous agreements with Indigenous peoples in the region that pertain water decision making.

For each of the topics of inquiry, the jurisdictions provided examples of legislative and policy options which have the potential to inform Ontario's own water quantity management framework. Further, the variability in approach to managing water quantity provides many comprehensive policy alternatives. Each of these alternatives has the potential to be redrafted to suit the Ontario legal and environmental context for the purposes of making changes to the Province's current water quantity management framework.

Although there is much that can be gleaned from the findings from the practices researched in the 21 jurisdictions, several notable insights emerged from this study:

- There is general recognition of cumulative effects and the need for their assessment relative to water withdrawal across jurisdictions; however, these efforts often only apply to certain withdrawals (e.g., hydro projects in a certain area of Manitoba) and are often not explicitly linked to their influence in the granting or amending of water allocation permits or licenses.
- Adaptive management in the context of water withdrawal is predominantly about the flexibility to adjust water allocation limits and withdrawal assessment processes in times of uncertainty. This process is not always explicitly labeled as 'adaptive management'.
- Many jurisdictions manage groundwater and surface water separately and have not yet integrated the management of these two sources into a single comprehensive permitting system.



- Some jurisdictions revealed novel institutions that have the potential to provide insight into alternatives for water quantity management (e.g., the Interagency Drought Task Force (California); the Environmental Court (New Zealand); the Water Court (Montana) water bailiff (British Columbia)).
- The Great Lakes -St. Lawrence River Basin Sustainable Water Resources Agreement (and companion U.S. Compact that applies to the U.S. jurisdictions) establishes a baseline of requirements for the Great Lake States and Provinces that provides uniform and binding water standards for the region. Notable consistencies include water conservation measures, public participation, Indigenous consultation, adaptive flexibility, and consideration for cumulative effects. Although there are variations in how the Agreement has been adapted by each jurisdiction, it exemplifies rules that are agreeable or generally thought of as beneficial water allocation management practices to multiple jurisdictions.
- Most jurisdictions have not yet utilized the opportunity to implement Indigenous knowledge into water allocation decision making.
- Similarly, because of a variety of different legal, societal, and historical circumstances, there are opportunities for policy transfer among all jurisdictions in order to increase the degree to which Indigenous peoples are involved in decision making for water quantity governance.
- While explicit statutory rules have been developed for water extraction for bottled water in Michigan and Florida, other jurisdictions do formally recognize water bottlers as a water user type. For example, British Columbia groups water bottlers with industrial purposes and New Brunswick and South Australia group water bottlers under commercial use. By doing so, these jurisdictions establish a consistent precedent for how extraction for certain economic purposes should be treated without having to develop specific regulatory language for one user type alone.
- The principles of equity and transparency connected to public or stakeholder participation are not always explicitly outlined as procedures; however, efforts such as open meetings, public hearings and collaborative efforts are indicative of such principles.



- In many of the jurisdictions, there is a great deal of institutional complexity when their water quantity frameworks are viewed as a whole. Because many of the pieces of the frameworks have been created in a piecemeal fashion, the frameworks in some ways lack a unified vision of water quantity governance. Further, some of these more complex frameworks (e.g., California, Montana, Florida) may eclipse the broader approach of the jurisdiction for the purposes of gaining insights to inform other contexts. Notably, jurisdictions such as BC, PEI and the Waikato Region have made recent efforts to consolidate the governance and policies for water management.
- There is no single jurisdiction where all management practices and rules should be considered as a model from which to draw entirely from for changes to Ontario's approach to water quantity management. Innovative approaches developed by different jurisdictions have evolved in response to certain water quantity issues. As such a thematic approach considering multiple jurisdictions' approaches to a certain issue with consideration for contextual differences may be more beneficial to assessing applicability to Ontario.

While potentially any of the findings from this review could be used to inform policy alternatives for Ontario's approach to water quantity management, further consideration of the following findings is warranted, on account of the innovative nature of the tools and approaches, and their potential application in Ontario:

- Michigan and Florida's use of explicit regulations and thresholds for water bottler appropriations, in which consideration is given to both the volume of water proposed for extraction as well as the transfer/destination of the water;
- Florida's annually-developed list of priority streams. Waters are listed by the state on the Minimum Flows and Levels (MFL) Priority Water Body List, and each district is required to establish minimum flows and levels for the water bodies in question;
- Florida's explicit adaptive management protocols have been outlined for certain activities or areas; mitigation banks are noted as an innovative approach to offset adverse impacts of certain activities;
- In British Columbia, the Comptroller of Water Rights or water manager can appoint a water bailiff to act on behalf of the province to manage conflicts in a stream before or during a drought. These people are given the authority to enter on any land and to regulate and control the diversion and use of water by all users (authorization holders as well as users that are not authorization holders) and control all diversion works on streams or aquifers;



- Montana and New Zealand each have dedicated water/environmental courts for the adjudication of water rights;
- In addition to being able to designate groundwater protection areas, Minnesota is able to apply a sustainability standard to ensure limited total annual water appropriation and uses in certain areas. Groundwater monitoring is used to monitor for sustainability “stress”, where aquifer water levels are decreasing without periodic recovery;
- In areas of southern Minnesota, aquifer management planning is sometimes a community-led effort. Community Aquifer Management Planning allows local governments and water users to become aware of and plan for current and future water needs. These locally-driven efforts bring together community planners, elected officials and water users.

Finally, during this review, three limitations of the study were identified. All three of these limitations have the potential to inform further studies or reviews:

- A limitation of this study is the gap in knowledge that remains regarding the implementation of the findings of legislation, statutes, policy, plans, etc. For example, has implementation been effective? What factors have hindered implementation of specific measures? How could the implementation be done differently? How could the policy/legislation have been written differently to facilitate smoother implementation? While questions regarding implementation were posed to respondents in the five focus jurisdictions, responses on this matter were limited. These responses may be limited by (1) the fact that describing implementation is inherently complex and requires a comprehensive understanding of context, (2) describing the nuances of implementation may require an understanding of the history of the jurisdiction, and/or (3) the respondents for this study were given a long list of questions and may not have had the time/resources to adequately describe implementation in light of points (1) and (2). Therefore, where specific findings from the study are selected and used to inform legislative updates to water quantity frameworks, follow-up with jurisdictional contacts is recommended for gaining deeper insight on this matter.



- Another limitation of this study is that any of the policy, statutes or legislation may not be fully understood from a perspective outside that jurisdiction. For example, if someone outside of Canada were to read s.35 of the Canadian Constitution, they would see that Aboriginal rights have been recognized, but may not understand the fraught and complicated history which led to the writing of that section, and how the Canadian courts have been left to interpret this section of the Constitution through case law. Thus, while the findings of this study have been written to try to maximize available details, the historical and present-day context may require further investigation.
- A final limitation of this study is that it does not comprehensively address how various jurisdictions address the concept of the human right to water. In California, water has been legislated as a human right and thus affects approaches to other water legislation, water planning and strategies. A potential future study could include a focused jurisdictional review identifying how values and principles surrounding water are addressed. The study could review jurisdictional policies recognizing water as a human right and economic value of water resources in the context of water quantity management.



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1. INTRODUCTION

How water is governed is fundamental to social-economic development, ecosystem integrity, and human survival. Water quantity management is vital for improving the health, welfare, and productivity of society; providing ecosystem services that benefit the environment and people; and is central to adapting to climate change effects. As such, the sustainability of water resources is an essential concern to social, environmental and economic wellbeing. Although these linkages are understood by most, there are intensifying concerns such as projected population growth, economic growth, and the anticipated impacts of climate change that have further raised concerns about future water security in many jurisdictions, including Ontario. A central driver of these issues in Ontario is the concern regarding intensifying severity of drought conditions. For example, in 2016, portions of the province recorded the sixth driest summer since 1938 (Agriculture and Agri-Food Canada (2017)). This dryness has been particularly evident in southern and eastern Ontario and in 2016 led to negative impacts on the development of important crops, particularly corn, soybeans and hay. These conditions led several conservation authorities in southern Ontario to raise the water condition level to the highest rating (severe) in August 2016. This action prompted conservation, planning, and public education/communication efforts. Public concern has focused on how Ontario manages the use of groundwater for water bottling, particularly in areas of the province where groundwater is the primary source of potable water for communities.

These concerns have prompted the Ontario Ministry of the Environment, Conservation and Parks (MECP) to take actions to protect water, including the following:

- 1) Implementation of a 2-year moratorium on new or increased groundwater taken for water bottling (in effect until January 1, 2019) under Ontario Regulation 463/16
- 2) Development of a new guidance document outlining stricter rules for water takings by existing permitted water bottling facilities (effective April 21, 2017)
- 3) Introduction of a new regulatory charge for water bottling facilities of groundwater

During the Moratorium, the Ontario MECP is also actively working to increase understanding of current and future water quantity resources and to broadly examine the rules governing water takings in Ontario to ensure continued protection and conservation of groundwater and surface water in light of climate change and population growth. To conduct such an assessment, it is beneficial to consider how similar water concerns are framed in other jurisdictions and to compare and evaluate policy options based on action taken by other jurisdictions in response to



similar issues. Jurisdictional reviews are a common tool used to inform water governance and policy change for topics such as water conservation practices and initiatives (J. Kinkead Consulting, 2006), water allocation (AMEC, 2008), watershed-scale water use decision making (Conservation Authorities of Ontario, 2003), cumulative impacts (Ecofish Research Ltd. *et al.*, 2017), water security (de Loë *et al.*, 2007), and legal principles in authorities managing water (Curran & McArdle, 2018). Similarly, this report presents a jurisdictional review to assist the MECP in identifying and anticipating considerations associated with various rule and policy-based options in order for the MECP to consider changes to Ontario's current water quantity management framework. Such reviews have the potential to inform water policy transfer, that is, "using knowledge of water policies, programs and institutions in one context in the development of water policies, programs and institutions in another, can help to expedite the changes that are needed to improve water governance" (Swainson & de Loë, 2010).

1.1 REPORT OBJECTIVE AND STRUCTURE

The overarching purpose of this document is to identify, through a review of the legislation/policy of other jurisdictions, enhancements that could be made to Ontario's water quantity management framework. The goals of this report are to (a) review jurisdictions on identified topics that have potential to be informative to the Ontario water management context, and (b) present the findings from this review for the MECP to make informed decisions relative to the legislation/policy of other jurisdictions. This study was carried out by reviewing the available legislative, regulatory, policy, by-law, guidance and plans of other jurisdictions related to the following concerns identified by the Ontario MECP:

- a) Legal doctrine, scale and permitting structure used in other jurisdictions to manage water quantity; approaches to managing groundwater used by water bottlers;
- b) The legislative coverage of integrated water management, and approaches to evaluate Cumulative Effects of water use at watershed/aquifer scale;
- c) tools and practices for implementing adaptive management approach;
- d) ecosystem protection and environmental flows;
- e) drought and water use planning in anticipation of drought/for drought scenarios; identifying water quantity "stress" areas, including defining "stress";
- f) mechanisms to resolve conflicts among water users and to address shortages (e.g., priority/hierarchy of water uses);



- g) stakeholder involvement in water quantity management decisions, including local collaboration, stakeholder, Indigenous community and public participation, and transparency of decisions.

Specifically, these concerns were reviewed across 21 jurisdictions, five of which were selected to verify the water management framework and provide additional details. The report that follows is a summary of this review. Please note that all definitions are provided in the glossary for the Task 5 Evaluation Report to which this Jurisdictional Review is appended.

2. STUDY APPROACH

2.1 METHODS

Phase One of this jurisdiction review included an initial scan – mainly based on document collection and analysis – of 21 jurisdictions in Canada, the United States (US), and internationally (British Columbia, Manitoba, New Brunswick, Quebec, Prince Edward Island (PEI), Yukon, England/Wales, New Zealand (Waikato Region), South Australia, California, Indiana, Illinois, Florida, Michigan, Minnesota, Montana, New York, North Carolina, Ohio, Pennsylvania, and Wisconsin). These jurisdictions were identified on the criteria that they (a) included Canadian, American, Great Lakes, and international locations and (b) were known to address some or all of the topics outlined by the RFB. Document collection for each of the 21 selected jurisdictions included identification of documents from searches for relevant legislation and policies, review of academic and legal documents, communication with experts within the 21 jurisdictions, and review of other jurisdictional reviews. The types of documents collected included:

- Legislation
- Statues
- Codified Law
- Policy Documents
- Constitutions
- Agreements
- Planning Documents
- Regional Plans
- Regulation
- Guidance Documents
- Department Websites
- Jurisdictional Reviews



The identified documents for each of the 21 jurisdictions were then analyzed by searching for topics relevant to the topics of inquiry for this review (see below). Findings were then collated into a tabular format in order to organize jurisdictions by topic. Where possible, findings were corroborated with water managers available in the 21 jurisdictions. Verification of findings through water managers in each of the 21 jurisdictions was successful for British Columbia, Manitoba, Yukon, Quebec, South Australia, Indiana, Illinois, Ohio, PEI, Pennsylvania and Wisconsin but not available (i.e., no response) from New Brunswick, New York, California, North Carolina, England/Wales. As discussed below, verification and answers to follow-up questions for Michigan, Minnesota, Montana, Florida, and New Zealand (Waikato Region) were corroborated among 2-3 water managers in each of these jurisdictions.

Following the collection of data, each of the 21 jurisdictions were first scanned and then prioritized according to the following two criteria (Appendix A):

1. Does the jurisdiction address, through legislation, policy, statutes, codes, or in available planning documents each of the following questions posed within the scan?
 - a. How are different water users identified (by volume or purpose of use)?
 - b. Are there mechanisms to include watershed/aquifer scale cumulative/incremental adverse effects assessments in water allocation decision-making? If so, by what mechanisms?
 - c. Are concerns for integrated water management (e.g., groundwater and surface water and integrated groundwater and surface water) incorporated into water allocation assessment frameworks?
 - d. Are there limitations related to in-stream or environmental flow requirements? If so, by what mechanism?
 - e. What formal conservation measures exist for the restriction of water allocation in times of water stress?
 - f. How is priority among water users (including in-stream needs if applicable) assigned? Are there additional conflict resolution systems in place? If so, what are they?
 - g. Is there a drought plan? If so what are the main action items of the plan? (e.g., monitoring, communication/coordination planning, local assistance, conservation)?
 - h. Where information is available, what is the role of stakeholders in water allocation decisions?



- i. What province-level legislation (if any) frames the role of Indigenous nations in allocation decisions?
 - j. What, if any, are the approaches implemented to manage groundwater used by water bottlers?
2. Of the jurisdictions that addressed most or all of the above questions, to what degree are the questions addressed (i.e., are the questions addressed nominally such as a technical note in legislation, or thoroughly through comprehensive legal or policy language in statutes, legislation, policy documents, plans, etc.)?

The above two criteria were applied to the 21 jurisdictions which resulted in a shortlist of nine roughly equal jurisdictions (ordered alphabetically):

- British Columbia
- Florida
- Michigan
- Montana
- New York
- New Zealand (Waikato Region)
- South Australia
- Wisconsin
- Minnesota

These nine jurisdictions were then presented to the MECP on January 22, 2018, for input and consideration, including what other criteria could be pertinent to the purposes of the overall Assessment of Water Resources to Support a Review of Ontario's approach to water quantity management project. The following criteria were suggested along with the above two criteria as possible considerations when selecting the final five jurisdictions for Phase Two of the jurisdictional review:

- How applicable to Ontario is the context of the jurisdiction? For example, the jurisdiction's context in terms of water rights, legal framework, geography, population, political climate and drought projections may all have bearing on which are selected.
- How recent is/are the most relevant legislation? For example, can water legislation passed in the 1990s, as opposed to more recent legislation, inform policy at the present time?



- Is diversity of location important to selection of the final five jurisdictions? For example, is it important to have at least one representative jurisdiction from Canada and internationally among the final five jurisdictions? Or should this criterion not affect the final selection?

MECP then reviewed the nine jurisdictions internally, and on January 24, 2018, selected the following final five jurisdictions for follow-up review: Florida, Michigan, Montana, New Zealand, and Minnesota. The Jurisdictions were chosen by MECP based on several factors, including the variability in approaches among them; innovation in approaches; established procedures whose success in implementation could likely be verified, and the likely adaptability when considering Ontario's regulatory framework. Though only five jurisdictions were selected for a detailed, follow-up review, it should be noted that the remaining 16 jurisdictions were not necessarily discarded from further consideration, as they may nonetheless provide valuable insight for Ontario's framework.

Phase Two of the jurisdictional review immediately commenced which included telephone and email follow up with 2-3 representatives from each jurisdiction. Representatives with direct and senior operational knowledge of water allocation in that jurisdiction were sought.

Each of these jurisdictions were asked the same set of questions related to water allocation and management policy. The questions sent to each respondent can be viewed in Appendix B. Answers to each of the questions were pre-drafted for each jurisdiction with available information in order to make the task of responding to the relatively long list of detailed questions less onerous for respondents. Further, the pre-drafted answers allowed for the verification of any information gathered from the initial scan for that jurisdiction. The information gathered from these five focus jurisdictions were then summarized for the purpose of discussion in this report.



3. WATER QUANTITY APPROACHES

The following sections and subsections discuss identified attributes that were reviewed in relation to both Phase One jurisdictions (British Columbia, California, England/Wales, Indiana, Illinois, Manitoba, New Brunswick, New York, North Carolina, Ohio, Pennsylvania, Quebec, Prince Edward Island, South Australia, Yukon, and Wisconsin, along with Ontario) and Phase Two jurisdictions (Florida, Michigan, Minnesota, Montana, and New Zealand (Waikato Region)). Each section provides a brief description and overview of the topics of inquiry. Following each description are the detailed findings from the Phase Two jurisdictions, where representatives from each jurisdiction were able to give detailed information and insight into the topics of inquiry, as well as a summary of findings from the Phase One jurisdictions for comparison. More detail on Phase One jurisdictions can be found in the Appendices.

3.1 LEGAL FRAMEWORK

Legal frameworks of riparian rights, prior allocation, and prior appropriation are generally thought of as the three types of water right doctrines that overarch water allocation in North America (Kwasniak, 2007; WESA & Rob de Loë Consulting Services, 2009). Despite the evolving nature of water rights doctrines, knowledge of the legal framework guiding each jurisdiction is central to the understanding of subsequent differences concerning the scale at which authority is exercised, how different water users are identified, and how users acquire water rights or permission to use water. The riparian system of water rights in use in Ontario, was born out of English common law (the legal framework derived from custom and judicial precedent rather than statutes), is most prevalent in Eastern North America, and limits water use to landholders with riparian land (land that abuts a water body) (Getches *et al.*, 2015). Riparian rights are typically attached to the land; therefore, non-use of water does not extinguish right. Associated with this doctrine, is the principle of reasonable use, which means that a riparian landowner may make reasonable use of water so long as that use does not impede upon the reasonable use of another downstream user. New uses for water may begin at any time, so long as that use is considered *reasonable* (The National Agricultural Law Centre, 2016). As a result, jurisdictions that are historically grounded in a riparian system typically have enacted some type of permitting system – e.g., regulated riparianism. Through permitting systems, the regulated riparian doctrine allows a central agency to have control over who may use water, how much they may use, and when they may use it (The National Agricultural Law Centre, 2016). This approach allows for groundwater considerations to be potentially incorporated and allows for



jurisdictions to take into account future use and potential benefits to society before water is used.

In contrast, much of Western North America is guided by the doctrine of prior appropriation assigning the 'first-in-time, first-in-right' principle of water rights to individuals – not land ownership. This right traditionally assigns priority based on the date of a completed application for water use to the permitting agency. In this sense, senior licensees may take priority over junior licensees in times of scarcity and rights can be upheld through common law as a form of property right associated with beneficial use³ in the US. However, in Canada, since the Canadian Constitution or Charter of Rights and Freedoms do not provide direct protection of property rights, a prior allocation framework has developed where beneficial use is not a measure or a limit to an allocation right. In such systems – for example, in Alberta – water rights are laid out in legislation as the right to divert (AMEC, 2008).

Finally, in considering the above analysis, the treatment of groundwater should also be explicitly noted as not all legal frameworks apply to groundwater and variation exists in how jurisdictions view rights to groundwater in comparison to surface water. Some jurisdictions, such as British Columbia, have incorporated groundwater into frameworks of prior appropriation. However, other jurisdictions use frameworks such as the rule of capture (e.g., England), the rule of reasonable use (e.g., Minnesota), and the rule of correlative rights (e.g., Michigan). The application of how and whether groundwater withdrawal is permitted using the same tools and decision-making procedures as surface water differs greatly by statute.

3.1.1 Phase One Jurisdictions – Legal Framework

The differences among the reviewed jurisdictions are detailed in Table 1.

³ "Beneficial use is used to determine whether a certain use of water will be recognized and protected by law against later appropriations. The justification for beneficial use criteria is to prevent waste. Since water is a scarce resource in the west, states must determine what uses of water are acceptable. Beneficial uses of water have been the subject of great debate, and each western state has an evolving system for evaluating what uses of water are considered 'beneficial' (Energy & Environmental Research Center).



Table 1: Summary of Legal Frameworks for Water Quantity Management for All Jurisdictions

Jurisdiction	Doctrine	Scale	Permitting Structure
Canada			
British Columbia	Prior allocation (ground and surface water)	Provincial	Licensing or use approval; no identified volume permitting for any particular water use (see the Water Sustainability Fees, Rentals, Tariffs and Charges Regulation).
Manitoba	Hybrid system - riparian and groundwater rights for domestic purposes; formally prior allocation based on precedence of license according to application submission date	Provincial	Permit required for >25,000 litres/day for groundwater or surface water. License is required for use of water for domestic or industrial/agricultural purposes or use >25,000 litres/day.
Ontario	Riparian/no water rights	Provincial	The MECP requires Permit (Permit to Take Water) for water taking at a specific location for amounts of 50,000 litres on any day or more with some exceptions (domestic, livestock, emergency uses etc.)
Quebec	Riparian/no water rights	Provincial	License and provincial authorization required for withdrawal >75,000 litres/day.
New Brunswick	No rights assigned	Provincial	Permit to operate required for all water works >50 cubic meters/day (or 50,000 litres/day) except for domestic wells not on distribution system
Prince Edward Island	Riparian rights under common law does apply to ground and surface water for smaller withdrawals (Somers, 2017). Under the Water Act, the control of water resources is vested in the province (s.3), and the province also claims "guardianship" of the water (s.2 (a)) ("Water Act," 2017)	Provincial	Permit to operate required for all withdrawal >25 cubic meters/day (25,000 litres/day) (2017 Water Act)



Table 1: Summary of Legal Frameworks for Water Quantity Management for All Jurisdictions (continued)

Jurisdiction	Doctrine	Scale	Permitting Structure
Canada			
Yukon	Prior allocation	Territorial with an independent administrative tribunal	Licence requirement of 100 m ³ /day (100,000 litres/day) for industrial, municipal, miscellaneous water use; licence requirement of 300 m ³ /day (300,000 litres/day) for agriculture, conservation, mining, recreation
US – Great Lake States			
Illinois	Riparian, common law, reasonable use	State & Basin	Permitting for withdrawals >100,000 gpd (gallons per day), equivalent to about 378,541 litres/day, for groundwater and surface water
Indiana	Riparian, common law, reasonable use	State & Basin	Registration required for significant water withdrawal facilities (SWWF). A SWWF is “the water withdrawal facilities of a person that, in the aggregate from all sources and by all methods, has the capability of withdrawing more than one hundred thousand (100,000) gallons [378,541 litres] of ground water, surface water, or ground and surface water combined in one (1) day”; any withdrawal in a navigable waterway also requires a permit
Michigan	Riparian, common law, reasonable use	State	Groundwater and surface water permitting for withdrawals >2,000,000 gpd (7,570,824 litres/day); >1,000,000 gpd (3,785,412 litres/day) for withdrawals in areas where there is the possibility of adverse impact (Zone C waterbodies), and 100,000 gpd (378,541 litres/day) for intrabasin transfer withdrawals over any 90-day period



Table 1: Summary of Legal Frameworks for Water Quantity Management for All Jurisdictions (continued)

Jurisdiction	Doctrine	Scale	Permitting Structure
US – Great Lake States			
Minnesota	Riparian, common law, reasonable use	State & Regional	Permitting for groundwater and surface water withdrawing more than 10,000 gpd of water (37,854 litres/day) or 1 million gallons (3,785,412 litres) per year for both surface and groundwaters.
New York	Riparian, common law, reasonable use	State & Basin	Permitting for withdrawals >100,000 gpd (378,541 litres/day) for groundwater and surface water
Ohio	Riparian, common law, reasonable use	State & Basin	Registration for withdrawals >100,000 gpd (378,541 litres/day) for groundwater and surface water; Lake Erie specific permitting required for >2.5 million gpd (9,463,529 litres/day) averaged over any 90-day period; permitting required as well for specific high-quality water takings also required for >100,000 gpd (378,541 litres/day)
Pennsylvania	Riparian, common law, reasonable use	State & Basin	Permitting for withdrawals >100,000 gpd (378,541 litres/day) for groundwater and surface water
Wisconsin	Riparian, common law, reasonable use	State	Permitting for withdrawals that average 100,000 gpd (378,541 litres/day) or more in any 30-day period but do not equal at least 1,000,000 gpd (3,785,412 litres/day) for 30 consecutive days. Additional permitting requirements also noted for specific types of users, new or increased water losses, or multiple wells on same property



Table 1: Summary of Legal Frameworks for Water Quantity Management for All Jurisdictions (continued)

Jurisdiction	Doctrine	Scale	Permitting Structure
US – Non-Great Lake States			
California	Hybrid, primarily prior appropriation riparian and appropriative surface water rights	State	Permitting for public water systems (domestic water supply) – surface water; no permitting for groundwater
Florida	Riparian and common law structure	State and regional water management districts	Permits are required for all users having a cumulative average annual average daily consumption of 100,000 gpd (378,541 litres/day), a capacity to pump 1,000,000 gpd (3,785,412 litres/day) and, for wells greater than six inches in diameter, or withdrawals from surface water bodies with an intake diameter or cumulative intake diameter of 8 inches or greater. Additional specific thresholds vary by management district
Montana	Prior appropriation and beneficial use	State and court	Since 1973, new rights can only be acquired via a permit; permit required to develop a well or groundwater spring with >35 gallons per minute (190,785 litres/day) and 10 acre-feet (12,334.8 m ³) per year
North Carolina	Riparian and common law structure	State	Registration required for agricultural users > 1 million gpd (3,785,412 litres/day), other users withdrawing > 100,000 gpd (378,541 litres/day). All non-riparian landowners must also obtain a registration



Table 1: Summary of Legal Frameworks for Water Quantity Management for All Jurisdictions (continued)

Jurisdiction	Doctrine	Scale	Permitting Structure
International Jurisdictions			
England/Wales	Common law and Roman/statutory law	National	Licensing for water supply for non-household premises: retail license (wholesale supply purchase from water company) or combined license (use of water company's supply system).
New Zealand (Waikato)	Prior allocation	Regional	Water take permitting for temporary or permanent transfer of the whole or part of a surface water or groundwater
South Australia	Riparian and common law rights extinguished; common commodity/no ownership	State	Water licencing and permitting, e.g., use of imported water, new well drilling.

3.1.2 Phase Two Jurisdictions – Legal Framework

3.1.2.1 Minnesota

Minnesota Statutes Chapter 103G ("Waters of the State," 2008) is the main water use legislation guiding water allocation in the state. Chapter 103 G requires the Department of Natural Resources to manage water resources to ensure an adequate supply to meet long-range seasonal requirements for domestic, agricultural, fish and wildlife, recreational, power, navigation, and quality control purposes. The water itself is a public trust resource. The Minnesota Department of Natural Resources administers the water use permit program on a statewide basis. Local soil and water conservation districts, watershed districts, and cities have an opportunity to comment on permit applications to ensure consistency with local water and land management plans.

Minnesota's water permitting system is based on the English common law doctrine of riparian rights and the concept of reasonable use and does not assign water rights. Like all of the Great Lake States, both groundwater and surface water are managed as parts of one hydrologic system at the regional level through the Great Lakes-St. Lawrence River Basin Compact. The Water Appropriation Permit Program (Minnesota Statutes (103G.255 to 103G.315) and Minnesota Rules ("Minnesota Rules: Public Water Resources,") (6115.0600 – 6115.0810)



provide authority and criteria for implementation of a permit program. Users withdrawing more than 10,000 gallons (37,854.12 litres) of water per day or 1 million gallons (3,785,411.78 litres) per year for both surface and groundwater are required to obtain an appropriation permit. Users over this amount can apply for one of two primary types of permits, one for non-irrigation water use and one for irrigation water use. Permits cost \$150 USD while applications to appropriate more than 100 million gallons (378,541,178.4 litres) per year are assessed additional fees to recover costs incurred for project evaluation and environmental review (Minnesota Department of Natural Resources, 2016b). Permit holders also must annually report (by February 15th) their monthly water volume pumped and pay fees based on volume (Minnesota Statutes 103G.261, subd. 6). State of Minnesota and U.S. federal agencies are exempt from application fees.

Exempt from the permitting program are domestic uses serving less than 25 persons for general residential purposes, test pumping of groundwater source, reuse of water already authorized by a permit (e.g., water purchased from a municipal system, or certain agricultural drainage), certain diversions for production of hydropower, and the use of stormwater withdrawn from certain constructed facilities (Minnesota Statutes 103G.271, subd. 1 and Minnesota Rules 6115.0620). Moreover, limits to appropriation include the following situations in Minn. Statute 103G.285 sub 2. & Rule 6115.0670, subp. B: (1) the total of all withdrawals from a lake may not be more than one-half acre-foot per acre per year (616.74 cubic metres per acre per year) (i.e., 6 inches of water taken off the surface of the lake); (2) surface water usage from a lake of less than 500 acres is subject to increased scrutiny based on riparian owner support; and (3) only temporary appropriations are allowed from designated trout streams. Finally, under Minnesota Statute 103G.223, calcareous fens⁴ have additional protection that directs appropriation. Water bottlers are not specifically identified or prioritized.

3.1.2.2 Michigan

Like Minnesota, both groundwater and surface water are managed in Michigan as parts of one hydrologic system at the regional level through the Great Lakes-St. Lawrence River Basin Compact (Part 342 of the "Natural Resources and Environmental Protection Act," 1994 (NREPA)). Michigan's water law is based on riparian doctrine and common law and large

⁴ Calcareous fens are rare and distinctive wetlands characterized by a substrate of non-acidic peat and dependent on a constant supply of cold, oxygen-poor groundwater rich in calcium and magnesium bicarbonates (Minnesota Department of Natural Resources, 2017)



quantity withdrawals are subject to reasonable use doctrine. The public trust doctrine also applies to navigable waters in Michigan, requiring that the state prioritize the interest of the public over that of private entities in management decisions (Hall, 2008). Groundwater and non-navigable waters, however, are not subject to the public trust. Moreover, MCL 324.32728 states that nothing in Part 327 of the NREPA shall be construed to affect, or in any way alter or interfere, with common law water rights or property rights. To regulate water rights, large quantity water withdrawals are identified by volume and require a permit. Existing large quantity water withdrawals that reported their water use to the State of Michigan by April 1, 2009 are considered baseline capacity⁵ and are not required to be authorized under Part 327 of the NREPA. New or increased large quantity withdrawals greater than 100,000 gallons (378,541.18 litres) per day and up to 2,000,000 gallons (7,570,823.568 litres) per day are required to be authorized through the on-line Water Withdrawal Assessment Tool (WWAT) or by a site-specific review by the Michigan Department of Environmental Quality (MDEQ).

The WWAT is an assessment tool that estimates the likely impact of a water withdrawal on nearby streams and rivers. Use of the WWAT is required of anyone proposing to make a new or increased large quantity withdrawal (over 70 gallons per minute – approximately 167 litres per minute) from the waters of the state, including all groundwater and surface water sources, prior to beginning the withdrawal. The WWAT uses three models to assess impact: (1) a withdrawal model – assessing how much water in the aquifer is being withdrawn, and from where and how it will affect stream flow, (2) a streamflow model – assessing how much water is flowing in the stream during summer low flow periods, and (3) a fish impact model – assessing what fish are in the stream and what is the likely effect of removing water on those fish populations. From these models, the WWAT then categorizes withdrawals based on zones of risk; all streams and rivers of the state are classified by size and water temperature. Each stream type has different characteristic fish populations that respond differently to the loss of water. For each type, a maximum amount of water can be withdrawn before it causes an adverse resource impact. The risk of approaching an adverse resource impact is marked by Zones A through D. Zone A has little risk of causing an adverse resource impact, while Zone D means an adverse resource impact would likely occur in the stream. Zones B and C lie between

⁵ Baseline capacity for large quantity withdrawals (LQWs) means that LQWs that were installed and in-use on or before October 1, 2008, are considered to be accounted for in the stream index flow determinations that Part 327 required by that date (Subsection 32701(1)(x)) (Quality, 2016)



these extremes, indicating increasing risk. The Assessment Tool advises the user what zone their proposed withdrawal is in and provides instruction on what to do.

If an application cannot pass the WWAT (Zone C or D), then an application can be assessed through a site-specific review by the MDEQ before the withdrawal can be operationalized (Milne, 2018). There are also additional (but not utilized) provisions in Michigan's statute (Part 327 of the NREPA) for voluntary site-specific review requests without using the WWAT (Milne, 2018). For either type of review, there are no fees associated with the authorization. However, there is a \$2,000 USD application fee for permits required under Section 32723 of the NREPA. Non-agricultural water users withdrawing more than 1,500,000 million gallons (5,678,117.676 litres) per year are also required to pay an annual \$200 USD water use reporting fee. More specifically, the following outlines which large quantity withdrawals require a permit under Section 32723:

(a) A person who proposes to develop withdrawal capacity to make a new withdrawal of more than 2,000,000 gallons [7,570,823.568 litres] of water per day from the waters of the state to supply a common distribution system.

(b) A person who proposes to develop increased withdrawal capacity beyond baseline capacity of more than 2,000,000 gallons [7,570,823.568 litres] of water per day from the waters of the state to supply a common distribution system.

(c) A person who proposes to develop withdrawal capacity to make a new or increased large quantity withdrawal of more than 1,000,000 gallons [3,785,411.78 litres] of water per day from the waters of the state to supply a common distribution system that a site-specific review has determined is a zone C withdrawal.

(d) A person who proposes to develop a new or increased withdrawal capacity that will result in an intrabasin transfer of more than 100,000 gallons [378,541.18 litres] per day average over any 90-day period⁶.

Michigan also has specific legislation for water bottlers under Section 325.1017 of the *Safe Drinking Water Act* ("Michigan Safe Drinking Water Act," 1976).

⁶ Section 32723(d) is derived from stipulations of the Great Lakes Agreement/Compact and applies across all Great Lake States.



(3) A person who proposes to engage in producing bottled drinking water from a new or increased large quantity withdrawal of more than 200,000 gallons [757,082.357 litres] of water per day from the waters of the state or that will result in an intrabasin transfer of more than 100,000 gallons [378,541.18 litres] per day average over any 90-day period shall submit an application to the department in a form required by the department containing an evaluation of environmental, hydrological, and hydrogeological conditions that exist and the predicted effects of the intended withdrawal that provides a reasonable basis for the determination under this section to be made.

Applications for bottled water production are also required to undertake activities to meet applicable standards provided in Section 32723 of the Natural Resources and Environmental Protection Act (1994) and hydrologic impacts related to the stream flow regime, water quality, and aquifer protection that stem from the nature and extent of the withdrawal. Water bottlers are also required to consult with local government officials and interested community members. A fee of \$25 for a state license and \$25 for license renewal per brand/type of bottled water is charged. Additionally, there are select site-specific cases where municipal rates are also charged. For example, Nestle adheres to the municipal rate of \$2.37 USD/1,000 gallons (3,785.41 litres) to extract groundwater in municipal water supply for the City of Ewart for some of their water supply (Nestle Waters, N.D.). Terms of this agreement are between the water user and supplier. Limitations are also imposed via case law (e.g., Michigan Citizens for Water Conservation v. Nestle Waters North America INC 2005) on how much water Nestle can pump specifically in Mecosta County; an average of 218 gallons per minute (1,188,316 litres/day) is set with restrictions on spring and summer withdrawals from the Sanctuary Springs field (Miller, 2008).

3.1.2.3 Florida

Florida is guided by both riparian and common law at the state and regional scale. The Florida Department of Environmental Protection (FDEP) has primary responsibility, while five water management districts (WMD), divided by watershed boundaries, assume regional authority to regulate water use within their jurisdictional boundaries. This authority is granted under Florida Statute Chapter 373 Part II ("Florida Water Resources Act of 1972," 1972). The five districts include (1) Southwest Florida Water Management District (SWFWMD), (2) Northwest Florida WMD, (3) St. Johns River WMD, (4) South Florida WMD, and (5) Suwannee River Water Management District (SRWMD).



The districts were created by the legislature in 1972 out of a need to manage water on a state and regional basis. They determined that water is a public resource benefiting the entire state and so the water must be managed on a state and regional basis. The legislation relied on surface water basins to define the district boundaries, which were much better defined than aquifer divides at that time and more conducive to a regional division of the state (Laidlaw, 2018).

With regards to water use permitting, the five WMD have authority and each have their own rules governing the permitting process as codified in the Florida Statutes Chapter 373 Part II. The FDEP does not review or comment on water use permits and instead only exercises oversight to ensure a consistent and efficient application of the rules by each district. Across the state, water users are identified by volume; however, rules for general water use permits or consumptive water use permits, permitting cost, and the degree of reporting on water use data vary by district and in critical water use areas. In general, permits are required for all users with a cumulative annual average daily consumption of 100,000 gallons (378,541.18 litres) per day, a capacity to pump 1,000,000 gallons (3,785,411.78 litres) per day, for wells greater than six inches in diameter, or withdrawals from surface water bodies with an intake diameter or cumulative intake diameter of 8 inches or greater. Some projects require an Environmental Resource Permit (ERP) before a water use permit (WUP) will be issued. For example, in the SWFWMD, there are three types of WUPs based on the amount of water used in one year: individual: 500,000 gpd (1,892,705.89 litres/day) or more; general: 100,000 gallons (378,541.18 litres) per day or more, but less than 500,000 gpd (1,892,705.89 litres/day); and small general: less than 100,000 gallons (378,541.18 litres) per day (Southwest Florida Water Management District, 2015). In the St. Johns River WMD, the same water quantity thresholds of permit tiers as the SWFWMD are used; however the permit titles and permitting cost for new or renewal of existing use permits vary. This is explained in section 1.4.2 Thresholds in the St. Johns River WMD Applicant's Handbook (Florida Department of Environmental Protection, 2013): 40C-2.041 Permits Required from SJRWMD Permitting of Consumptive Uses of Water. Across all jurisdictions, Chapter 373.223 outlines that to obtain a permit, all applicants must establish that the proposed withdrawal is for a reasonably-beneficial use, does not interfere with any present existing legal use of water, and is consistent with the public interest.

Water bottlers are also included explicitly as one of the water use groups requiring evidence that withdrawals for water bottling be of reasonably beneficial use and public interest in Chapter 373.223. Additionally, water bottlers (extracting from both surface and groundwater



sources) are explicitly defined in Statute 500.03(1)(d) ("Food Products," 2012) and specific conditions for water permitting by water bottlers is addressed in Florida Statute 373.223. Specifically, the statute outlines considerations for evaluating whether a potential transport and use of ground or surface water across county boundaries for bottled water are consistent the public interest. A governing board or department shall consider:

(a) The proximity of the proposed water source to the area of use or application. (b) All impoundments, streams, groundwater sources, or watercourses that are geographically closer to the area of use or application than the proposed source and that are technically and economically feasible for the proposed transport and use. (c) All economically and technically feasible alternatives to the proposed source, including, but not limited to, desalination, conservation, reuse of nonportable reclaimed water and stormwater, and aquifer storage and recovery. (d) The potential environmental impacts that may result from the transport and use of water from the proposed source, and the potential environmental impacts that may result from use of the other water sources identified in paragraphs (b) and (c). Whether existing and reasonably anticipated sources of water and conservation efforts are adequate to supply water for existing legal uses and reasonably anticipated future needs of the water supply planning region in which the proposed water source is located. (f) Consultations with local governments affected by the proposed transport and use. (g) The value of the existing capital investment in water-related infrastructure made by the applicant (s. 373.223(3)).

3.1.2.4 Montana

In Montana, the scale at which authority is exercised is at the state and court level. The responsible agency at the state level is the Montana Department of Natural Resources and Conservation (DNRC). The DNRC's responsibilities under the Montana Water Use Act ("Water Use," 2017) include "acquiring new water rights, changing existing water rights, and maintaining a centralized water right record system". The eLight regional water offices (<http://dnrc.mt.gov/divisions/water/water-rights/water-resources-regional-offices>) assist in these activities. The DNRC is responsible for the development of the State Water Plan (Montana Watercourse at the Montana Water Center & Montana Department of Natural Resources & Conservation, 2015b). Water rights in Montana are broken down into two groups. Water rights that were established prior to July 1, 1973, are administered by the Adjudication Bureau and under the jurisdiction of the Montana Water Court. Water rights that were established from July 1, 1973, through to the present are administered by the New Appropriations Program of



the DRNC (Montana Department of Natural Resources & Conservation, 2018e). Under Article IX of the Montana Constitution, all waters belong to the State for the use of its people and are subject to appropriation for beneficial uses. The legal structure in Montana is hybrid - primarily prior appropriation, first in time, first in right. According to Franz (2008):

Montana's water law is based in the Doctrine of Prior Appropriation – First in Time, First in Right. Water rights are ranked according to the date on which the water was first put to beneficial use... Priority date is critical; because water users with the earliest priority date (senior water right holders) can divert the FULL amount of their claim before claimants with later (junior water right holders) can divert ANY water. If the water source cannot supply enough water to meet all claims (as when the river flows drop after spring flood), junior water users must cease diverting water in descending order of priority date to allow those with senior water rights their full claim amount. The law does NOT mandate that shortages be shared among water users.... Whenever senior water users are not using water, the water is available to the next user in order of priority date. The total amount of water allotted by priority date is measured at the head gate on the river. Within a ditch or canal system, the water can be shared by consent and priority date. We get our water from the Allsop Branch of the Upper Creamery Ditch. Our neighbors on each side have 1865 water rights. We have 1872 and 1888 water rights. When they shut down for haying, we can get our full complement of water for irrigating when water is short. As seniors reduce water use and fall rains increase river flow, junior water right holders begin to receive water depending on priority date. Water is distributed by volume based on priority date only. No preference is given for one use over another. Municipal or domestic uses are no more valuable than other uses.... Beneficial use is the measure, limit, and extent of a water right. Most senior water right claims are based on flood irrigation. Flood irrigation uses more water than sprinkler irrigation, but more is returned to groundwater and the river. The water needed to grow the designated crop (like potatoes, barley, or alfalfa hay) without waste is the extent of the water right regardless of how it is applied. Our neighbor Brad found that out when he bought up other water rights on his ditch. The DNRC would only give him authorization to change the use of the amount that had been needed to grow the crop historically produced with that water – less than half of the amount



he purchased. The rest of what he bought could potentially be moved to other property, sold, or converted to in-stream flow. If this water is not put to beneficial use, it may eventually be considered abandoned. A water right is under threat of abandonment if it meets three criteria: (1) the claimant does not use the water for an extended period of time (10 or more years), (2) water is available AND (3) there is no intent to use the water. This does not apply to federal or tribal water rights and some state based reserved water rights.

Montana Code Annotated § 85-2-102(1), defines, in part, “appropriate” to mean “to divert, impound, or withdraw, including by stock for stockwater, a quantity of water for beneficial use”. “Montana law recognizes a wide range of beneficial uses including, but not limited to, agriculture, mining, stock, commercial, domestic, industrial, municipal, navigation, wildlife, fish and fish protection, power generation and recreational uses”.

Montana Code Annotated § 85-2-302 discusses permitting of all new surface water and “big” groundwater new appropriations or changes to existing water rights. A permit is not required if a person proposes to develop a well or groundwater spring with an anticipated use of up to 35 gallons per minute (190,785 litres/day) and 10 acre-feet per year (12,334.8 cubic metres per year) § 85-2-306, MCA (12 dam³)” (AMEC, 2008; Olsen, 2018). Notably, in terms of implementation, this exempt well statute (§ 85-2-306, MCA) has proven challenging. In the 1970-1980s, prior to significant development, this statute flew largely “under the radar”. Citizens could develop and utilize numerous exempt wells and relatively few notable problems were realized. Once development ramped up and Montana entered a prolonged drought, citizens became more concerned about cumulative impacts of exempt wells. While this issue has been and continues to be discussed with stakeholders, legislative bodies, courts, and DNRC, the statute remains in effect, and DNRC has adopted policies to attempt to resolve issues with implementation of this statute, concerns are ongoing (Ferch, 2018).



In Montana, there is a water trading system. Montana Code Annotated states that “[w]ater rights can be bought, sold, and leased in Montana”. According to Franz (2008):

An outgrowth of the revised Montana Constitution, the Water Use Act of July 1, 1973 set a key date that forms the basis for contemporary Montana Water Law. All water rights dated before July 1, 1973 (with a couple of exceptions) are subject to adjudication by the Montana Water Court. In 1982 all holders of pre-1973 rights had to file their claims with DNRC. Those claims could be based on one of three sources: (1) historical use (a use right with no formal documentation), (2) a notice of appropriation on file in the courthouse (called “a filed right on the water right abstracts” or an appropriated right), or (3) a court decree like Bell vs. Armstrong in 1909. All new water rights filed after July 1, 1973 require a permit from DNRC – except individual wells pumping no more than 35 gallons a minute [190,785 litres/day] or 10 acre feet a year [12,334.8 cubic metres per year] – known as “exempt wells” (or a stock pond of less than 30 acre feet [37,004.4 cubic metres] a year serving 40 acres or more). An exempt well requires only a filing of a “Notice of Completion of Ground Water Development” and \$125 and the water right is approved. In contrast, the permitting process for any surface water or wells pumping MORE than 35 gallons a minute [190,785 litres/day] or 10 acre feet a year [12,334.8 cubic metres per year] (as for a subdivision water supply) is a DNRC administrative process that involves lengthy analysis of the effects on other water users, opportunities for objections, possible hearings, and finally, a decision. Depending on the complexity of the situation, the process can take two years or more.

Although water rights are attached to the land on which they are used and are typically conveyed with the land in the event of a sale, water rights may be severed from the land and leased or sold to another party for other beneficial uses. Whether a water right is sold or leased, the change of a water right to another beneficial use requires the approval of DNRC to ensure that the pertinent criteria are met. This includes the requirement that the proposed use not adversely affect the use of other water rights (85-2-402, MCA; 85-2-407, MCA). Water right transactions may include: the sale of water rights for other beneficial uses, a temporary lease with Department of Fish, Wildlife and Parks (DFWP) or other parties for in-stream flows to protect fishery resources (85-2-408, MCA), the lease or sale for aquifer recharge or for



mitigation of adverse effects of off-stream uses (85-2-420, MCA), a temporary lease of up to 180 acre-feet (222,026 cubic metres) during two of ten consecutive years and a short-term lease for up to 17 acre-feet (20,969.2 cubic metres) over 90 days for road construction projects (85-2-410, MCA). Compensation associated with water right transactions is subject to negotiation between the parties. Due to the specific circumstances of particular water rights and the limited number of these transactions, the availability of relevant information regarding water right transactions is limited" (Montana Department of Natural Resources & Conservation, 2018b). For more detail, see Form No. 613 FEE SCHEDULE FOR WATER USE IN MONTANA (Montana Department of Natural Resources & Conservation, 2012). Finally, application, processing, issuance, and follow-up of permits for water bottling are no different than permits for any other purposes.

3.1.2.5 New Zealand (Waikato Region)

New Zealand has a unitary Central Government, below which governance is highly decentralized. Since the *Soil Conservation and Rivers Control Act 1941* ("*Soil Conservation and Rivers Control Act*," 1941), water has been managed at the level of the Regional Council which are based on catchment (watershed) boundaries. The Waikato Regional Council, like other Regional Councils in New Zealand, holds most of the power/authority and responsibility for regional water and management decisions, and has the responsibility to create its own Regional Plans which pertain to the management of resources and consent permits in the region (Curran & McArdle, 2018). In New Zealand, water is allocated on a "first-in, first-served" basis (akin to first in time, first in right).

National direction on environmental issues is provided in the form of the Resource Management Act 1991 (RMA), which is New Zealand's main piece of legislation outlining the approaches and requirements in air, soil, fresh water and coastal marine areas (New Zealand Ministry of the Environment, 2017). It is based on the principles of sustainable management, and also regulates land use and the provision of infrastructure.

For the Waikato Region, for surface water, there is no volume threshold. The threshold is the allocable flow (rate of take) at the point of take, and cumulatively for the waterway or catchment. If the allocable flow of a waterway is set at 10% of the Q5 (rate), then that 5% applies at the 'bottom' or 'end' of that waterway (and its tributaries) where the Q5 flow rate is say 100 litres per second (L/s); 10% is the allocable flow i.e., 10 L/s. If in the upper part of the waterway, the flow is 10 L/s, then there is only 1 L/s allocable flow at that point. The sum of all



takes is assessed at the point of take, cumulatively with all others, so the total should not exceed 10 L/s. For groundwater/aquifer areas where a management or sustainable yield has been set as an annual volume, that volume comprises the threshold for all takes cumulatively. There is no threshold for any particular permit irrespective of end use (Davenport, 2018).

For the Waikato Region, there are permit exemptions for water takes discussed in the Permitted Activity Rule- Supplementary Groundwater Takes s.3.3.4.12 of the Waikato Regional Plan (Waikato Regional Council, 2010) which states that:

In addition to the taking of groundwater as allowed by s14 (3)(b) of the RMA [Resource Management Act]

*1. The taking of up to 1.5 cubic metres per day on sites equal to or less than one hectare; or 2. The taking of up to 1.5 cubic metres per day on sites where the well is within 600 metres of the coastal marine area; or 3. The taking of up to 15 cubic metres of groundwater per day on all other sites by means of a well is a **permitted activity** subject to the following conditions: a) The take(s) shall be within a single site. b) The site of the activity shall not be within 100 metres of a Significant Geothermal Feature except for those features that are Recent Sinter or Hydrothermal Eruption Craters containing no geothermal pools or discharging geothermal features in which case the take shall not be located within 20 metres of the feature. c) The activity shall not result in salt water intrusion or any other contamination of the aquifer. d) The total of all takes from the aquifer does not exceed the Sustainable Yield if listed in Table 3-6. **Exception** This rule does not apply to: The taking of geothermal energy and water. The taking of water for a dam or diversion. Such takes are managed by the policies and rules in Chapter 3.6.*

For temporary “takes”, Permitted Activity Rule- Temporary Takes s.3.3.4.14 of the Waikato Regional Plan (Waikato Regional Council, 2010) states:

*The taking of up to 150 cubic metres of water per day (calculated on a net take basis for surface water takes) for no more than five days per annum from any river or aquifer is a **permitted activity** subject to the following standards and terms: a) The net rate of the take, assessed in combination with all other authorised water takes, shall not exceed 100 percent of the primary allocable*



*flows for catchments specified in Table 3-5. b) For groundwater takes the well is not within 600 metres of the coastal marine area and the total rate of the take in combination with all other takes from the aquifer does not exceed the Sustainable Yield if listed in Table 3-6. c) The intake structure shall comply with the screen and velocity standards as set out in the Water Management Class for that water body (see Chapter 3.2 of this Plan) and with the provisions in Rule 4.2.10.1 of this Plan. d) This rule shall not apply when water restrictions are in place in accordance with Standard 3.3.4.27. e) Written notice of the location, time and duration of take shall be provided to the Waikato Regional Council 10 working days before works commence. **Exceptions** This rule does not apply to: the taking of geothermal energy and water; or to takes from wetlands or lakes (excluding artificial lakes and Lake Taupo). The taking of water for a dam or diversion. Such takes are managed by the policies and rules in Chapter 3.6.*

For water use consents, the consent/water right applicant pays the actual and reasonable cost of consent processing. A \$NZ1000 deposit required for each application. 'Simple' non-complex (Controlled Activity) applications between \$NZ2500 & \$NZ5000. For complex applications without a Hearing, \$NZ10000 to \$15000 is not uncommon. Contested application requiring a hearing, independent qualified & certified Commissioners, \$NZ15000 to \$NZ50000 can be required. If granted, the consent holder pays an annual fee which goes toward Council's regulatory administrative and environmental investigation and monitoring functions. The fee is based on the quantity of water allocated and is set annually as part of Council's (public) annual planning process. There are no restrictions or fees for water bottlers (Davenport, 2018).

3.2 INTEGRATED WATER MANAGEMENT & CUMULATIVE EFFECTS

Integrated water management is based on the interconnected nature of water bodies across landscapes, above and below ground and in terms of water quantity and quality connections (Canadian Council of Ministers of the Environment, 2016b). Included within this set of ideas are suggestions to account for the interaction between groundwater and surface water, water quantity and quality, and land and water use in water management decision-making. The necessity of considering these interactions is apparent in examples such as groundwater withdrawal lowering connected surface water flows and altering surrounding ecosystems when these systems are fed by aquifer base flows (Schofield *et al.*, 2003). Likewise, water quality



concerns such as urban storm water runoff as a source of non-point source pollution and irrigation-induced salinity into groundwater can impact the availability of sufficient quantities of potable water for communities and ecosystem health. Despite these interactions, how these topics have traditionally been separated institutionally by departments or policies. The extent integration can be addressed in water use systems ties strongly to the presence of enabling institutions that allow for coordinated decision-making (Shortt *et al.*, 2006). However, the ability to overcome institutional fragmentation is still recognized as a principle challenge in achieving such coordination across a broad range of jurisdictions (Canadian Council of Ministers of the Environment, 2016b). Other challenges include incomplete scientific knowledge and geographic variations of interconnectivity. In the Canadian context, these challenges are reflected as efforts that are still ongoing to develop comprehensive mapping and data collection programs to understand groundwater resource sustainability and interactions with surface water across multiple settings (Canadian Council of Ministers of the Environment, 2010).

To support integrated decision making for allocation, the assessment of cumulative effects to recognize the combined effects of multiple activities over space or time can improve knowledge of varying ecological interactions and human influence (MacDonald, 2000). For example, multiple water withdrawals (e.g., irrigation, municipal, and industrial) combined with more frequent droughts associated with climate change lead to reduced summer flows, which adversely affects downstream water availability, stream temperature, and fish habitat (Scherer, 2011). Despite general understanding of the importance of cumulative effects assessment and consideration as an integrated management approach, it tends to be inconsistently legislated across the Western Hemisphere (Chilima *et al.*, 2013). Exceptions include the Great Lakes states and provinces, each of which are signatories to the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement (along with the companion Compact, which applies to the Great Lakes states only). Through the Compact, a baseline for minimal considerations is set for each signatory party to assess cumulative effects in water withdrawal assessments. Part of the challenge of including cumulative effects assessment in consideration of water taking relates to the degree of complexity of cumulative effects assessment. The integration of watershed disturbances means that a change to one single process will not likely reverse or change watershed processes. Likewise, the diversity and the vast amount of bio-physical processes make a full comprehensive cumulative effect assessment based on the availability of data a limiting factor, alongside political will and adequate scientific knowledge (Scherer, 2011).



The following subsections (Section 3.2.1 and 3.2.2) demonstrate the legislative coverage of integrated management across the reviewed jurisdictions. Integrated management concerns were reviewed as either the consideration for water quantity/quality and groundwater/surface water/integrated water interactions in policy. The extent and ways these concerns materialize in policy varies across the reviewed jurisdictions. All Great Lake jurisdictions, along with Florida, Montana, New Zealand, South Australia, and British Columbia (BC) have statutory requirements to consider both groundwater and surface water as well as water quality and quantity in the permitting or licensing of water. Other jurisdictions (Manitoba, PEI, Yukon, North Carolina, England) may also review these interactions in water allocation; however, the requirement was not identified as a legislated requirement in the review. Additional to the formalized requirement to consider water interactions, some jurisdictions also have explicit policy and planning objectives that incorporate integrated management. Notable activities considering groundwater and surface water include water allocation planning in South Australia and Minnesota; watershed-based planning in BC, New Brunswick, Illinois, California, Michigan, Minnesota, and Florida; water budgeting in Ontario and Florida; basin closures in BC and Montana; and well head or field protection in BC, New Brunswick, and Wisconsin. Other Jurisdictions such as Quebec and California also have explicit Integrated Water Management programs or protocol.

3.2.1 Phase One Jurisdictions – Integrated Water Management/Cumulative Effects

3.2.1.1 Canada

In **British Columbia**, the Water Sustainability Act (WSA) integrates stream water and groundwater in multiple ways. The dates of precedence on a source (e.g., a stream and hydraulically connected aquifer) are integrated. The development of water objectives, water sustainability plans, drilling authorizations, and the closing of a basin also consider integrated management principles (Vigano, 2018). Per Section 65(1) of the WSA, the minister may designate an area for the purpose of the development of a water sustainability plan, for reasons including (but not limited to), preventing/addressing conflicts between water users, conflicts between the needs of water users and environmental flow needs, risks to water quality, or risks to aquatic ecosystem health; or identifying restoration measures in relation to a damaged aquatic ecosystem. A proposed water sustainability plan must recommend measures to address issues considered in the planning process and provide the rationale for the recommendations (s.73(1)(e)). Additionally, through the Policy for Mitigating Impacts on Environmental Values (Province of British Columbia, 2014), aquifers connected to sensitive



streams are given specific consideration in decision-making for water use applications. At the aquifer and watershed level, consideration of cumulative effects is not required; however, they are commonly considered on a source-by-source basis in the technical review of applications. Moreover, a cumulative effects framework for assessment in resource decision-making is currently under development. Information on integrated management in **Manitoba** was not readily available. Cumulative effects assessment was only noted as a requirement for hydro projects associated with the Nelson River sub-watershed. **New Brunswick's** Clean Water Act includes well field protection (Wellfield Protected Area Designation Order: Regulation 2000-47 s.5-6), watershed protection (Watershed Protected Area Designation Order: Regulation 2001-83 s.6) and water classification systems (Water Classification Regulation: Regulation 2002-13 s.18); additionally, with the province's Biodiversity Strategy (Brunswick, 2009), there is a prioritization of integrated planning and management. Cumulative effects assessment in the Clean Water Act or its supporting regulations were not formalized. In **Ontario**, guidance and policies for the Permit to Take Water (PTTW) program emphasize the importance of managing both surface and groundwater and/or both water quantity and water quality, but there is no operational guidance or mandated process to consider a comprehensive, integrated water management approach (Ontario Ministry of Environment and Climate Change, 2018). It is noted in the PTTW Manual (Ontario Ministry of the Environment, 2005a) that, for operational purposes, water takings are typically classified as either groundwater takings or surface water takings, and the proposals are subsequently evaluated by either a groundwater specialist or surface water specialist according to the proposal's classification. However, when reviewing permit applications, Ministry technical reviewers will be cautious to consider potential impacts to both surface and subsurface water resources, due to the interconnected nature of these two resources. The PTTW also considers cumulative effects on a regional and permit scale; however, there is limited guidance for what triggers regional assessment or strategy development. **Prince Edward Island** does not have a formal mandate for Integrated Water Management; however, allocation decisions are made on the basis of collective water demand in a watershed, not just the demand by the proponent. **Quebec** Water Policy (Ministère de l'Environnement du Québec, 2002) states that "It is from this integrated management perspective that the Québec government has appointed a Minister of State for the Environment and Water, whose primary role is to ensure consistency among all government actions pertaining to this resource. In particular, the Minister must coordinate the policies, programs, and various governmental, intergovernmental and international committees likely to have an influence on water and aquatic ecosystems. There were no noted approaches to groundwater/surface water (GW/SW) integration or cumulative effects assessment. Cumulative impact of withdrawals for flow level



maintenance of the St. Lawrence River System is required through the Great Lakes Charter. The **Yukon Waters Act** does not have a mandate for integrated water management. Yukon focuses on land use planning and integrated resource management (IRM), which includes water, but water is not the central aspect of the IRM plans (Canadian Council of Ministers of the Environment, 2016a). Tangentially, cumulative effects are considered through the Waters Act via consideration of adverse impacts for water licences.

3.2.1.2 US – Great Lake States

Across the Great Lake States, the Great Lakes Compact provides general consideration for integrated water management and consideration of cumulative adverse impacts related to proposed water withdrawals. More specifically, the **Illinois** EPA has implemented a source water assessment program (SWAP) to assist with wellhead and watershed protection of public drinking water supplies recognizing GW/SW interconnection. In the Drought Plan (2011), well proximity to surface water are considered in times of drought. Additionally, one of the goals of Illinois' Lake Michigan Water Allocation Program is to reduce the use of water from the Cambrian-Ordovician aquifer. Water withdrawals typically are not evaluated based on cumulative impacts or renewable yields. In **Ohio** and **Indiana**, the only measures for incorporating integrated water management and cumulative effects are those related to the states' implementation of the Great Lakes—St. Lawrence River Basin Water Resources Compact. In Indiana, under the Flood Control Act (IC 14-28-1) and 312 IAC 10 (Flood Plain Management) rules, the Natural Resources Commission must consider cumulative effects study (habitat loss, habitat fragmentation, habitat change, habitat enhancement or conversion) when assessing a proposed project that may result in flooding. In **New York** and **Pennsylvania**, integrated water management and cumulative effects is considered through the 1972 Susquehanna River Basin Compact, which provides a commission with authority to regulate water withdrawals within the three basin states (Pennsylvania, New York and Maryland). Additionally, in Pennsylvania, groundwater is not included in permitting assessment; however, under the PA Safe Drinking Water Act 35 P.S. §721.1 et seq. (1984) groundwater withdrawal includes evaluation of impact to nearby water resources (Oley Township, et al. v. DEP and Wissahickon Spring Water, Inc., 1996 EHB 1098). Likewise, for surface water allocation, according to Water Allocation Application and Instructions (3900-PM-WM0001 Rev. 9/2001), "The quantity of surface water allocation will be determined based upon true safe yield and the conjunctive uses of all developed and proposed sources. Sources include groundwater sources or interconnections with other water suppliers, as well as all surface water sources." In **Wisconsin**, specific concern exists for the impact of groundwater withdrawals on springs in s. 281.34.5d., Wis. Stat. "1. Except as provided in subd. 2., if the department determines, under



the environmental review process in sub. (4), that an environmental impact report under s. 23.11(5), Wis. Stat. must be prepared for a proposed high capacity well that may have a significant environmental impact on a spring, the department may not approve the high capacity well unless it is able to include and includes in the approval conditions, which may include conditions as to location, depth, pumping capacity, rate of flow, and ultimate use, that ensure that the high capacity well does not cause significant environmental impact." Additionally, cumulative adverse impacts to quantity or quality of waters and water dependent resources are noted throughout Wisconsin Statute s. 281.343 as a factor to be considered in water management and regulation.

3.2.1.3 US – Non-Great Lake States

California's Water Plan (California Department of Water Resources, 2017a) explicitly emphasizes integrated water management across all levels of government as a key to managing inter-regional water systems. Tools such as the finite-element-based Integrated Groundwater and Surface-Water Model (IGSM) support this goal in many major basins across the state (LaBolle *et al.*, 2005) Additionally, Groundwater Sustainability Plans are also legislated by California Statute 10727.2 (d)(2) of the California Sustainable Groundwater Management Legislation ("Sustainable Groundwater Management Act ", 2014) and include "the monitoring and management of groundwater quality, groundwater quality degradation, inelastic land surface subsidence, and changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater extraction in the basin." Information on cumulative effects assessment in California was not readily available. Integrated management in **North Carolina** was not identified; however, cumulative effects consideration was adapted through the Clean Water Act as standards for issuance of permits by the North Carolina Environmental Management Commission.

3.2.1.4 International

The objective of the **South Australia** Natural Resource Management Act ("Natural Resources Management Act," 2004) is to establish "integrated scheme to promote the use and management of natural resources". The Act deals extensively with ground water (the term underground water is used) and surface water in the context of allocation. Water allocation plans can regulate the taking of groundwater, surface water such as farm dams, and/or water extracted directly from watercourses. A single water allocation plan can cover one or more of these three resource types. The Water Allocation Planning process, including technical assessments, considers the interaction of ground and surface water (e.g., baseflow, recharge); the plans set policies that are based on the establishment of allocation limits with various



management units (e.g. sub-catchments) within the area. Water allocation plans are not well linked with other management activities (Poppleton, 2018). Direct consideration for cumulative effects in water allocation in South Australia were limited other than in the preparation for Water Allocation Plans, which can set policies for allocation limits in an area based on various assessments. With the implementation of the European Water Framework Directive, **England/Wales'** approaches to cumulative effects were identified in the context of drinking water when the "cumulative impact of mitigation on the benefits provided by a use reaches a point beyond which it would be come significant" (Department for Environment, Food & Rural Affairs, 2014).

3.2.2 Phase Two Jurisdictions – Integrated Water Management/Cumulative Effects

3.2.2.1 Minnesota

Under Minnesota Statute 103A.204, 103G.271 and 103G.287, the state is required to take into consideration surface and groundwater interactions in water use permitting.

103G.271 Subd. 5a: Maintaining surface water levels. Except as provided in subdivision 5, paragraph (b), the commissioner shall, by January 31, 1994, revoke all existing permits, and may not issue new permits, for the appropriation or use of groundwater in excess of 10,000,000 gallons [37,854,117.84 litres] per year for the primary purpose of maintaining or increasing surface water levels in the seven-county metropolitan area and in other areas of concern as determined by the commissioner...

To help the commissioner determine areas of concern the document "Long-Term Protection of the State's Surface Water and Groundwater Resources" (Minnesota Department of Natural Resources, 2010) offers details and related laws for implementation. Areas of concern are identified as either a) landscapes that are highly altered and require a high degree of restoration to regain adequate natural functions and biotic communities or b) areas that currently support natural ecosystems in hydrologically sensitive areas can be managed to preserve existing ecosystem function. Either of these area types are prioritized through an evaluation process based on three criteria: altered areas with impaired function, hydrologically sensitive areas with intact function, and water supply areas of concern (Ekman, 2018).



Additionally, in 103G.287 Subd. 2. "Groundwater appropriations that will have negative impacts to surface waters are subject to applicable provisions in section 103G.285." Groundwater modeling efforts, which are still on going in the state, have documented the negative interactions from appropriation in certain areas of Minnesota. As a response to these recognized challenges, the Department of Natural Resources (DNR) has implemented a pilot project in three aquifers - Groundwater Management Areas (see Minnesota Statute 103G.287, subd. 4) where allocation plans for all water users are being developed that consider the impacts of groundwater appropriations on surface water.

The allocation plans of the Groundwater Management Areas are developed through a public participation process. Specific members of the public volunteer to participate throughout the process as members of an advisory team. Membership includes representatives from other agencies, the area's local government; industry and individual water appropriation permit holders. Typically, around 25 people make up an advisory team. DNR begins the planning process by presenting on the water appropriation problems that the department has identified in the selected area and drafts a plan of action for the department. The advisory team then provides feedback and advice (Ekman, 2018). The process can take 1 to 2 years to finalize the Plan that officially designates the groundwater management area (Ekman, 2018). The plans lay out what actions DNR will take over a 5-year period. They are implemented by DNR staff members working in the area with oversight provided by a project manager. The advisory team is invited to two meetings each year during implementation of the plan. At these meetings DNR reports on its progress and the advisory team provides feedback and insights.

As a result of these plans in the Groundwater Management Areas, when new groundwater use projects are proposed, the project proposer is required to seek an assessment from the DNR prior to drilling a new well about the water availability. The DNR assesses the risk of an additional appropriation to the aquifer, including the risk to surface water, to allow the project proposer to make an informed decision of whether or not they are likely to be successful in obtaining a water use permit prior to spending money on a well and other equipment in an area.



Water quality and quantity interactions are also considerations in Minnesota Statute. In 103G.287 Subd. 3.

The commissioner may establish water appropriation limits to protect groundwater resources. When establishing water appropriation limits to protect groundwater resources, the commissioner must consider the sustainability of the groundwater resource, including the current and projected water levels, water quality, whether the use protects ecosystems, and the ability of future generations to meet their own needs.

Following the establishments of these limits the commissioner may designate groundwater protection areas and follow a sustainability standard to ensure limited total annual water appropriations and uses in certain areas to ensure the sustainable use, which includes ensuring waters are not degraded. Minnesota's Department of Agriculture, Pollution Control Agency, Department of Health, and Department of Natural Resources collaborate on addressing water quality issues (Ekman, 2018).

Such area-based efforts, like the Groundwater Management Areas, represent the state's approach not only to integrated water management, but also to the consideration of cumulative effects. To this end, additional rules and approaches that exist in state legislation also include Minnesota Rule, 6115.0670 Subp. 2.C(4), which states that Minnesota DNR must consider the "cumulative long-range ecological effects in(of) proposed appropriation" when permitting. This Rule also discusses the "Commissioner's Actions on Permit Applications" as it relates to appropriation from basins. 6115.0670 Subp. 2.C(4) also informs permit staff to consider the proposed appropriation on wildlife, fisheries, aquatic vegetation and other natural resource features that depend on the basin water levels for ecosystem health. DNR permitting staff reach out to the appropriate internal DNR staff who have expertise in these other areas of wildlife, fisheries, nearshore habitat (aquatic vegetation) in order to inform their decision-making on the permit application. This action is a part of the iterative approach of mapping, modeling and monitoring for managing water resources the DNR employs that allows for the collection of information from the field (e.g., DNR's Geologic Atlas program, which maps aquifer sensitivity to contamination on a county scale), from permit application processes, and information from others (e.g., other state agencies, the United States Geological Survey (USGS), the Minnesota Geological Survey) to support the permitting assessments. Such assessments and planning are made on a watershed level through partnerships with various state agencies and watershed districts.



Another effort made by the state to consider cumulative effects and integrated management includes Minnesota Rule, 6115.0750 "Provisions and Conditions of Water Appropriation Permits." 6115.0750 outlines monitoring, reporting, amendment, transfer, limitation, and termination conditions or procedures for water permitting. Processes for considering both groundwater and surface water are included within this Rule and reflect the actual assessment and practice-based procedures for considering cumulative impacts and integrated management in permitting.

3.2.2.2 Michigan

Although Michigan statute does not hold surface water and groundwater together in public trust, the State does manage both conjunctively. For example, Part 327: 324.32706a(2c) "Cool streams and warm streams with a drainage area of more than 3 square miles but less than 6 square miles (7.8 square kilometer but less than 15.5 square kilometer) shall be integrated into the next largest drainage area for purposes of assessment tool determinations for groundwater withdrawals." Additionally, the integration of three models into WWAT application review (i.e., groundwater withdrawal, stream flow, and fish population models) more broadly emphasizes Michigan's emphasis on integrated assessment in permitting. Outside of permitting specifically, water quality/quantity integration is also noted in Act 451, Section 324.31202 ("Natural Resources and Environmental Protection Act," 1994) as an area requiring data collection and analysis for municipal planning and implementation activities concerning flow issues.

Cumulative effects assessment to identify these interactions is noted in Sec. 32723(6)(b) of the Natural Resources and Environmental Protection Act (NREPA):

The withdrawal will be implemented so as to ensure that the proposal will result in no individual or cumulative adverse resource impacts. Cumulative adverse resource impacts under this subdivision shall be evaluated by the department based upon available information gathered by the department.

To make a cumulative assessment for large withdrawal permitting (over 70 gallons per minute – approximately 167 litres per minute), Michigan's Water Withdrawal Assessment Tool or if warranted for a permit that is likely to cause an adverse impact (i.e., the proposed permit is in a zone of high risk – e.g., Zone C or D) are used. Groundwater and surface water are taken into consideration either through online calculation of the WWAT tool or the site-specific review by the state before issuing a water withdrawal permit. Three models – a streamflow, aquifer



withdrawal, and fish population model are used in assessment. To this regard, cumulative effects using the WWAT are measured on a sub-watershed basis, which in Michigan can range in size from a few acres to 120 square miles (311 square kilometers). Sub-watersheds are delineated as 'water management areas' and do not take into account downstream watersheds (Ecofish Research Ltd. *et al.*, 2017), except when a cold-transitional sub-watershed is immediately downstream of the affected sub-watershed. In that case, the stream flow depletion limits for the cold-transitional sub-watershed apply. Any large quantity withdrawals that may cause adverse resource impacts are prohibited.

3.2.2.3 Florida

Florida gives equal weight to surface and groundwater in its permitting system recognizing 'environmental flows and levels' as an integrated concept (Hirji & Davis, 2009). In considering the establishment and implementation of minimum flows and minimum water levels, Chapter 373.0421 outlines that both surface waters and aquifers must be considered by the governing board or department. Likewise, minimum flow levels are calculated using water budget computer models taking into account both existing surface and groundwater withdrawals on flow levels before issuing a new allocation permit.

Additionally, water quality of both water sources and any discharges into water bodies are required as a part of the reasonable beneficial use criteria that each water management district uses to evaluate water use. For this reason, permitting considerations are also addressed in the Integrated Water Quality Assessment for Florida (Florida Department of Environmental Protection, 2016).

To help identify groundwater and surface water and water quality and quantity interactions, cumulative effects of water withdrawal are monitored by each of the five Water Management Districts in Florida (Neubauer *et al.*, 2008). As a result, all applications for water use are evaluated for unmitigated impacts to water quality, wetlands, minimum flow levels, existing legal users, and off-site land uses on both an individual and cumulative basis (Laidlaw, 2018). For example, the St. Johns River Water Management District (SJRWMD) uses a cumulative and a priori regulatory approach to water use such that "new allocations are not permitted until the effects of the proposed and existing water uses are assessed" (Neubauer *et al.*, 2008). To do so, the SJRWMD typically utilizes the entire model domain as the cumulative approach for impacts to the resource and other existing legal users. Currently, this involves three overlapping regional models: North Florida Southeast Georgia, Northern District Model, and the East Central Florida



groundwater flow model (Laidlaw, 2018). In some cases, the model boundaries may include two or three water management districts. Chapter 40C-2.301, of the Florida Administrative Code, outlines conditions for issuance setting forth the criteria that is evaluated upon completion of the model assessment. To assist in this assessment, water use data are reported monthly, quarterly or annually, depending on the management district, with the exception of agricultural use, which is collected only in some areas of the state. The SJRWMD, SWFWMD, and SRWMD require the submittal of monthly water use data on a monthly or quarterly basis for all uses above 100,000 gallons (378,541.18 litres) per day annual average daily use (Laidlaw, 2018).

3.2.2.4 Montana

In Montana, concerns for groundwater and surface water are formally integrated into legislation and code. The concern is addressed in terms of definition; the act entitled ("An Act Clarifying the Definition of "Change in Appropriation Right" for Purposes of the Water Use Act; Providing That a Change in Appropriation Right Does Not Include A Change in the Method of Irrigation; and Amending Section 85-2-102, MCA.," 2017) addresses surface water, groundwater and groundwater recharge. Further, Montana rule 36.12.101(13) on definitions in the Montana Water Use Act defines "Combined appropriation" as an "appropriation of water from the same source aquifer by two or more groundwater developments that are physically manifold into the same system." Montana's Constitution ("The Constitution of the State of Montana," 1972) also sets the stage for how groundwater and surface water are integrated: in s.3(3) on water rights it states "(3) All surface, underground, flood, and atmospheric waters within the boundaries of the state are the property of the state for the use of its people and are subject to appropriation for beneficial uses as provided by law." More specifically, Montana's Agricultural Chemical Ground Water Protection Act Part 1. General Provisions Policy 80-15-103 specifies that

It is the public policy of this state to: (1) protect ground water and the environment from impairment or degradation due to the use of agricultural chemicals; (2) allow for the proper and correct use of agricultural chemicals; (3) provide for the management of agricultural chemicals to prevent, minimize, and mitigate their presence in ground water; and (4) provide for education and training of agricultural chemical applicators and the general public on ground water protection, agricultural chemical use, and the use of alternative agricultural methods.



While policy/code on cumulative effects in Montana are not comprehensive in comparison to some other jurisdictions, in practice, when processing permit applications, DNRC considers the quantity of water physically available and the amount already legally spoken for via water rights. If the water rights already issued meet or exceed the amount of water physically available, permits are typically denied for that area/time. According to Ferch (2018):

We use median of mean monthly flows and volume, if that data is available. For example, let's say we have USGS gage data available and at the median of the mean monthly flow is 1000 CFS [28.3 cubic metres per second] and the median of the mean monthly volume is 59,500 AF [73,392,060 cubic metres]. We then add the total flow rates and volumes for all existing water rights and subtract that from the total physically available. If there is enough for the new appropriation, we consider the water legally available for that month. In many cases we don't have median of monthly mean data available so we use individual measurements and professionally accepted estimation techniques (ARM 36.12.1702). We've also got some new programs that we are just starting to use to help estimate stream flows. Speaking about groundwater, we typically look at annual aquifer flux through the affected area and subtract legal demand volume from the total. We do not assess flow rate "physical availability" for groundwater, just volume. Since groundwater and surface water are connected, we also look at legal availability of connected surface sources. Applicants must meet the criteria identified in 85-2-311, MCA (further refined in ARM 36.12.1701-1802 and case law). If an applicant fails to meet the criteria required, the permit is denied.

Further, according to Ferch (2018), such denials are sometimes contested by applicants:

[I]f an applicant chooses, he/she may request a hearing with the department. This is termed a show-cause hearing. If an applicant chooses this approach, he/she will proceed to an administrative hearing where additional information may be presented. The hearing examiner can either uphold the decision, reverse the decision and grant the permit, or remand the application back to the original office for further assessment of additional data. If the hearing examiner upholds a denial, the applicant may appeal to district court (and even Supreme Court if they choose).



Groundwater/surface water interactions are also considered (i.e., if a groundwater appropriation is sought, the impact to connected surface sources is calculated) (Ferch, 2018; Olsen, 2018). This practice addresses the Montana Environmental Policy Act s.75-1-208 on environmental review procedure which specifies that

...(11) An agency shall, when appropriate, evaluate the cumulative impacts of a proposed project. However, related future actions may only be considered when these actions are under concurrent consideration by any agency through preimpact statement studies, separate impact statement evaluations, or permit processing procedures.

However, cumulative impacts in this Act refers only to “collective impacts on the human environment” (AMEC, 2008). Notably, Montana has closed basins and controlled groundwater areas throughout the state; these are closed to new appropriations of water or special permitting circumstances apply.

The state of Montana has the ability to control or close river basins and groundwater sources to certain new water appropriations when there are problems involving water use and health. There are four types of closures: 1. A Controlled Groundwater Area (CGWA) may be designated to protect water quantity or quality. Certain local government entities or 1/3 of water rights holders in the proposed area can petition for a CGWA. The DNRC may also propose an area for designation and may then designate a CGWA by administrative rule assuming the criteria for establishing a CGWA are met... 2. The DNRC may also adopt an administrative rule closing a basin or restricting new uses in a basin. In order for the DNRC to adopt an administrative rule closing a basin it must first receive a petition from the Department of Environmental Quality, or from 25 percent or ten (whichever is less) of water users in the basin. The closure can only occur when certain conditions⁷

⁷ The following conditions must exist for the DNRC to adopt administrative rules to close a drainage basin (Montana Department of Natural Resources & Conservation, 2016): “there is no unappropriated water in the source of supply, the rights of prior appropriators would be adversely affected by further appropriation, new uses would interfere with other planned uses, the water quality of an appropriator would be adversely affected by further appropriation, additional new uses would affect water quality so that the source will not meet its classification under 75-5-301(1), MCA [...], and additional new uses would adversely affect the ability of holders of discharge permits to satisfy their effluent limitations.”



threatening the water supply exist. 3. Statutory closures are created by the Montanan Legislature. These closures typically limit permit applications in basins that are over appropriated. 4. Compact closures can occur when the Reserved Water Rights Compact Commission negotiates compacts with tribes and federal agencies resulting in closures of certain water sources (Montana Watercourse at the Montana Water Center & Montana Department of Natural Resources & Conservation, 2015a).

Closure is done either legislatively or administratively and each one can be unique. In most cases the closures are permanent. However, there have been a few temporary controlled groundwater areas which have expired. Closures can range from just a few acres or small basins to millions of acres for larger basin closures. Most controlled groundwater areas are fairly localized. Where closure happens the types of water appropriations stopped are closure dependent. In most cases the DNRC looks specifically at surface or groundwater in each closure. However, special circumstances could apply across the board. See MCA 85-2-330 through 85-2-343 for a listing of exceptions. All controlled groundwater areas and basin closures are on the DNRC website at <http://dnrc.mt.gov/divisions/water/water-rights>. (Ferch, 2018). According to Ferch (2018):

Basins are closed to new appropriations of surface water because all of normal surface flow is already spoken for (current legal demands exceed typical flows). There are exceptions to the rules of course and those are outlined in statute (high spring flows, for example (85-2-330 – 85-2-343, MCA)). Many Controlled Groundwater Areas are based upon water quantity and each area has different requirements for filing. In some cases new uses are allowed in these areas.

See 85-2-506 and 508, MCA for controlled groundwater areas and 85-2-319 for surface closures. The Montana legislature may also close basins to future appropriations. Forms 630 and 631 may also be of interest (<http://dnrc.mt.gov/divisions/water/water-rights/water-right-forms>). To see some finalized rules regarding controlled groundwater areas, see ARM 36.12.905 and 906 (<http://www.mtrules.org/gateway/ChapterHome.asp?Chapter=36%2E12>). More information on specific controlled groundwater areas or closed basins can be found at <http://dnrc.mt.gov/divisions/water/water-rights>.



3.2.2.5 New Zealand (Waikato Region)

The Water Module of the Waikato Regional Plan (Waikato Regional Council, 2010) addresses integrated management Policy 11 “Consent Application Assessment Criteria – Surface Water” and Policy 12 “Consent Application Assessment Criteria – Groundwater”. Both of these policies specify that the Regional Council consider “Impacts on, and integration with, other existing authorised uses of the relevant water body (including customary uses)”. Further, Objective 3.3.4.2 on “Integration with Territorial Authorities” specifies how the Regional Council will work with Territorial Authorities on matters related to both surface and groundwater. Further, the Waikato Regional Council explicitly focuses on integrated catchment management (Waikato Regional Council, 2018).

Formally, water quality and quantity are the focus of the Water Module of the Waikato Regional Plan. This focus is outlined in the Plan’s background and explanation section, stating:

3.1.1 Issue The following aspects of the issue apply to all activities throughout the Plan: a) Point source discharges into water bodies can cause deterioration in water quality and the values for which the water body is being managed. b) The cumulative effects of non-point source discharges have a significant adverse effect on the water quality of many water bodies in the Region, particularly:... vi) taking and impounding of water can have cumulative effects and can reduce water quality and quantity.....e) Modification of flow regimes through water takes, damming and diversion can adversely affect water bodies, particularly: i) in-stream ecological/biological values ii) recreational values iii) potential uses of water resource iv) reduced water quality and quantity.

Similarly, cumulative effects are the keystone of the Water Module of the Waikato Regional Plan. Specifically, Policy 11 (Consent Application Assessment Criteria – Surface Water) and Policy 12 (Consent Application Assessment Criteria – Groundwater) outline the factors that must consider when assessing resource water consent applications for groundwater/surface water “takes” and water use. In terms of approach, for surface water, takes catchment- (watershed-) based, allocation is assessed at the point of take and cumulatively with all takes downstream. The assessments influence decisions on whether to permit a take in a very specific manner: in the regulatory regime Waikato uses the allocable flows and management levels as ‘goalposts’ (stay under the allocable flow = “green light”). Applications for rate of take



that is in excess of allocable flow, then (with some exception that applies to domestic/municipal use) means red light (Davenport, 2018). For groundwater, conservative management yields have been set for some geographic areas (particularly those areas with greatest allocation pressure or risk of saltwater intrusion). For a large part of the Waikato River catchment, groundwater is considered surface water on a one to one basis for allocation purposes (Davenport, 2018). According to Davenport (2018):

The allocable flows for surface water, and the management yields for aquifers, have been based on particular studies undertaken by [Regional] Council staff or commissioned by same, taking into consideration various national and international studies/science/ecology/hydrology etc. The [Regional] Council studies have continued from period commencing in earnest in the early 1980's. There is a large complement of scientific staff. In terms of tracking allocation, Council has developed a 'paper based' accounting system, which is updated daily for both surface and groundwater as consents/permits are granted/expired/renewed/surrendered etc. The system includes estimates of permitted use allocation. It is not based on water allocated but not used.

3.3 ADAPTIVE MANAGEMENT

Broadly speaking, adaptive management concerns the development of an institutional environment that can adjust to changing circumstances of scientific uncertainty, climate variability, institutional complexity and shifting social concerns (Armitage *et al.*, 2007). Key within adaptive approaches to water allocation is an emphasis for system flexibility to reduce vulnerability to evolving and uncertain watershed conditions, particularly instances of drought, severe storms and flooding. In these contexts of uncertainty, the practice of adaptive management in water allocation policy connects to the need for integrated decision-making. In order to accurately understand the impacts of variability, allocation decisions must account for multiple ecosystem parameters and their interactions (e.g., the hydrologically interconnected system of surface and groundwater) (Curran & Mascher, 2016). To do so, allocation strategies range from institutional measures such as water rates, conservation measures such as low water irrigation, or behavioral changes such as water sharing agreements (de Loë *et al.*, 2007).



3.3.1 Phase One Jurisdictions – Adaptive Management

Adaptive management was researched only for the five Phase 2 jurisdictions. Notably, adaptive management rarely shows up in legislation, and only sometimes in policy documents. An exception to this norm includes Article Four of the Great Lakes-St. Lawrence River Basin Agreement and Compact: “c. Consider adaptive management principles and approaches, recognizing, considering and providing adjustments for the uncertainties in, and evolution of science concerning the Basin’s water resources, watersheds and ecosystems, including potential changes to Basin-wide processes, such as lake level cycles and climate.” Beyond this acknowledgement, adaptive management rarely appeared as an explicit label in legislation and policy. Consequently, researching the practices and protocol that can be interpreted as adaptive management required interviews with several water managers who typically described regional or unofficial ways in which adaptive or adaptive-like management approaches were used.

3.3.2 Phase Two Jurisdictions – Adaptive Management

While in practice, many options for responding to climate change can be found in the Phase 2 jurisdictions reviewed, explicit recognition for adaptive management in legislation/statute is more limited. Examples of practice-based adaptive management activities in the Phase Two jurisdictions included iterative efficiency or conservation based measures in times of increasing water stress (drought) (Minnesota, Michigan, Florida, Montana, New Zealand), required updates to water planning initiatives such as Minnesota’s ten year requirement to update local water supply plans, periodic review of water use efficiency in Florida for permittees, and the use of mitigation banks to offset impacts to wetland areas in Florida. Explicit adaptive management policy in the Phase Two jurisdiction only included adaptive management recognition through the Great Lakes-St. Lawrence River Basin Agreement and Compact (Michigan and Minnesota) as noted above and in Florida as protocol for the Everglades Long-term Plan and Lake Okeechobee Operations. Further details on these jurisdictions are provided below.

3.3.2.1 Minnesota

Minnesota’s adaptive management for water quantity management beyond the Great Lakes Compact is apparent in three primary ways. First, permitting is not considered a right in Minnesota and can be changed as necessary to protect public welfare, which includes safe



water and healthy ecosystems (Ekman, 2018). Permitting amendments and terminations as outlined in Minnesota Rule 6115.0750 Subp.5 and 7 reflect this adaptive ability. Second, the 2010 Minnesota Water Plan (Minnesota Environmental Quality Board, 2010) includes specific acknowledgement of adaptive management as an implementation principle that “must be employed to support informed decision-making while supporting the collection of information to improve future management (p. 2).” While the plan does not focus on water permitting specifically, indirectly it focuses on allocation by emphasizing improved efficiency measures and access to environmental data. Third, as a part of efficiency efforts – adaptive measures are noted in both the state drought plan as well as through the use of Local Water Supply Plans. All public water suppliers serving more than 1,000 people, large private water suppliers in designated Groundwater Management Areas, and all water suppliers in the Twin Cities metropolitan area are required to develop and submit a Local Water use plan that is approved by the DNR (103G.291). A template for developing Water Supply Plans is provided by the DNR (Minnesota Department of Natural Resources, 2016a) to guide these water users in the development of the plan. Water Supply Plans, which are updated every ten years, must include water demand reduction measures such as conservation water rates. In times of water deficiency, conservation rate structures must be flexible and “may include increasing block rates, seasonal rates, time of use rates, individualized goal rates, or excess use rates (103G.291. Sub. 4). If there is a period of water deficiency, disregard for critical water deficiency orders is grounds for immediate modification of a public water supply’s water use permit (Subd. 2.). Beyond water supply plans, all permitted water users must report their monthly water use on an annual basis and pay fees. DNR tracks data and follows up with permit holders who may be violating one or more conditions of their permit.

3.3.2.2 Michigan

In addition to consideration of adaptive management principles adopted by Michigan through the Great Lakes-St. Lawrence River Basin Agreement and Compact, adaptive management is also recognized in Michigan’s Water Strategy (Michigan Department of Environmental Quality, 2016) as a necessary framework to water management; however, adaptive strategies specific to water withdrawal permitting are not detailed. For example, flexible water rates and sharing of information and services at the watershed scale are discussed as a possibility for water withdrawal; however, direct action-items, according to the Strategy, are still in development. Compliance with changes are enforced by law and changes to water rights would require civil litigation culminating in a judge’s ruling (Milne, 2018).



3.3.2.3 Florida

Adaptive management strategies are noted, for example in 373.227 (3&4), where in the use of water conservation plans, as well as water conservation or drought rate structures as a conservation practice by the water management districts, are allowed to be tailored to different circumstances. However, the water management districts do not set municipal water rates; rather they support rate structures that encourage efficient use and water conservation.

Additionally, specifications are made for periodic review and update to ensure efficient water use during a permit. Such adaptive planning is also incorporated directly in allocation decision making as Section 62-40.473 ("Procedures to Obtain Permits and Other Authorizations," 2016), of the Florida Administrative Code directs water management districts to consider seasonal fluctuations in water flows or levels, non-consumptive uses, and environmental values. Guidelines to make such considerations are noted in Chapter 40C-2 of the Florida Administrative Code "Permitting Consumptive Uses of Water" as well as the Applicant's Handbook: "Consumptive Uses of Water," which is published by each WMD (e.g., Southwest Florida Water Management District, 2015). Within the Applicant Handbooks details are provided with regards to the actions permittees must undertake to be granted a permit. For example, in the SJRWMD Handbook (St. Johns River Water Management District, 2009) Section 1.5.7.2 all permittees must implement a conservation plan approved by the district in accordance with a set schedule.

Subsequent modification to address unexpired permit terms is also permissible under Florida Statute 373.239 if "(a) a change in conditions has resulted in the water allowed under the permit becoming inadequate for the permittee's need, or (b) the proposed modification would result in a more efficient utilization of water than is possible under the existing permit."



More explicitly, adaptive management is also stated as guiding principle for the Everglades Long-term Plan (State of Florida, 2003), which is designed to provide over 1,100,000 acre-feet (1,356,828,000 cubic metres) of additional water annually to the environment and human uses. 373.4593(3)(b) provides the following detail:

Revisions to the Long-Term Plan shall be incorporated through an adaptive management approach including a process development and engineering component to identify and implement incremental optimization measures for further phosphorus reductions. Revisions to the Long-Term Plan shall be approved by the department. In addition, the department may propose changes to the Long-Term Plan as science and environmental conditions warrant.

Adaptive Protocols have also been developed by the South Florida Water Management District for Lake Okeechobee Operations, which specifically prioritize flexibility and the involvement of the public in an advisory capacity. Mitigation banks are also noted as adaptive techniques to offset adverse impacts of activities in certain geographic areas (373.4136) ("Procedures to Obtain Permits and Other Authorizations," 2016).

3.3.2.4 Montana

Montana does not use any formal adaptive management strategies including tools and practices for implementing an adaptive management approach. However, "some water users occasionally take matters into their own hands and encourage conservation and water sharing techniques to help enhance or maintain certain stream levels.... Water rights are typically not amended for this purpose; however, owners are in no way penalized for instituting water saving practices/sharing on a year-by-year basis depending on need" (Ferch, 2018). It is notable that the Water Storage Policy Act ("Water Storage Policy," 2017) (85-1-701 to 85-1-704) allows for the prioritization of water storage projects that may solve severe water problems.

3.3.2.5 New Zealand (Waikato Region)

New Zealand's legislation, and Waikato Regional Council's Policy does not take an explicit adaptive management approach to water allocation. However, regarding water rights systems, water user groups, combining separate rights/consents, can be promoted in fully allocated catchments such that water already allocated may be shared according to need/for efficiency (Davenport, 2018).



3.4 ECOSYSTEM PROTECTION⁸

Freshwater ecosystems provide numerous environmental, economic, and aesthetic benefits such as biodiversity conservation, crop irrigation, and recreational and cultural values. A requirement in securing these water benefits includes maintaining “in-stream” or “environmental” water flows as a variable in aquatic ecosystem functioning (Katz, 2006). Ecosystem water flows are the flows (quantity and timing) and water levels required in a water body to sustain freshwater and estuarine ecosystems, human livelihoods, and the ecological function of the flora and fauna present within that water body and its margins (Canadian Science Advisory Secretariat, 2013; Ecofish Research Ltd. *et al.*, 2017). (While “in-stream” and “environmental” flows are used interchangeably in many jurisdictions, the term environmental flows “more accurately reflects the rationale for setting flow targets in regulated rivers where environmental considerations include concerns that extend beyond the wetted area of the river” (Ecofish Research Ltd. *et al.*, 2017)).

In many jurisdictions around the world, there is a potential for, or an already lived reality of, changing levels of water availability. These changing flow levels are due largely to the predicted or realized effects of climate change coupled with increasing human demand for water. As a result of these circumstances, there is growing recognition of the need for environmental flow policies to mitigate these problems. However, in order for environmental flow policies to be implemented, multiple considerations and approaches have been taken and implemented into policy by various governments. For example, the degree to which policies consider different hydrological characteristics including flow magnitude, timing, frequency and duration of flow events, and the rate of change between flows create different policy implications for different jurisdictions (Katz, 2006). Likewise, the type of tools and assessment techniques regulated through policy can also create variations based on the different methodologies implemented. These tools for assessments can be broadly grouped into four types: historic flow data, hydraulic geometry, habitat simulation, and holistic approaches (Linnassari *et al.*, 2013). Therefore, although the need for policies protecting environmental flows is widespread among many jurisdictions around the world, the differences in the contextual needs and policy alternatives for implementing those are inherently diverse.

⁸ RFB 6792 3.2.1 f



As a result of the varying approaches to assess environmental needs as well as in-stream flow policy being secured under varying ecological, navigational, and recreational objectives, there are differing approaches to how environmental flows are considered in legislation. For instance, across Canada, there is a great deal of variability in policies related to environmental flows (de Loë et al., 2007). In Canada and elsewhere, the challenges that are central to environmental protection policy stem from the accuracy of the data to make allocation decisions because of scientific uncertainty that still exists on exact aquatic function needs, the interdisciplinary nature of holistic assessment, and site-specific variations which create capacity and knowledge limits (Ecofish Research Ltd. et al., 2017; Linnassari et al., 2013; Schofield et al., 2003). Sections 3.4.1 and 3.4.2 demonstrate this variability in environmental protection policy. Within the reviewed jurisdictions, direct legislative consideration for in-stream or environmental flow needs (EFN) in water permitting or licensing are noted in the following jurisdictions: BC, New Brunswick, Ontario, PEI, Quebec, New York, Ohio, Michigan, Florida, Minnesota, Pennsylvania, Wisconsin, California, North Carolina, South Australia, and England. Section 3.4.1 summarizes environmental protection of the 16 Phase One jurisdictions as well as Ontario. Section 3.4.2 then explores environmental protection in detail for the five Phase Two jurisdictions.

3.4.1 Phase One Jurisdictions – Ecological Protection

3.4.1.1 Canada

In **British Columbia**, Section 15 of the Water Sustainability Act requires that a decision maker must consider the environmental flow needs of a stream or an aquifer that is reasonably likely to be hydraulically connected when making a decision on an application, unless a specified decision is exempt under the Water Sustainability Regulation. Section 14 of the Water Sustainability Act provides the comptroller and the water manager with powers respecting an application for a water licence. Environmental Flow Needs Policy (2016) outlines the procedures, environmental risk management framework and tools for determining flow requirements; “use of mean annual discharge for characterizing flow sensitivity has precedence in B.C. (e.g., BC Modified Tennant method, described in Hatfield et al. 2003) and is supported by B.C.-specific studies.” Under Sections 86 and 87 of the Water Sustainability Act, if a declaration of a significant water shortage is in place for a designated area, and an order for a critical environmental flow threshold is in place for an identified water source within that area, the critical environmental flow threshold will have precedence over water rights, other than essential household use. In **Manitoba**, there are no public guidelines for establishing environmental flow standards, although the Tessman rule is known to have been used, and



site-specific studies have been conducted to determine more specific environmental flow requirements on a case-by-case basis (Linnassari *et al.*, 2013). In **New Brunswick**, guidance is provided for water intake structures in the Watercourse and Wetlands Alteration Technical Guidelines ("Watercourse and Wetland Alteration Regulation," 1990, p. 101): "For flowing bodies of water such as streams, creeks, rivers, or brooks, the acceptable rate of water removal or the pumping rate is dependent upon the average annual flow in the channel throughout the withdrawal period. A certain rate of flow must be maintained downstream of the water intake. This rate is known as maintenance flow and is specific to each site. Since channel flows fluctuate on a seasonal basis, acceptable rates of maintenance flows are based on the mean flow in the watercourse throughout the desired withdrawal period and specific criteria regarding water withdrawal during periods of low flow may be necessary.... One method of determining maintenance flow requirements can be calculated as about 70% of the Monthly Median Flow, as derived from the nearest Environment Canada gauging station." In **Ontario**, protecting natural functions of aquatic ecosystems is a regulatory requirement through the Water Taking and Transfer Regulation, s.4 that the MECP (PTTW signing Director) must consider when reviewing PTTW applications. Guidance and policies for the PTTW program discuss the importance of managing surface and groundwater for habitat and ecological needs, as well as sustainability of the resource. As per the MECP's technical guidance document for Category 3 surface water PTTWs (Ministry of the Environment, 2008), in-stream minimum flow or water level requirements will be determined by a site-specific assessment, as it is not feasible to recommend one assessment method or low flow index that will be appropriate for all situations. The study report in support of a PTTW application must show that the addition of the proposed taking will not result in a violation of the low flow requirement. Similarly, a PTTW for groundwater will not be issued until the ministry is satisfied that the proposed taking is unlikely to result in unacceptable impacts to, for example, the ability of the aquifer to provide baseflow to streams, maintain water levels in wetlands and or lakes, or provide recharge to other aquifers (Ontario, 2016). Individual PTTWs can set specific protections for environmental flows, and in many cases, have set specific minimum flow requirements through conditions in the permit. The **PEI Water Act 2017** ("Water Act," 2017) Section 8 "authorizes the Minister to direct that an approval not be issued for a water withdrawal for commercial, industrial or recreational purposes if it would interfere with the availability of water for domestic purposes or for water flow needs of a watercourse." AND Section 31 (1)(c) states that The Minister may, by order, establish a process by which a water sustainability plan is to be developed for the purposes of preventing or addressing threats to, or maintaining or restoring ... the environmental flow needs of a watercourse". In **Quebec**, the Politique de Débits Réservés



Écologiques pour la Protection du Poisson et de ses Habitats (Policy of Ecological Reserved Flow for Protecting Fish and their Habitat) governs the issuance of authorization certificates for hydro-electric facilities, dams, water diversions and withdrawals, in order to maintain adequate streamflow for fish and fish habitat (Faune et Parcs Québec, 1999; MENVO, 2002b). This policy is implemented by the Ministère du Développement Durable, de l'Environnement et des Parcs (de Loë *et al.*, 2007). Several thresholds are proposed for protecting fish habitat: for example, in the Saint-Charles River, minimal flows are set as:- Q50 [*median flow*] during low summer flows- Q50 [*median flow*] during fall spawning- 0.25 times the QMA [*mean annual discharge*] during winter low flows (Ecofish Research Ltd. *et al.*, 2017). In the **Yukon**, all Water Use Licences include terms and conditions that are intended to avoid or minimize adverse effects on the environment (de Loë *et al.*, 2007). Yukon Environmental and Socio-Economic Assessment Act (de Loë *et al.*, 2007; "Yukon Environmental and Socio-Economic Assessment Act," 2003) effects licencing abilities of the Yukon Water Board who "cannot issue a water licence, or set terms of a licence, that are contrary to a decision document issued under [YESEAA]." Waters Regulation ("Waters Regulation, Y.O.I.C. 2003/58," 2003) s.4 "(1) A person may use water or deposit waste without a licence if the proposed use or deposit (a) has no potential for significant adverse environmental effects". The First Nation Self Government Agreements (based on the Umbrella Final Agreement which is constitutionally protected) state that Yukon First Nations have the right to have substantially unaltered quality, quantity, and rate of flow of water flowing on, through or adjacent to Settlement Land (chapter 14). However, in the Yukon, in-stream and environmental flow needs are poorly understood and there is currently no standard or method to regulate them. It is a concern that is being worked on by many people currently (Salvin, 2018).

3.4.1.2 US – Great Lake States

In **Illinois**, if a water withdrawal on a Public Body of Water involves construction of a permanent intake structure, an Illinois Department of Natural Resources, Office of Water Resources (ILDNR/OWR) permit will be required per the Rivers, Lakes, & Streams Act (615 ILCS 5). These permits will generally be subject to special conditions restricting the withdrawal of water during periods of low flow to prevent adverse effects on navigation, natural resources or other public interests in the public body of water. In **Indiana**, the Significant Water Withdrawal Facilities water withdrawal categories ("Water Resource Management Act," 1983) do not include in-stream uses. In **New York**, the Division of Water technical operations and guidance series 1.3.12 - Incorporation of Flow-Related Conditions in Water Withdrawal Permits (New York State Department of Environmental Conservation, 2017, p. 1) "describes the policies and procedures for incorporating flow-related conditions when issuing Water Withdrawal Permits,



pursuant to 6 NYCRR Part 601 ("Water Withdrawal Regulations"). The Environmental Conservation Law ("ECL") Section 15-1501 and accompanying water withdrawal regulations (Part 601, 2013) encourage the responsible use of water resources, including ensuring adequate supplies of potable water, while protecting aquatic life, habitat function, and best usages." Additionally, the Susquehanna River Basin Compact includes environmental flow requirements for New York State. **Ohio's** ORC § 1501.32(6) establishes limitations restricting permits for diverting more than 100,000 gallons (378,541.18 litres) of water a day away from the Ohio River watershed when "The proposed diversion, alone or in combination with other diversions and water losses, will have a significant adverse impact on in-stream uses or on economic or ecological aspects of water levels." Information to help decision-makers determine whether to impose restrictions is sourced from the Water Inventory Program. This is the key state program collecting and generating historic and current data on the status of Ohio's water resources. It supports stream gauging to monitor stream flow and lake levels. It also operates a network groundwater observation wells. **Pennsylvania's** Dam Safety and Encroachments Act (1978) P.L. 1375, No. 325 Cl. 32 grants the Department of Environmental Protection authority to regulate the construction, operation, and maintenance of dams and other water obstructions, which includes minimum flow guidelines for dammed waterways. Under s. 78a.69 of the ("Oil and Gas Act," 2012), water management plans (WMP) are required for unconventional operations (not those with a water allocation permit or order of confirmation pursuant to the Water Rights Act). In **Wisconsin**, when considering an application for a stream/lake diversion, the Department determines the amount of surplus water available in the stream after making a detailed field investigation of the site, per the requirements of Chapter 30 of the Wisconsin Statutes ("Navigable Waters, Harbours and Navigation," 2015).

3.4.1.3 US – Non-Great Lake States

In **California**, the Policy for Maintaining In-stream Flows in Northern California Coastal Streams (Agency, 2014), establishes principles/guidelines for the maintenance of in-stream flows including the protection of fishery resources, with the goal of minimizing supply impacts on other uses of water, i.e., irrigation, municipal, and domestic use. **North Carolina** addresses flow under the Clean Water Act (Federal) ("Federal Water Pollution Control Act," 2002). The Division of Water Resources has an In-stream Flow Unit which makes decision on flows for natural resources, other in-stream uses, flow volume, low flow periods, permitted discharges, off-stream uses, dams, and riparian rights (North Carolina Department of Environmental Quality, 2018c).



3.4.1.4 International

In **England/Wales**, Environmental Flow Indicators (EFI), which are used in the hydrological classification for the European Water Framework Directive (WFD), identify the water bodies where reduced river flows may be causing or contributing to a failure of good ecological status (OECD, 2015). EFIs are used as an indicator of the flows required by the environment. The EFI is a percentage deviation from the natural river flow represented using a flow duration curve (Environment Agency Government of the United Kingdom, 2013a). Both freshwater and terrestrial biodiversity are taken into account in the EFI. EFIs are used to inform licensing strategies that are development for catchments subject to Catchment Abstraction Management Strategies; the licensing strategies outline restrictions and conditions to be applied to licence applications, as well as any local constraints that potential abstractors will need to be aware of, e.g. existence of higher levels of environmental protection for a given area, or where local information indicates that different amounts of water are available in the catchment (Environment Agency Government of the United Kingdom, 2013a). In **South Australia**, Water Allocation Plans (WAP) are legal documents that are developed by the regions within South Australia legislated under the Natural Resource Management Act ("Natural Resources Management Act," 2004) s.76. Section 76 requires that the Plans account for ecosystem water needs, an assessment of the water resource to meet environmental water requirements, the water that will be set aside for the environment, and a statement of environmental outcomes. Suggested: please see a recent WAP which can be found here, together with supporting docs: (<http://www.naturalresources.sa.gov.au/eyrepeninsula/land-and-water/water-allocation-plan-new>).

3.4.2 Phase Two Jurisdictions – Ecological Protection

3.4.2.1 Minnesota

Minnesota restricts water appropriations via Minnesota Statutes, Section 103G.285, subdivision 2: "Water appropriations from water courses during low-flow periods may be suspended to protect water availability for in-stream uses and higher priority water users." The DNR is resultantly charged with maintaining natural flows and levels through MN Rules 6115.0220 and is directed to protect flow to "accommodate in-stream needs such as water-based recreation, navigation, aesthetics, fish and wildlife habitat, water quality, and needs by downstream higher priority users located in reasonable proximity to the site of appropriation (6115.0630 Subp. 12)."



The Guidelines for Suspension of Surface Water Appropriation Permits (Minnesota Department of Natural Resources, 2012), outlines technical guidance to assess and implement this restriction. Notably the Guidelines points to the State Water Use Data System which contains all water appropriations permits and assigns water use codes (listed in Table 3 of the Guideline) that help identify higher priority uses and non-consumptive appropriations that are considered next to in-stream flows. First priority uses are public health and welfare connected to public water supply and private water works; however, other high priority uses are also listed (e.g., hydropower, steam power cooling once-through, heat pump, coolant pump, mine/quarry/sand/gravel dewatering).

Additionally, details such as the frequency of monitoring impacts effecting flows and the tools required to do so and collect data are outlined in 103G.282 subp.1. Subp 2. 103G.282 gives authority to the commissioner to determine the frequency of measuring and specifies that measurement reports must be made annually to the commissioner. Effort is also being made by the River Ecology Unit in the DNR Division of Ecological and Water Resources to improve data collection around environmental flows, habitat, and in-stream needs (Minnesota Department of Natural Resources, 2018b). Notably, in-stream flow programming through Stream Health and Restoration workshops are being conducted by the River Ecology Unit to determine the necessary annual exceedance flow. Currently, annual Q90 exceedance flow value is acknowledged as the specified low flow value for suspending certain surface water appropriations until specific watershed protection levels are established (Minnesota Department of Natural Resources, 2012). A state-wide effort using a network of over 240 stream gauges and regression modeling is being used to form a water use index that identifies the percentage of water that is extracted for consumptive uses across the state.

This monitoring and flow determination work helps the DNR identify critical flows needed to sustain the ecosystems. The long-term monitoring of flows and groundwater levels help identify where groundwater appropriation may be having an impact on surface waters. A permit applicant might be required to submit aquifer test data to help better understand the impact that their proposed use would have on stream flow or wetland water levels. More broadly, the work of the River Ecology Unit allows for a greater understanding of the window within which an impact might be sustainable without causing harm to the surface water and related ecosystem health (Ekman, 2018).



3.4.2.2 Michigan

The 2008 amendments to the Natural Resources and Environmental Protection Act in Michigan established stream flow requirements for fish populations. Specifically, Part 324.32701- outlines requirements for varying cold river systems, cold transitional river systems, warm river systems and specific environmental flow requirements specifying the acceptable percent of withdrawal reduction for each. Additionally, NREPA Part 327 has a narrative standard for adverse resource impacts for inland lakes that includes impacts to fish populations. These pieces of legislation inform permit review criteria outlined in Section 32723, which includes determining that the proposed large quantity withdrawal is in compliance with the decision-making standards of Section 4.11 of the Great Lakes Compact (i.e., establishing that the proposed large quantity withdrawal will not cause significant individual or cumulative adverse impacts to the quantity and quality of the waters and water dependent natural resources of the affected watershed(s)). The permit review criteria in Section 32723 also include determining that the proposed large quantity withdrawal is in compliance with all applicable local, state, federal, interstate, and international regulations. This includes Parts 301, Inland Lakes and Streams; and 303, Wetlands Protection; of the NREPA.

The main tool in determining environmental flow needs relative to water withdrawal applications is Michigan's Water Withdrawal Assessment Tool (Michigan Department of Environmental Quality, 2009). The WWAT determines the level of risk associated with proposed withdrawals by water temperature and catchment area. The tool also lets property owners whose proposed large quantity withdrawals pose a low risk for adverse resource impacts to register their withdrawals with the State of Michigan without having to seek a formal approval. This protocol is enforced through Section 324.32706d of the NREPA. Multiple online guides available on the MDEQ Water Use program webpage⁹ outline procedures for various aspects connected to water withdrawal permitting; for example, the use of and registration through the WWAT, water use reporting and data, conservation measures and dispute resolution procedures.

The WWAT was developed using stream temperature classifications and fish response curves developed by the Michigan Department of Natural Resources (MDNR), and stream flow data from the USGS' stream gage network. The MDEQ and USGS collect miscellaneous stream flow measurements at multiple sites around Michigan. There are two on-going data collection

⁹ See http://www.michigan.gov/deq/0,4561,7-135-3313_3684_45331---,00.html



studies in Michigan (one a federal-state partnership and the other a state-private partnership) that are innovative studies of the impacts of groundwater withdrawals on stream flow. The federal-state partnership includes the use of fiber optic cables and thermal imaging cameras to identify groundwater discharge zones in streams, differential stream gauging to determine the stream flow in specified stream reaches, and the development of a numerical model to simulate the impact on stream flow from high capacity wells (Milne, 2018).

This data is then used as part of a classification scheme to determine permitting approval as well as environmental impact based on the “zones of risk” mentioned previously through Part 327 of the NREPA as a narrative standard for adverse resource impacts. Within this legislation, ecological risk is established on a graduated scale – Zones A-D are based on fish response curves with Zone ‘A’ as less likely for adverse impacts and Zone ‘D’ as high risk for adverse impacts. These zones are tied to 11 stream/river classifications (based on size/temperature) and given as a percentage of flow available that can be withdrawn in consideration with fish population responses. The values for the percentage of stream index flow reduction is for the risk zones (A/B/C/D) and are defined in Part 327 (MCL 324.32701) based on the stream size and temperature classification. The WWAT can register withdrawals in Zones A and B (except for Zone B cold-transitional streams). Zone B cold-transitional, all Zone C, and all Zone D results from the Water Withdrawal Assessment Tool require a site-specific review authorization by MDEQ before the withdrawal can be put into operation. Site-specific reviews (SSR) and Part 327 permits can be issued for Zones A, B, and C. A proposed withdrawal that is classified as Zone D, where an adverse resource impact is likely, is prohibited.

SSR and permit application reviews also contain specific requirements regarding the environmental flows and ecological protection, which are also outlined in MCL 324.32701 under ‘Adverse Resource Impact.’ In this section are prescriptive environmental flow and protection measures related to the Stream Index Flow (50% exceedance flow in the lowest flow month, typically August or September). Data sources to determine requirement thresholds are identified through stream gage data, miscellaneous stream flow measurements, water temperature data, and fish population studies. Permit application reviews can also use data from wetland and other ecological studies. The WWAT uses an analytical groundwater model to predict stream flow depletion from pumping wells. Bedrock and glacial aquifer transmissivity are based on median values for WMAs from water well logs. The WWAT’s groundwater model uses an aquifer storage coefficient appropriate for leaky confined aquifers. Geologic and hydrogeologic data sources used by SSRs and permit reviews include water well logs, aquifer



test data, groundwater elevation data, monitor and soil boring logs, geophysical surveys, research by universities and other state and federal agencies, and 3-dimensional geologic mapping of glacial and bedrock deposits. Numerical groundwater models can also be used in SSRs and permit reviews (Milne, 2018).

The WWAT has been successful in screening a large number of proposed large quantity withdrawals (2,631 authorizations out of a total of 3,678 total authorizations between July 2009 and July 2017 or 71.5%) and authorizing withdrawals that pose a low risk for adverse resource impacts to fish or stream flow. However, challenges or places for improvement are still noted in the use of the WWAT for ecological protection purposes. Notably, the WWAT is not designed to evaluate inland lakes or wetlands and there are data gaps in three-dimensional mapping for Michigan's glacial and bedrock geology as well as for calculating stream index flow. These gaps have led some stakeholder groups to question whether the WWAT can accurately represent their regions (particularly for the groundwater model assessment of glacial geology) (Milne, 2018). Additionally, there are an increasing number of site-specific reviews as more water management areas become depleted (Milne, 2018).

3.4.2.3 Florida

The Florida Waters Resource Act (1972) requires the state's five Water Management Districts to establish minimum flows and levels (MFL) for surface waters and aquifers within their jurisdiction. MFLs represent the limit beyond which additional groundwater withdrawals would cause significant harm to the resource or ecology of an area. Each district is required to develop a priority list of waterbodies for minimum flow/level each year. Minimum flow/level is used for permitting, environmental resource permitting, water supply planning and resource projects. Staff rely upon groundwater flow models to determine the potential impact to a lake or spring flow through a change in head in the aquifer. If the change will negatively impact a level such that the level is predicted to fall below a MFL, the permit may be denied, the requested allocation reduced to avoid impacting the MFL, or the applicant must propose a project to offset the impacts to ensure the MFL is not tripped.

MFL criteria are developed pursuant to requirements in Sections 373.0421 and 373.042 of the Florida Water Resources Act. Monitoring and enforcement regulations are district-based and established on best available data. Each district is required to establish MFLs for waters the state lists on the MFL Priority Water Body List. Using this list as a schedule, each district undertakes research, analysis, and interpretation of data necessary to develop "technical criteria" for each water body, to determine low water conditions (water levels and/or flows)



that may cause significant harm to water resources of the region. The criteria typically consist of a minimum water level or flow rate, a duration of time that this level can occur before damage occurs and a return frequency (how often such conditions can occur over a specified time period). These technical criteria may be voluntarily subjected to scientific peer review or peer review may be required if the basis for MFL establishment is questioned by the public, engineers, or other scientists (South Florida Water Management District, 2017). Information on abstraction licenses is used to evaluate water availability for further permitting; large water users are required to monitor and report actual water use. Also, fish habitat, “umbrella species” or another biological/hydrological indicator are used to support in-stream flow decisions by Water Management Districts. E.g., Saint Johns River Water Management District uses ecological functions of an ‘umbrella species’ and requires all water users to report total monthly water use every six months (Ecofish 2017).

If minimum targets for minimum flow/level cannot be met, there is a mandate that a 20-year prevention or recovery plan be developed and implemented (Laidlaw, 2018). This 20-year plan is mandated in Chapter 373.0421(2), which states that if the existing flow or level in a water body is below, or is projected to fall within 20 years below, the applicable minimum flow or level established to s. 373.042, the department or governing board, as part of the regional water supply plan described in s. 373.709, shall expeditiously implement a recovery or prevention strategy. A recovery or prevention strategy shall include the development of additional water supplies and other actions, consistent with the authority granted by Chapter 373, to achieve recovery to the minimum flow or level as soon as practicable, or to prevent the existing flow or level from falling below the established MFL.

In the SJRWMD, the process of development of a prevention or recovery strategy is a public process that includes stakeholder inputs who would be responsible for the impact to an MFL and then responsible for fixing the problem through implementation of projects or measures, such as conservation. The district currently has two strategies, *Prevention/Recovery Strategy for Implementation of Minimum Flows and Levels for Volusia Blue Spring and Big, Daugharty, Helen, Hires, Indian, and Three Island Lakes*, approved October 2013 by the SJRWMD Governing Board, and the *Prevention Strategy for the Implementation of Silver Springs Minimum Flows and Levels*, approved April 2017. The district initiates and develops the plans; however, projects identified in the plan are implemented by the various utilities or local governments. These projects are often funded through the District’s cost share program which will provide up to 33% of construction costs to an entity to build a project. Projects may also include water



conservation measures to reduce groundwater consumption to assist in achieving the MFL (Laidlaw, 2018).

3.4.2.4 Montana

In Montana, the Department's power over state water plays a central role in allocation for environmental flows and in-stream needs. Under Montana Code 85-1-204, the Department may "sell, lease, and otherwise dispose of water impounded under this chapter. The water may be sold for the purpose of irrigation, development of power, watering of stock, or other purposes". For example, water held under an existing consumptive right could be changed, transferred to or leased to an entity such as the Montana Department of Fish, Wildlife and Parks for the purpose of in-stream needs (AMEC, 2008). Montana Code 85-1-204 goes on to affirm that the authority of the Department "extends and applies to rights to the natural flow of the water of this state that it may acquire by condemnation pursuant to Title 70, chapter 30, or by purchase, exchange, appropriation, or agreement." The firm police power assertion in Montana Code Annotated 85-1-204(5) of the right of the Department to implement these measures is notable:

The department, when engaged in controlling and dividing the natural flow of a stream under the authority granted by this chapter, is exercising a police power of the state, and water commissioners appointed by any court may not deprive the department of any of the water appropriated or administered under agreement with respective water right holders. The holder of a prior right who contends that the department is not recognizing and respecting the appropriation may resort to a court for the purpose of determining whether or not the rights of the claimant have been invaded, and the department shall observe the terms of the final decree.

In practice, the Department of Natural Resources and Conservation will sometimes issue a state water reservation for in-stream flows and related purposes within the purview of its jurisdiction. The Department also reviews all permit applications to determine the extent to which they pose a significant environmental threat in terms of impacts (AMEC, 2008). 85-2-316, MCA discusses water reservations – reservations are unrelated to Montana's ownership of water. Current reservations of water were all completed over 20 years ago. Water reservations essentially become a legal demand on the source but can be viewed differently in different areas. In some cases, certain water reservations may not have been used since their inception approximately 30 years ago. That can be taken into consideration when analyzing a stream for



legal availability (Ferch, 2018). The DNRC has a recent water reservation report which is available at http://dnrc.mt.gov/divisions/water/water-rights/docs/water-reservations/dnrc-summary-report2_recommendations_webversion.pdf. Finally, Montana Code Annotated 85-1-223 on negotiations with other states by the Department outlines their authority to negotiate “interstate compacts or agreements governing the use, distribution, and allocation of the water of any stream or streams flowing from Montana into such other states or flowing from such other states into Montana”.

The following in-stream flow protections are also worth noting:

- **Murphy Rights:** legislation that provides for in-stream flow protection for specified rivers, including Blue Ribbon trout streams in Montana.
- **Recreational Water Rights:** held by the Montana Fish Wildlife and Parks for maintaining in-stream flows considered necessary for public recreational uses (e.g., In the Upper Missouri River Basin, Montana Fish Wildlife and Parks holds a public recreation claim for 200 cubic feet per second in the Beaverhead River).
- **In-stream Flow Leasing:** “In 1995, the Legislature extended authority to a water right owner to convert their right to in-stream flow, or lease the water right to a private third party for in-stream flow. A lease for in-stream flow may be entered for a term lasting up to 10 years. All leases may be renewed an indefinite number of times, but not for more than 10 years for each term. A lease up to 30 years is allowed if the leased water is made available from the development of a water conservation or storage project” (Montana Watercourse at the Montana Water Center & Montana Department of Natural Resources & Conservation, 2015b).
- **Changes of Use:** “Landowners that wish to preserve in-stream flows on their property also have the option of changing their water right from a consumptive use right to an in-stream flow right. This process requires the landowner to go through the change process administered by DNRC to ensure that the change of use does not negatively impact other senior water rights. These conversions are limited to a term of not more than 10 years.” (Montana Watercourse at the Montana Water Center & Montana Department of Natural Resources & Conservation, 2015b).



- **State Water Reservations:** “In 1979, the Yellowstone River Reservations process reserved the FWP in-stream flow rights for a large number of streams in the Yellowstone Basin. These reservations vary by month, generally following seasonal flow patterns. In 1992, the FWP was granted water reservations for minimum in-stream flows for 245 streams or stream reaches in the Upper Missouri River Basin. The reservations are intended to provide some protection to fisheries, wildlife, and recreational use values, and they have a priority date of July 1, 1985 (Montana Watercourse at the Montana Water Center & Montana Department of Natural Resources & Conservation, 2015b).
- **Federal Water Reservations:** “18 compacts have been negotiated by the Reserved Water Rights Compact Commission and approved by the Montana Legislature. The Legislature has approved compacts for all of the seven Indian reservations in Montana, as well as for five federal agencies administering federal lands in the state. All of the federal and tribal compacts include some water rights to protect in-stream flows” (Montana Watercourse at the Montana Water Center & Montana Department of Natural Resources & Conservation, 2015b).

3.4.2.5 New Zealand (Waikato Region)

Generally speaking, environmental flows are addressed through the mechanism of policy and done so throughout many facets of the Water Module of the Waikato Regional Plan. For examples, see Policy 1 (Establish Allocable and Minimum Flows for Surface Water), Policy 2 (Determining the level of minimum flows, primary, secondary and water harvesting allocable flows), and Policy 4 (Establish Sustainable Yields from Groundwater) (Council, 2000). Allocation is very conservatively limited to that proportion of the low flow or aquifer management level (Q5) as set out in tables 3.5 & 3.6 of the Waikato Regional Plan. The balance is retained for those matters as set out in policies 1 through 4. Depending on the end use, all surface water “takes” have water shortage conditions (reduce or cease take) which have effect when the natural low flow (Q5) is approached (Davenport, 2018). Particularly, in times of shortage, Policy 17 (iii) and (iv) state “(iii) Priority SW-C activities all other takes allocated within the primary allocable flow as defined in Table 3-5. (iv) Priority SW-D activities: all other takes allocated water above the primary allocable flow as defined in Table 3-5 and temporary takes of short duration” (Waikato Regional Council, 2010). According to Davenport (2018) “There are continuous flow monitoring sites throughout the region, with flows available on our website. Onset and length of water shortage conditions are signaled by these according to Priority status (policy 18) and Standard 3.3.4.27.”



Like environmental flows, monitoring mechanisms are addressed throughout the many facets of the Water Module of the Waikato Regional Plan. For example, each of the following sections of the Waikato Regional Plan contains a policy section on monitoring: 3.1 Water Resources, 3.2 Management of Water Resources, 3.5 Discharges, 3.6 Damming and Diverting, 3.7 Wetlands, 3.8 Drilling, 3.9 Non-Point Source Discharges, and 3.10 Lake Taupo Catchment. All water takes are required to be measured, recorded, and reported. Council monitors those takes plus other conditions of consent. The Regional Council acquires ecological knowledge for such decision making through “in house research and experts/expertise in relevant fields/sciences” (Davenport, 2018).

Enforcement is not addressed specifically in relation to environmental flows. However, enforcement is addressed in various sections throughout the plan. For example, Method 3.9.4.9 of the Plan states “Section 17 of the RMA [*Resource Management Act*] places a duty on every person to avoid, remedy or mitigate adverse environmental effects. Method 3.9.4.10 promotes the use of Part XII of the RMA, where poor land management practices and decisions result in significant adverse effects on the water quality of streams and rivers. In these situations, Waikato Regional Council will apply to take enforcement action by way of an enforcement order, abatement notice or other mechanisms under Part XII or the RMA. This may require a person to cease, or prohibit from commencing, an activity that may result in those effects occurring. Apart from within the Lake Taupo Catchment, Waikato Regional Council is taking a non-regulatory approach to management of non-point source discharges as it considers this is the most effective method for changing behaviour in the long term. However, there is also a mechanism needed to require improvement or remediation in the event of serious effects caused by inappropriate land use practices.” Where non-compliance such as taking beyond volume or rate allocated, taking during water shortage conditions, or even non-reporting, various enforcement options are available under the Resource Management Act (“Resource Management Act,” 1991). These include abatement notices, infringement fines and prosecution (Davenport, 2018).



3.5 DROUGHT MANAGEMENT¹⁰ AND WATER STRESS

Around the world, drought is a natural hazard which creates, or can create, significant economic challenges, and challenges for water quantity management. Though viewed very differently by jurisdictions worldwide, at its most basic level, drought can be understood as a deficiency of rainfall over a period of time, resulting in a water shortage for some activity, group, or environmental sector (National Drought Mitigation Center, 2018). However, defining drought is far from simple as there are over 150 published definitions of drought. According to the National Drought Mitigation Center, those definitions can be categorized into four broad categories (National Drought Center, 2018b):

- **Meteorological drought:** “defined usually on the basis of the degree of dryness (in comparison to some “normal” or average amount) and the duration of the dry period. Definitions of meteorological drought must be considered as region specific since the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region.”
- **Agricultural drought:** “links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced groundwater or reservoir levels, and so forth.”
- **Hydrological drought:** “associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (i.e., streamflow, reservoir and lake levels, groundwater). The frequency and severity of hydrological drought is often defined on a watershed or river basin scale.”
- **Socioeconomic drought:** “differs from the aforementioned types of drought because its occurrence depends on the time and space processes of supply and demand to identify or classify droughts... Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply.”

Notwithstanding the lack of unanimity on the definitions of drought, many countries and jurisdictions around the world alike have created contingency plans and response frameworks for times of drought. The same is true in the North American context where far-reaching drought conditions have driven the enactment of legislation and plans which address the growing challenge of water supply during low-water periods (Conservation Authorities of

¹⁰ RFB 6792 3.2.1 i



Ontario, 2003). In the United States, 44 states, plus Puerto Rico, currently have state drought plans. The National Drought Mitigation Center also lists four tribal drought plans, 22 watershed drought plans, and a handful of county- and local-level drought plans (National Drought Center, 2018a). The broad trend in drought planning is away from a reactive/response approach to acute drought events, and increasingly toward drought mitigation and preparedness planning (Conservation Authorities of Ontario, 2003; National Drought Center, 2018a). Whether reactive/response or mitigation planning, all five of the jurisdictions reviewed revealed substantial attention to drought legislation and planning.

Globally speaking, there are a vast array of current and emerging sources of human activities that lead to water quantity stress for groundwater and surface water. These sources vary by jurisdiction and geography, but share many common threads linked to human activities. Exacerbated by anthropomorphic climate change and human activities that affect water quality, water quantity stress can be linked to municipal water use, population size and growth, agricultural and non-agricultural irrigation, intensification of agricultural production, overconsumption, industrial use, and loss from distribution leakage.

Drought is a form of *water stress*¹¹ which is a term understood and defined differently by different organizations. The United Nations Environment Program defines the occurrence of waters stress as follows:

when the demand for water exceeds the available amount during a certain period or when poor quality restricts its use. Water stress causes deterioration of fresh water resources in terms of quantity (aquifer over-exploitation, dry rivers, etc.) and quality (eutrophication, c, etc.) (United Nations Environment Programme, 2004, p. 91).

Similarly, water stress can also be defined as the “ability, or lack thereof, to meet human and ecological demand for fresh water”, and notably specifies demand beyond human uses (Pacific Institute & United Nations Global Compact, 2012). Compared to water scarcity, which is a contributing factor to water stress and refers to the objective volumetric abundance of water supply, or lack thereof (Schulte, 2018), water stress is used more broadly including the physical aspects of water resources as well as quality, environmental flows and human accessibility to water (Pacific Institute & United Nations Global Compact, 2012; Schulte, 2018).

¹¹ Water stress in the realm of water allocation and policy is different from the use of the term in the field of botany.



Further, inclusive understandings of water stress can include affordability of water, societal values (e.g., what constitutes sufficiently clean drinking water), and the appropriate level of environmental flows (Pacific Institute & United Nations Global Compact, 2012).

There are different frameworks that are used to determine and assess water stress. One example is the Water Exploitation Index that is used as an indicator in the European context for water stress. The Index is used to measure the mean annual total demand for freshwater in a country divided by the long-term average for freshwater resources. This very specific volumetric measure (unlike broad definitions of waters stressed discussed above) allows the classification of countries in the region to range from non-stressed, low stress, stress, and severe stress (United Nations Environment Programme, 2004). Similarly, the World Resources Institute compares countries in terms of water stress which are calculated as the ratio of total withdrawals to total renewable supply in a given area. Like the Water Exploitation Index, countries are classified in terms severity of water stress with classifications including low-stress, low-to-medium-stress, medium-to-high-stress, high-stress, and extremely-high-stress (Institute, 2013). Also identifying water stress at the country-level, the Water Footprint Network's national water footprint explorer tool identifies hot spots or challenged regions based on water scarcity, pollution, social equity and other benchmarks.

In the Canadian policy context, the concept of water stress appears in Saskatchewan and Ontario. Focused on wells, the Saskatchewan Watershed Authority measures groundwater levels in stressed systems (Nowlan, 2005). Saskatchewan's *State of the Watershed Reporting Framework* addresses stress-condition-responses indicators focused on ecosystem protection (Assiniboine & River Watershed Advisory Committees, 2006) and uses the indicators to inform watershed/aquifer-scale integrated water planning (de Loë *et al.*, 2007). Via the *Clean Water Act* ("Ontario Clean Water Act," 2006) and the development of drinking water source protection plans, Source Protection Committees are considering water quantity-related risks to their drinking water systems using a tiered approach (Tier 1, 2 and 3) to identify areas of hydrological stress in response to variations in water supply and water demand (AquaResource, 2013). However, within the five focus jurisdictions, Michigan, Montana, Minnesota, Florida and New Zealand (Waikato Region), the term *water stress* does not feature prominently. With the exception of California and South Australia, the Phase One Jurisdictions generally do not specifically address water stress.



The following two sections (Sections 3.5.1 and 3.5.2) discuss how the Phase One and Two jurisdictions manage and plan for drought management and identify water stress. Many jurisdictions do not explicitly identify water stress as a term within their legislation. However, all but four of the reviewed jurisdictions had drought management plans (Quebec, Yukon, New Brunswick, Prince Edward Island). Within the reviewed plans there are varying types of action that generally can be grouped into preparing, responding (emergency management) or recovering from a drought. Not all jurisdictions had comprehensive drought plans that covered all of these actions (exceptions include California, Florida and British Columbia which covered all three action types). Some jurisdictions focused more extensively on emergency response alone (e.g., Ohio, Minnesota, Pennsylvania, Wisconsin). Common actions across the jurisdictions included (a) preparedness actions such as water quantity monitoring and studies, coordination efforts to assist users in developing conservation measures and education (about recognition); (b) response actions that exist at different levels of drought (declaring, communicating amongst relative authorities and public, conserving, minimizing losses/improving efficiency, (c) emergency responses such as limiting use, providing water, sanitation, and emergency measures and (d) recovery actions (noted in California; Michigan plans) such as communication and monitoring replenishment, salt water intrusion, forest/range/pasture recovery/herd recovery, and phasing out drought rates.

3.5.1 Phase One Jurisdictions – Drought Management and Water Stress

3.5.1.1 Canada

In **British Columbia**, the BC Drought Response Plan (Ministry of Environment, 2016) contains action items which are outlined for provincial level committees and ministries as well as regional and local drought teams. Regional and municipal management are noted as creating specific bylaws, planning initiatives, and agencies (e.g., Columbia Basin Trust). **Manitoba's** Drought Management Strategy (Province of Manitoba, n.d.) action items include: monitoring, data communication and sharing; reporting on water availability and drought conditions; drought forecasting; infrastructure planning and design, use and operation of water retention structures, drought proofing programs, groundwater management; drought tolerant crops, restoration of wetlands, transboundary drought management, drought insurance/assistance fund, demand management (water efficiency and reduced consumption), innovative water technology, limiting water licensing/permits, education and awareness, and support for human health. Broad authority exists in **Ontario's** current PTTW framework to tailor individual permits to given conditions and to alter or revoke a permit if conditions change (e.g., respond to



drought and to consider water availability and manage water takings at a regional scale (e.g., to potentially delineate drought-prone areas and develop/implement a strategy to manage existing and new takings within such areas)). Further, the Clean Water Act ("Ontario Clean Water Act," 2006) s. 15(1) includes requirements for source protection committees to prepare water budgets, and where necessary, policies, to assess and manage water quantity risks to their drinking water systems. A Permit to Take Water Standard Operating Procedure (Ministry of the Environment and Climate Change, 2018) was prepared to provide guidance on how source protection water budgets should be considered in making permitting decisions. For example, the guidance states that the "Tier 1 and 2 water budgets were developed as screening tools to identify municipal drinking water systems with a potential for water quantity vulnerability. However, the screening level assessment of sub-watershed (or study area) stress provide ministry staff with insight into regional surface water and groundwater conditions not specific to municipal wells". The Ontario Low Water Response plan (led by Ministry of Natural Resources and Forestry) outlines a program to monitor and report on low water conditions across the province, on a watershed basis. **New Brunswick, PEI, Quebec and Yukon** have no noted drought management plans. **BC, Manitoba, PEI, and Quebec** do not specifically address water stress.

3.5.1.2 US – Great Lake States

In **Illinois**, there is a state-wide drought action plan. However individual communities within the state have their own drought response plans that set their own restrictions and actions. During a drought, communities send out press releases and voluntary conservation techniques. In a more severe drought, the Governor, through the Illinois Emergency Management Act, may respond to a drought emergency and implement mandatory conservation measures. In **Wisconsin**, a Statewide Water Conservation and Efficiency program established in Chapter 281.346(8) ("Water and Sewage," 2011) outlines that the department shall develop a statewide program to promote environmentally sound and economically feasible conservation measures. Chapter NR 852 ("Water Conservation and Water Use Efficiency," 2010) is Wisconsin's Administrative Code that outlines water use conservation and efficiency measures. **Indiana's** Water Shortage Plan (Indiana Department of Natural Resources, 2015) has actions for different uses (i.e., domestic and miscellaneous uses, essential service uses, public water supply system use, industrial and commercial use, industrial use, irrigation use, livestock and poultry water, institutional use) through phases of Water Shortage Watch, Warning, and Emergency; water conservation measures also suggested for individuals, water and wastewater utilities, local and state governments; plan includes triggers to identify the start of a water shortage and



appropriate responses, including water-use priorities and conservation tools (e.g., voluntary restrictions or conservation methods). **New York's** State Drought Plan (New York State Department of Environmental Conservation, 1988) outlines state and local response actions under normal conditions drought alert/watch, drought warning, drought emergency, and drought disaster. The Drought Plan describes the actions to be taken during each drought stage by water purveyors, towns and villages, water authorities, and other agencies with water supply responsibilities. **Ohio's** Emergency Operations Plan Drought Incident Response Annex (2009) outlines emergency response actions for federal, state, and local support agencies. In Pennsylvania, drought emergencies are managed in conformance with Pennsylvania's Emergency Management Agency's drought emergency regulations found in PA Code Chapters 118-120. A three stage process (drought watch, warning, and emergency) organize actions including reductions of major water use in a commonwealth drought emergency area (Ch. 118), prohibition of non-essential water uses in a commonwealth drought emergency area (Ch. 119), and local water rationing plans (Ch. 120). **Wisconsin's** Emergency Response Plan (Wisconsin Department of Military Affairs 2015) includes a Drought Incident Annex that outlines recognition, response, and mitigation action items in times of abnormally dry, moderate drought, severe/extreme drought, exceptional drought for local, state, and federal support and coordinating agencies. Although **Illinois, Indiana, Pennsylvania, Ohio** and **New York** also all have drought plans, they do not specifically address water stress.

3.5.1.3 US – Non Great Lake States

California's Drought Contingency Plan (California Natural Resources Agency & Resources, 2010) includes monitoring, communication/coordination planning, local assistance, and conservation. California's water system faces a number of "difficult challenges including: uncertain water supplies, drought, water quality, habitat loss, flooding and climate change" (Government of California, 2018). In 2015, the California Governor signed "emergency legislation - AB 91 and AB 92 - that fast-tracks more than \$1 billion in funding for drought relief and critical water infrastructure projects" (Office of the Governor, 2015). Further, the Sustainable Groundwater Management Program has developed a Groundwater Sustainability Plan Emergency Regulations Guide (Resources, 2016). The water right permit specifies how much and during which season water can be diverted, and other conditions, such as special terms to protect in-stream flows. Temporary transfers of water from one water user to another have been used increasingly as a way of meeting statewide water demands, particularly in drought years. In terms of water stress, the Sustainable Groundwater Management Act ("Sustainable Groundwater Management Act ", 2014) uses the term "undesirable results" (stress) with regard



to groundwater in the following contexts: Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply; Significant and unreasonable reduction of groundwater storage; Significant and unreasonable seawater intrusion; Significant and unreasonable degraded water quality; Significant and unreasonable land subsidence; Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water. In **North Carolina's** Drought Assessment and Response Plan (State of North Carolina, 2005), the main action items are monitoring, assessment, impact identification, reporting, and response; the Plan divides some of the action items among task forces, e.g., agriculture, health, water sources. North Carolina does not specifically address water stress.

3.5.1.4 International

England's "Our Framework for England" (Environment Agency Government of the United Kingdom, 2017), published by the Environment Agency and defined drought stages from normal to severe. Action items include (response to) environmental incidents, drought permits and orders to increase water supply, drought orders to protect the environment, spray irrigation restrictions, drought monitoring, data and information gathering and reporting, and communication. "The Environment Agency's, "Enforcement and Prosecution Policy," sets out a framework for agency inspection of abstractions and impoundments to ensure compliance with licence conditions. The frequency of inspection depends upon the criticality of the impact of the authorized activity on the environment. Meter inspections are an integral part of licence enforcement" (Canadian Council of Ministers of the Environment, 2016a; Environment Agency Government of the United Kingdom, 2013b). Under Section 28 of the Water Act ("Water Act," 2014) drought plans must be revised every five years. Dŵr Cymru **Welsh** Water (Dŵr Cymru Welsh Water, 2015) also has published a drought plan with a comprehensive table of action items in relation to various drought conditions. England and Wales do not specifically address water stress. In **South Australia**, the Natural Resource Management (NRM) Act 2004 establishes eight regional boards across South Australia. Each is responsible for developing a Natural Resource Management Plan for its region; some of the goals of such Plans are to ensure sustainable management and productive use of natural resources, and to improve the condition and resilience of natural systems (Government of South Australia, 2012). Droughts are identified as one of the main pressures on South Australia's natural resources (Government of South Australia, 2012). Water license trading is the primary mechanism being used within Australian jurisdictions to deal with conflict and re-allocate scarce resources. If someone needs water, they can buy temporary or permanent rights to take more water from someone who has



excess water allocation available and/or is financially better off selling their water than using it. In situations of water stress, the NRM Act provides a number of options to restrict or reduce water use. These include reissuing allocations with a reduced volume (applies in unbundled water regimes, i.e. River Murray Prescribed Watercourse, and Southern Basins and Musgrave Prescribed Wells Area) which can be done by the Minister at his discretion; notice of restriction pursuant to section 132 of the NRM Act; reductions to water allocations pursuant to section 155; or water conservation measures pursuant to section 169.

3.5.2 Phase Two Jurisdictions – Drought Management and Water Stress

3.5.2.1 Minnesota

In Minnesota, there is no definition of water quantity stress. However, there is a sustainability standard (103G.287, subd. 5.) with respect to groundwater. Through groundwater monitoring, sustainability stress is indicated when the aquifer “water level” is decreasing without periodic recovery. A network of stream gauges is used for assessment to indicate when a watershed might be considered to be under stress. When flows are at Q90, action may be taken to suspend surface water users in that watershed, which can include suspending permits in accordance with priority uses stated in law (103G.261).

As a part of the state’s response to water stress as a form of scarcity, Minnesota Statewide Drought Plan (Department of Natural Resources, 2009) outlines state, federal, water user and supplier actions during phases of non-drought, drought watch, drought warning, restrictive, and emergency. The DNR is currently in the process of updating this drought plan to include more action-based roles and responsibilities in response to changing environment and climate conditions (Ekman, 2018). Actions broadly cover public awareness and education campaigns, monitoring, conservation and efficiency measures, ordinances, restriction implementation, and planning and coordination growing in effort and strictness as drought levels escalate. In addition to this plan, there is also the Mississippi River System-Wide Low-Flow Management Plan (Minnesota Department of Natural Resources, 2015b), which focuses on run-of-the-river hydropower facility operations during low flow along the Mississippi River upstream of St. Paul; the Minnesota Emergency Operations Plan (Minnesota Department of Public Safety, 1996), which addresses emergency response during extreme drought conditions and other natural hazards; and Local Water Supply Plans (Minnesota Department of Natural Resources, 2015a); formally called Water Emergency and Water Conservation Plans), which include emergency



preparedness and supply and reduction measures, and water priorities. Additionally, in statute, surface water appropriations can be suspended in certain low flow conditions:

If data are available, permits to appropriate water from natural and altered natural watercourses must be limited so that consumptive appropriations are not made from the watercourses during periods of specified low flows. The purpose of the limit is to safeguard water availability for in-stream uses and for downstream higher priority users located reasonably near the site of appropriation (103G.285 Subd 2.).

A Q90 low flow stream threshold (of the August median flow) is currently used as the condition indicator that suspensions should be issued by the DNR. In case these conditions arise, users are required to have a contingency plan for action they will take when notified by DNR that their surface water use is suspended. (Minnesota Statutes, chapter 103G.285, subd. 6). A publicly available guideline document¹² “Guidelines for Suspension of Surface Water Appropriation Permits” assists in this contingency planning process. When approaching Q90 the DNR sends out warnings about possible upcoming suspensions to water users and takes into consideration the time of year (e.g., whether water use will drop again after harvest). Suspensions have not been issued in the last seven years (Ekman, 2018).

Conservation measure for different water users during times of shortage are formally legislated under Minnesota Statute 103G.291. Specifically, this Statute requires public water suppliers to adopt and enforce water use restrictions when the governor declares a critical water deficiency. This local law is required of public water suppliers that serve over 1,000 people with their water supply. The restrictions must limit sprinkling lawns, washing vehicles, irrigating golf courses and parks, and other nonessential uses and have appropriate penalties for failure to comply with restrictions. All measures noted are voluntary until a governor declares a critical water deficiency. Also, since 1996 every public water supplier serving more than 1,000 people must submit a water supply plan to the commissioner every ten years. The DNR assists with the development of these plans and provides approval. The plans “must address projected demands, adequacy of the water supply system and planned improvements, existing and future water sources, natural resource impacts or limitations, emergency preparedness, water conservation, supply and demand reduction measures, and allocation priorities (103G.291, Subd 3.).” Enforceability and which parts of the plan form local ordinances is at the discretion of

¹² See http://files.dnr.state.mn.us/natural_resources/climate/drought/drought_permit_suspension.pdf



local governments. However, one portion of the plan that must become an ordinance is the development of the critical water deficiency local law. This portion of the Water Supply Plan can be found in various Minnesota municipal codes. As with all municipal ordinances public notification must be made to form local law (Minnesota Rural Water Association, 2017). Examples of municipal codes with ordinances that address the critical water deficiency portion of the Water Supply Plan include the following:

- City of Hugo, MN: Chapter 82, Article II, Division 1, Sec. 82-34:
https://library.municode.com/mn/hugo/codes/code_of_ordinances?nodeId=COOR_CH82UT_ARTI IWASY.
- City of Woodbury, MN: Chapter 23, Article II, Division 1, Sec. 23-20:
https://library.municode.com/mn/woodbury/codes/code_of_ordinances?nodeId=CICO_CH23WASESEDI_ARTIIMUWASESY.
- City of Shoreview, MN: Chapter 500, 501.140 - Water Use Restrictions, Part C:
<https://www.shoreviewmn.gov/home/showdocument?id=28>

In addition to local ordinances and management, the DNR also manages the critical water deficiency measures through the permitting process. For example, if a municipal water supplier applies to increase their permitted volume, the DNR would review their work to implement water conservation measures and water efficiencies of their system. If the measures are found inadequate, the DNR may deny an increase in the permitted volume or only issue a temporary increase while corrections are made by the supplier.

Additionally, also under Minnesota Statute 103G.291 other, non-public, water users are subject to different conservation measures. Surface water users are subject to temporary suspension of water pumping when their watershed's indicator gage shows that stream flow is at a critically low flow (set at Q90). Groundwater users whose pumping is shown to negatively impact surface waters are subject to this temporary suspension, too (Ekman, 2018). Permit applicants must provide the DNR with information on how they will conserve water and use efficiently. During a drought, if water is unavailable to meet the needs of all water users, the prioritized list of user types (M.S. 103G.261) is utilized by the DNR. Other types of water users cannot interfere with domestic water supply for drinking, cooking and cleaning.



3.5.2.2 Michigan

For both Minnesota and Michigan in the context of drought, the US Drought Monitor (a weekly index depicting the location and intensity of drought conditions using a blend of quantitative and qualitative indicators – i.e., the Midwest Drought Early Warning System (MDEWS)) is used as a water stress indicator. The MDEWS is a local stakeholder-driven effort encompassing data collection and monitoring; research; planning for climate extremes; and communication, education, and outreach. Complementing the work of the MDEWS is also Michigan's Drought Response Plan (Office of Water Resources, 1988), which outlines both short and long-term actions to respond to water scarcity. Short term actions are direct and tangible in nature and include actions such as contacting dam agencies and remind them to maintain minimum flow releases, taking measures to protect recreational uses and public health, and authorizing where appropriate, the use of partially treated wastewater for irrigation. Long-term actions include implementing a watershed management program with water use reporting, protection of minimum in-stream flows, and further water use regulation. However, "actions have not proceeded under Michigan's Drought Response Plan, and Michigan's water use regulations are not tied to the Drought Response Plan in any way" (Milne, 2018).

With regards to conservation measures in times of shortage, the Drought Response Plan outlines three options for water conservation: educational programming for demand conservation that can be carried out by all government levels, mandatory regulation of water uses by municipal governments, and temporary changes to water rate pricing to encourage water users to conserve. If escalated enforcement actions are required, Part 327 of the NREPA would be used to provide authority to order previously authorized water users to cease or reduce their pumping. This has not yet occurred. However, if it did, MDEQ would be required to show through a preponderance of evidence that these withdrawals are likely to cause adverse resource impacts (Milne, 2018). This requirement would be guided through the registrations via the WWAT and site-specific reviews and permits under MCL 324.32723, which have a rebuttable presumption that the authorized withdrawal will not cause an adverse resource impact. The MDEQ would have to demonstrate through a preponderance of evidence that the withdrawal is likely to cause an adverse resource impact to rebut that presumption and order the property owner to cease or reduce pumping. Evidence of an adverse resource impact could include data of stream index flow or fish population depletion beyond the Zone D cut-off value where an adverse resource impact is likely. For inland lakes, the criteria also include other uses of the lake (e.g., navigation, fishing, other recreational uses). The most likely assessment



approach is a combination of groundwater elevation data and stream flow data, possibly in conjunction with a groundwater/surface water model (Milne, 2018).

Michigan also has conservation measures outlined in statute: Public Act 35 of 2006 requires that each water use sector develop voluntary guidelines for generally accepted water management practices or environmentally sound and economically feasible water conservation measures. Water users are encouraged to consider their worst-case water use needs when they use the WWAT or request a SSR (Milne, 2018). The Act allows for such guidelines to be developed and adopted by an established statewide professional or trade association representing that sector and may or may not outline shortage specific measures. Although it is not known in Michigan what factors are influencing water use conservation and efficiency measures directly, there are general trends of increasing conservation (i.e. withdrawals decreasing); the degree sector-based water conservation measures that were developed have contributed is not yet clear (Milne, 2018).

3.5.2.3 Florida

Florida is guided by the goals of its Drought Action Plan (Florida Department of Environmental Protection *et al.*, 2007), which focuses on actions such as environmental monitoring, environmental and water user assessment, coordinating responses, communicating, taking mitigation efforts, and preparing for the future. The drought plan does not specifically outline conservation measures; however, under Florida Statute 373.175 “Declaration of Water Shortage or Emergency,” during times of water shortage a governing board may impose restrictions on one or more classes of water users if necessary to protect water resources in an area. Additionally, the water management districts also have developed their own Water Shortage Plans; for example, the SJRWMD Water Shortage Plan (St. Johns River Water Management District, 2005) found in 40C-21 of the Florida Administrative Code. In these plans, both voluntary and mandatory measures are incorporated into water shortage criteria depending on the severity of the shortage. Note, currently the SJRWMD is updating this Rule which is slated for approval in April 2018 (Laidlaw, 2018).

At the state level, Florida does not use the word water stress. However, the governing boards of a water management district may declare a water shortage within all or part of a WMD. The decision as to whether or not hydrologic conditions warrant a water shortage is up to the WMDs. This declaration is done when insufficient ground or surface water is available to meet the needs of the users or when conditions are such as to require temporary reduction in total



water use within a specific geographic area to protect the water resources from serious harm. Making such a water shortage declaration is a short-term solution to minimize negative impacts to the water resources and environment features but does not affect water use permitting (Laidlaw, 2018). Only the District's Governing Board may declare a water shortage based upon a staff recommendation to do so. Rules governing a water shortage are specific for each district.

Chapter 40C-21, Florida Administrative Code outlines rules and hydrological criteria used to determine whether or not a water shortage is warranted. The statute codifies the authority granted to the WMDs to declare a water shortage. Allocations for consumptive use permits are made on the basis of a specific drought event; typically a 2-in-10-year drought event is used to determine the water allocation needed to efficiently meet irrigation demands during that drought event. In most years the actual water use will be less than that amount. On rare occasions a more severe drought can be experienced and water shortage plans are designed to be implemented in those cases (Laidlaw, 2018).

For the SJRWMD, there are four levels of water shortage, Moderate, Severe, Extreme, and Critical, each with varying levels of water use restrictions. The moderate condition relies on a variety of voluntary reductions to reduce consumption, up to a critical declaration where mandatory reductions are enforced. To assess whether such a declaration is needed in the SJRWMD, various tools are used to determine water quantity stress, such as rainfall and aquifer levels, stream or spring flow, lake levels, vegetative and floodplain impacts, wetlands, and/or river. District staff continually evaluate the hydrologic conditions and if one or more of the criteria is tripped as set forth in Chapter 40C-21, FAC, a recommendation for a water shortage is made to the Governing Board. Other WMDs may vary in their processes.

3.5.2.4 Montana

At its highest level, the Montana Constitution ("The Constitution of the State of Montana," 1972) sets the stage for how drought is managed. In Article IX Environment and Natural Resources s.1(3) on Protection and Improvement, the Montana Constitution states that the "legislature shall provide adequate remedies for the protection of the environmental life support system from degradation and provide adequate remedies to prevent unreasonable depletion and degradation of natural resources". Further, the Constitution clearly asserts its authority in matters of water in s.3(3) "[a]ll surface, underground, flood, and atmospheric waters within the boundaries of the state are the property of the state for the use of its people and are subject to appropriation for beneficial uses as provided by law". Montana's Code



("Water Use," 2017), Chapter 85 on Water Use, makes specification on state water plans as they relate to drought in s.85-1-203(3c) specifying that state water plans must be completed for the Missouri, Yellowstone, and Clark Fork River basins, must updated at least every 20 years, and must include "analysis of the effects of frequent drought and of new or increased depletions on the availability of future water supplies".

As discussed, Montana's familiarity with drought and drought planning date back at least as far as "Dust Bowl"-era drought conditions. Following these extreme conditions, conservation districts were created with broad power and authority under the Natural Streambed and Land Preservation Act ("The Natural Streambed and Land Preservation Act," 1975) which lays out the administrative rules under which the conservation districts carry out programs for the conservation of soil and water, protect streams and rivers". The current Montana Drought Response Plan (Montana Drought Advisory Committee, 1995) was predated by a plan in 1977 and focuses on mitigation as opposed to response. An updated Draft Outline for State Drought Management Plan (Montana Department of Natural Resources & Conservation, 2016) has not yet been finalized, but has been drafted and can be viewed online. Once approved, this 2016 Plan could reflect improvements in drought policy and planning that reflect more contemporary circumstances. The central action items of the 1995 Plan are monitoring, reporting, assessment, and response (including triggering mechanisms, drought alert and severe drought). The Plan provides an outline of state, federal, and local response actions. However, the Plan does not affect water right permitting. There are some local cooperatives that voluntarily reduce usage to maintain streamflow but that is outside the purview of water right permitting (Ferch, 2018).

A Drought Management Plan is a voluntary process in which water users agree upon specific management measures to limit water use and share sacrifice in the event of shortages. ...some basic first steps water users commonly use to minimize shortages [include] voluntarily conserving water; improving the efficiency of water delivery systems; cutting back on their diversions so that all users are able to divert at least some of their needed supply. If these voluntary measures are ineffective or inadequate to address shortages in supply, a water user always has the option of implementing more formal measures to exercise his or her water right. When a senior water right holder is unable to obtain enough water to meet his right, he can "call" the water of a junior water right holder. By placing a call, the senior user is asking specific water users with later priority dates to limit or stop water diversions.



When disputes arise over the administration of water rights, there are a number of remedies available to water users. For example, a water user can file an action in district court requesting a temporary restraining order and preliminary injunction. This process is the fastest way to obtain relief, but it is also the most expensive. If a water source is subject to a water rights decree, water users may petition the district court to appoint a water commissioner to administer water rights according to priority based upon the decree (Montana Watercourse at the Montana Water Center & Montana Department of Natural Resources & Conservation, 2015a).

Notably, the Northern Cheyenne (Indigenous), whose reservation is in Montana, have published a Northern Cheyenne Tribe Drought Mitigation Plan. In addition to these drought plans, the DNRC issues a monthly drought report outlining drought conditions in the state. When necessary (which is quite often), the governor issues executive orders related to measures combatting drought including legal specifications and outlining current and applicable drought conditions (Drought and Water Supply Advisory Committee, 2006). These measures are mandatory. According to Ferch (2018) the Montana Drought Response Plan has no bearing on permitting decisions – as long as Montana Code Annotated (MCA) criteria are met, DNRC issues the permit. The MCA Chapter 85 on Water Use is “pretty much what we live by with further clarification in ARM 36.12 and case law” (Ferch 2018).

Montana’s legislation, and Department of Natural Resources and Conservation do not use the term water stress specifically. The Natural Streambed and Land Preservation Act, also known as ‘The 310 Law’, is administered by the Conservation Districts and addresses matters of water shortage. The purpose of the 310 Law is to keep surface water as close to its natural or existing condition as possible, minimize sedimentation, and recognize beneficial uses” (Montana Department of Natural Resources & Conservation, 2018a). The Montana Drought Response Plan uses the term stress in relation to drought effects on fisheries and aquatic populations but does not explicitly measure water stress. Montana Fish, Wildlife, and Parks maintains a dewatered streams list. Montana’s dewatered streams list (Montana Fish Wildlife & Parks, 2005) is:

The list is of Montana streams that support important fisheries or contribute to important fisheries (i.e., provide spawning and rearing habitats) that are significantly dewatered by man-caused flow depletions. Most man-made



dewatering occurs during the irrigation season (July-September). Although most dewatering is caused by irrigation withdrawals, a few of the listed waters are dewatered through dam manipulations for both agricultural use and power production.

This information may be reviewed during the water permitting process, however, DNRC is limited only by legal availability of water, which means additional water rights may be issued despite the stream being listed on the dewatered stream list (Ferch, 2018).

3.5.2.5 New Zealand (Waikato Region)

In the Waikato region, while the term stress is not used specifically, the Waikato Regional Council Water Shortage Risk Mitigation Plan addresses the impacts of water shortage addressing the reduction of adverse effects, risk, and community vulnerability (Council, 2000). Additionally, the Water Module of the Waikato Regional Plan (Council, 2000) specifies what constitutes shortage (Table 3-5 and Table 3-6), how water shortage conditions will be observed (Policy 17), and lays out by user in order of priority the “Levels of Priority to Apply During Water Shortages” (Policy 18). For example, Table 3-5 on Allocable Flows for Surface Water in the Waikato Regional Plan is a Table that accompanies water allocation maps which lay out surface water allocation catchments. It is from these the catchments areas are identified and to which the allocable and minimum flows relate. Table 3-5 in the plan:

...specifies the percentage of the Q5 flow which is able to be allocated and the portion required for the minimum flow as established in Policy 1 and Policy 2. The Q5 flow will need to be calculated at the point of take and at each affected downstream reach. The Waikato Regional Council in many cases will be able to provide known values of Q5 for many locations in the region. However, where these are unknown applicants will need to provide a calculation of the Q5 flow.

When water shortage conditions are not occurring, then the relevant water shortage (restriction or cessation of take) conditions do not apply (Davenport, 2018). In addition to the mandatory and formal policies on water stress, the Waikato Regional Council has a Water Shortage Risk Mitigation Plan (Council, 2000) which deals with drought as a significant cause of water shortage. One of the main functions of the Mitigation Plan is to minimize the adverse effects associated with natural hazards such as drought. However, the Plan was originally proposed as a Drought Risk Mitigation Plan. The Plan, dated August 2000, states that because



the region does not experience water shortage extremes, the title was changed to Water Shortage Risk Mitigation Plan. However, 2016 climate projections for Waikato include decreases in winter rainfall, and an overall pattern of reduced rainfall in the north (New Zealand Ministry for the Environment & Aqualinc Research Limited, 2006). The major action items in the Water Shortage Mitigation Plan are reducing adverse effects, response and recovery, and monitoring and review. For each of these major action items, the Plan lays out detailed actions within each, including the agency which carries responsibility, as well as required timing. This Plan does not affect decisions about water use. The Plan was prepared by the natural hazards arm of Waikato Regional Council and has a purpose that falls outside the scope of water allocation regulation. It has more to do with drought response, people and animal welfare matters (Davenport, 2018).

3.6 CONFLICT RESOLUTION MECHANISMS¹³ - PRIORITY OF USE

One of the ways in which conflict over water can be anticipated is establishing a hierarchy of water users and the resulting prioritization of use. Water management hierarchies are simply the hierarchy of water priorities (Wan Alwi *et al.*, 2006) that have or can be established. How water users are prioritized within this management hierarchy largely reflect that society's normative principles, context, and values with regards to water governance (Roa-García, 2014). For example, Australia tends to attribute high priority to critical human water needs, and lower priority to agricultural and industrial needs. Mexico, on the other hand, tends to attribute high priority to domestic and agricultural uses for water, and less priority to use for national security and industrial purposes. Meanwhile, Spain prioritizes urban supply, irrigation, and agricultural uses, and attributes lower priority to aquaculture and recreational uses (Organization for Economic Co-operation and Development, 2015). Given the range of societal water priorities, even at jurisdictional or municipal scales, there is not a universal, objective way in which the priority of water users *ought* to be prioritized to reduce conflict. Value-based prioritization of resources is inherently challenging, particularly when considering a diversity of interests in resources like water. Thus, viewing the hierarchy of water users with the goal of reducing conflict over water implies that the prioritization of water use reflects, or attempts to reflect, that jurisdiction's societal values and context. Following are summaries of the reviewed Phase One (Section 3.6.1) and Two (Section 3.6.2) jurisdictions' priority systems. Many of the reviewed jurisdictions outline a priority for water uses in legislation (e.g., Minnesota, Manitoba,

¹³ RFB 6792 3.2.1 g



British Columbia, Indiana). Others outline priorities in water policies or in a drought plan (e.g., Ontario, Pennsylvania, England/Wales). These priorities may apply when considering and issuing a water withdrawal permit, and in some cases, the priorities apply only when there is a drought emergency.

3.6.1 Phase One Jurisdictions – Priority of Use

3.6.1.1 Canada

In **British Columbia** there is a precedence of rights based on date which established who is allowed full allocation of water first (AMEC, 2008). This applies to ground and surface waters, for which water use purposes are ranked, from highest to lowest as follows: (a) domestic; (b) waterworks; (c) irrigation; (d) mineralized water; (e) mining; (f) industrial; (g) oil and gas; (h) power; (i) storage; (j) conservation; (k) land improvement. Priority for the use of water is first given to essential household needs and critical environmental flows, and then managed according to the precedence of water rights or first-in-time, first-in-right. In **Manitoba**, the order of priority of the purposes for which water may be used or diverted, or works constructed, established or maintained, in accordance with the Water Rights Act: 1. domestic purposes; 2. municipal purposes; 3. agricultural purposes; 4. industrial purposes; 5. irrigation purposes; 6. other purposes. Water Rights Act S 9.2 states that “The minister may suspend or restrict the rights under a license for a specified period if (a) in the minister's opinion, (i) a groundwater level, (ii) a water body level, or (iii) an in-stream flow, is insufficient to ensure that aquatic ecosystems are protected and maintained.” In **Ontario**, priority of water uses are outlined in two policies: the MECP Water Management Policy, Guidelines and Provincial Water Quality Objectives (1994) and in the Ontario Low Water Response Plan (OLWR). As a guide in considering water management actions in response to low water conditions, OLWR describes water users within three classes: essential (human and animal life and health), important (social and economic well-being of a particular area), and non-essential (e.g., private swimming pools, lawn watering, public and private fountains and vehicle washing.). The MECP Water Management Policy, Guidelines and Provincial Water Quality Objectives (1994) contains a guideline setting out a priority of water uses when evaluating the relative priority of uses in an area where there is insufficient water to meet established and new uses: water takings for private domestic and farm purposes are considered to have the highest importance, followed by municipal water supply; in contrast, water takings for industrial, commercial and irrigation purposes are regulated by the availability of the supply, the efficiency of use and established uses in the area. The use of water for pollution control, flood control, fire protection,



recreation, wildlife preservation and habitat protection are also considered important uses. PEI's Water Act "authorizes the Minister to direct that an approval not be issued for a water withdrawal for commercial, industrial or recreational purposes if it would interfere with the availability of water for domestic purposes or for [environmental] water flow needs of a watercourse" and also states that "Water for fire suppression or domestic purposes not to be affected by regulations". In the **Yukon**, water users are not prioritized per se, but under the Water Act, water licences do not "apply in respect of the use of waters (a) by a domestic user; (b) by an in-stream user; or (c) for the purpose of (i) extinguishing a fire, or (ii) on an emergency basis, controlling or preventing a flood", though it should be noted that such exemptions for domestic and fire-fighting/emergency purposes are observed in numerous other jurisdictions as well. Priority to water users is not assigned in **New Brunswick** or **Quebec**.

3.6.1.2 US – Great Lake States

In **Indiana**, Rule 312 IAC 6.3-4-1 establishes the following water withdrawal priorities from State financed reservoirs: A) First Priority is for the use of water for domestic purposes as described in IC 14-25-1-3; B) Second priority is for the use of water for health and safety; C) Third priority is for the use of water for power production that meets the contingency planning provisions of the drought alerts described in 312 IAC 6.3-5-2; D) Fourth priority is for the use of water for industry and agriculture (not described in A, B, or C) that meets the contingency planning provisions of the drought alerts described in 312 IAC 6.3-5-2; E) Fifth priority is for the use of water for a purpose described in clause (C) or (D) that does not meet the contingency planning provisions of the drought alerts described in 312 IAC 6.3-5-2; F) Sixth priority is for the use of water for any other purpose. In **New York** priority for public health is assigned in the Drought Management Coordination Annex (New York State Disaster Preparedness Commission, 2016). Additionally, the Environmental Conservation Law states that with respect to the use of the waters of the state and the water courses thereof, due consideration shall be given to the relative importance of different uses. Private riparian rights are subordinate to the public trust doctrine, giving the state the right to reduce commercial, industrial, and agricultural usage in order to sustain domestic demand. In **Pennsylvania**, priority is only declared in a state of drought emergency wherein non-essential water use restrictions and water rationing are put in place. Priority to water users is not assigned in **Illinois** or **Ohio**.

3.6.1.3 US – Non-Great Lake States

In **California**, a water right (see sections 7.1 and 7.8) permit specifies how much and during which season water can be diverted, and other conditions, such as special terms to protect in-



stream flows (California Environmental Protection Agency, 2018a). Temporary transfers of water from one water user to another have been used increasingly as a way of meeting statewide water demands, particularly in drought years. Additionally, in California, when “deciding whether to approve applications and impose certain conditions in permits, the State Water Board is required to consider water quality control plans, including the protection of the beneficial uses of water, the public interest, reasonableness, and the public trust (protection of resources held in trust for all citizens, such as commerce, navigation, fisheries, and recreational and ecological values)” (California Environmental Protection Agency, 2018a). Before issuing a water right, the State Water Board must consider the prioritization of use by determining whether “unappropriated” (unclaimed) water is available to supply the applicant, considering the water flows needed to remain in the stream (in-stream flows) for the protection of other beneficial uses, including municipal supply, agricultural supply, and fish and wildlife habitat. In areas of **North Carolina** where water supplies are seen to be sufficient for in-stream and consumptive needs, no restrictions exist for lower priority water uses. However, the North Carolina Environmental Management Commission may designate “capacity use areas” where “water use requires coordination and limited regulation to protect the rights of residents, property owners or the public interest. In these capacity use areas, applications for water use permits may be subject to an environmental assessment and applications that jeopardize water quality, aquatic habitat, or endangered species may be denied” (AMEC, 2008). Per § 143-215.13 – 13 of the North Carolina General Statutes, a “capacity use area” is an area where the Commission finds that the aggregate uses of groundwater and/or surface water have, or risk being, developed to a degree which requires coordination and regulation, or which exceed, threaten or impair the renewal or replenishment of such waters.

International

In **England/Wales**, water permits/orders include prioritization into Tier 1 and Tier 2; what these Tiers signify was not readily identifiable. England’s Drought Plan (Environment Agency Government of the United Kingdom, 2017) is less specific: “the Environment Agency and water companies can apply to government for a drought order to stop any unlicensed or licensed abstraction with no low flow control conditions that is having a severe impact or is threatening to impact on the environment or public water supply. The Defra [*Department for Environment, Food & Rural Affairs*] Secretary of State will make a decision to grant such orders for reasons based on the predicted impacts and the prioritisation of water for people, industry and the environment”. Under **South Australia’s** Natural Resource Management Act (“Natural Resources



Management Act," 2004), some of the factors affecting the priority granted to a person to take and use water include whether they and/or others have: water access entitlements and water allocations subject to a water licence, site use approvals, water resource works approvals, stock and domestic rights.

3.6.2 Phase Two Jurisdictions – Priority of Use

3.6.2.1 Minnesota

Of the five jurisdictions examined, Minnesota's system of prioritizing of use in time of water stress was particularly explicit. Minnesota Statute 103G.261 outlines the following water allocation priorities:

The commissioner shall adopt rules for allocation of waters based on the following priorities for the consumptive appropriation and use of water:

(1) first priority, domestic water supply, excluding industrial and commercial uses of municipal water supply, and use for power production that meets the contingency planning provisions of section 103G.285, subdivision 6;

(2) second priority, a use of water that involves consumption of less than 10,000 gallons [37,854.12 litres] of water per day;

(3) third priority, agricultural irrigation, and processing of agricultural products involving consumption in excess of 10,000 gallons [37,854.12 litres] per day;

(4) fourth priority, power production in excess of the use provided for in the contingency plan developed under section 103G.285, subdivision 6;

(5) fifth priority, uses, other than agricultural irrigation, processing of agricultural products, and power production, involving consumption in excess of 10,000 gallons [37,854.12 litres] per day; and

(6) sixth priority, nonessential uses.

(b) For the purposes of this section, "consumption" means water withdrawn from a supply that is lost for immediate further use in the area.

(c) Appropriation and use of surface water from streams during periods of flood flows and high water levels must be encouraged subject to consideration of the purposes for use, quantities to be used, and the number of persons appropriating water.

(d) Appropriation and use of surface water from lakes of less than 500 acres in surface area must be discouraged.



- (e) The treatment and reuse of water for non-consumptive uses shall be encouraged.*
- (f) Diversions of water from the state for use in other states or regions of the United States or Canada must be discouraged.*

Utilizing this prioritization hierarchy, for surface water users and groundwater users subject to surface water laws, Minnesota follows the 2012 “Guidelines for Suspension of Surface Water Appropriation Permits” during low water situations. Non-essential uses (the lowest priority) are the first to be restricted in an area experiencing shortages; restrictions then continue through the priorities – moving up through higher priority users to protect the water supply needs of the highest priority user (domestic supply). In the long term, if water users in an area are experiencing shortages such that high priority users are impacted due to lower priority users’ withdrawals, then conflict resolution mechanisms would be employed by the DNR to resolve the issue. One mechanism the DNR has used is a well interference process; another is through the Groundwater Management Area designation.

3.6.2.2 Michigan

Michigan, although not explicitly stated in statute, generally operates without a priority of use system (Nozaki Lacy, 2013; United States Geological Survey & Michigan Department of Natural Resources, 2009). In the event of a conflict, public water supply uses would likely be prioritized over other types of water use (Milne, 2018).

3.6.2.3 Florida

Priority among water users is addressed in Florida Statute 373.246 specific to times of water shortage or emergency:

If an emergency condition exists due to a water shortage within any area of the district, and if the department, or the executive director of the district with the concurrence of the governing board, finds that the exercise of powers under subsection (1) is not sufficient to protect the public health, safety, or welfare; the health of animals, fish, or aquatic life; a public water supply; or recreational, commercial, industrial, agricultural, or other reasonable uses, it or he or she may, pursuant to the provisions of s. 373.119, issue emergency orders reciting the existence of such an emergency and requiring that such action, including, but not limited to, apportioning, rotating, limiting, or prohibiting the use of the water resources of the district, be taken as the



department or the executive director deems necessary to meet the emergency.

Use of this priority hierarchy has been utilized within the state in the past. For the SJRWMD, water shortage priorities have been adopted twice in the past 20 years. Restrictions associated with the water shortage are provided to the local governments affected by the water shortage. The restrictions were enforced by local law enforcement, not the SJRWMD, for those smaller urban landscape uses that do not require an individual permit (Laidlaw, 2018).

3.6.2.4 Montana

Montana's system of priority of users is embedded in, and bound by, its legal framework. Under Article IX of the Montana Constitution ("The Constitution of the State of Montana," 1972), all waters belong to the state for the use of its people and are subject to appropriation for beneficial uses. The legal structure in Montana Water Law is based primarily in prior appropriation, or "first in time, first in right". In Montana's two-part rights system: priority is given to those who first appropriated pre-1973, and those rights are administered by the Montana Water Court. Post-1973 water permit rights are administered by the New Appropriations Program of the DRNC (Montana Department of Natural Resources & Conservation, 2018e). Decisions over water priorities are made on this legal foundation. For example, Montana has closed basins to the new acquisition of certain types of water appropriations because of water availability, concerns of over-appropriation, and in the interest of protecting existing water rights (AMEC, 2008). Montana Amended Code Title 85-2-3 on Appropriations, Permits and Certificates of Water Rights contains lengthy statutes pertaining to rights and regulation in closed basins (see 2017 Codes 85-2-330, 85-2-336, 85-2-341, 85-2-343, 85-2-344, 85-2-360, 85-2-362, 85-2-368). For example, Montana Code 85-2-360 on groundwater appropriation rights in closed basins details specifications for ground water appropriation rights for applicants (e.g., hydrological report), and how the Department may consider the permit for new appropriation. Because water rights are property rights in Montana, the Constitutions of the United States and Montana protect water right holders from being deprived of those rights without due process of law. Water rights can thus be sold or leased to other users, but they do not own the water, they only own the right to use the water. Therefore, in terms of prioritization, the Department may, for example, acquire in-stream rights through transfer from existing users (AMEC, 2008). The nature of a water right is very well defined. Every water right has: (1) a specific source – a stream or spring (for surface water) or groundwater (for a well); (2) a specific point of diversion (head gate or wellhead) – that point where the water is diverted from its source; (3) a specific place of use – defined in acres,



township, range, and section; (4) a beneficial use – including, but not exclusively, irrigation, stock water, municipal, industrial, domestic, lawn and garden, and augmentation; (5) a specific quantity – in cubic feet per second; (6) a season of use. Domestic and stock water uses are typically year-round. Irrigation is usually April to October; and (7) a priority date – the date the water was first put to beneficial use.

3.6.2.5 New Zealand (Waikato Region)

New Zealand's Waikato Regional Council has clearly defined the hierarchy of water use priorities. Policy 18 on "Levels of Priority to Apply During Water Shortages" in the Waikato Regional Plan (Waikato Regional Council, 2010) states that:

a) The level of priority to apply during water shortage conditions in surface water (SW) bodies, in descending level of importance is as follows: i) Priority SW-A activities: takes which have a zero net take, or for firefighting ii) Priority SW-B activities: stock watering supplies, takes for animal welfare and sanitation (including shed wash down and milk cooling), takes for perishable food processing, takes associated with electricity generation, all permitted and s14(3)(b) RMA [Resource Management Act] takes, and takes for domestic or municipal supply. iii) Priority SW-C activities all other takes allocated within the primary allocable flow as defined in Table 3-5. iv) Priority SW-D activities: all other takes allocated water above the primary allocable flow as defined in Table 3-5 and temporary takes of short duration. v) Priority SW-E activities: takes for water harvesting. b) The level of priority to apply during water shortage conditions in groundwater (GW) aquifers, in descending level of importance, is as follows: i) Priority GW-A activities: will include groundwater takes allocated as discretionary activities. ii) Priority GW-B activities: will include groundwater takes allocated as non-complying activities.

As referred to in Policy 19, Table 3-5 on Allocable Flows for Surface Water specifies the percentage of Q5 flow which can be allocated and the portion required for minimum flow. In Table 3-5, the flows are first broken down by catchment (watershed) then divided into upland and lowland catchments. For each of these, flows are broken down into primary allocable, secondary allocable, and minimums. There is also (a form of) priority system applicable when reducing over-allocation in the Waikato Regional Plan Chapter 3.3.4.10 on "Phasing Out Exceedances of the Table 3-5 Allocable Flows". Further, on the topics of allocation, priority, and



implementation, King (King, 2018) offers the following insight for the Waikato Region (emphasis added):

*I've come to understand that incumbents really don't like to see any change, largely I think through a sense of entitlement that they develop through time. Also, there is very much a "me first" mentality – naturally I suppose but doing the work that we do one develops an understanding of the holistic benefits of balance and compromise – across the various sectors who take and use water, or who would like to take and use water, or who would like no water to be taken and used and as such it is very difficult if not impossible for one party to understand never mind accept the perspective of others. This always poses a challenge when we're working through the regulatory stuff that we do because in short you know there is always a really good chance that someone is going to feel aggrieved, upset, etc. if we don't see things their way. Given this, I think **it is paramount that a robust framework is in place to firmly guide decision making re water allocation matters.***

Further, according to Davenport (2018):

Processes for reducing and/or phasing out over allocation are time bound by the a) the National Policy Statement for Freshwater, and policy 19 b) which require such over allocation to be eliminated by 2030. The regulatory process is pretty much as set out in section [(Waikato Regional Council, 2010)] s. 3.3.4.10. 3.3.4.9 is relevant here; allocable flows may be adjusted via Plan review process, currently scheduled for early 2021.

3.7 CONFLICT RESOLUTION MECHANISMS¹⁴- CONFLICT/DISPUTE RESOLUTION

Water shortages, or anticipated water shortages, can cause conflict or escalate to disputes over water resources. Competition over water can occur between different sectors (e.g., agriculture and municipalities/cities), between jurisdictions (e.g., transboundary watersheds or aquifers), and because of allocation decisions between urban and environmental needs (Shamir, 2003). In these circumstances, particularly when the demand for water increases and/or when water becomes scarce, water allocation rules and procedures become more important in the

¹⁴ RFB 6792 3.2.1 g



prevention of conflict (Roa-García, 2014). Where conflict is not prevented, water scarcity often creates the need for different types of dispute resolution mechanisms. Mechanisms to resolve water disputes include adjudication wherein a decision regarding how the water will be allocated is made by government, designated authority, court, or a state-assigned institution which judges water disputes (Shamir, 2003). Though often done on an as-needed basis, consultations can be used as a dispute resolution procedure, or if done anticipatorily, as a mechanism of conflict prevention before water decisions are made (Cosgrove, 2003). Negotiation as dispute resolution can also be used in the water context. Negotiation processes, in which parties dispute or discuss possible outcomes directly with each other, may engage in interest-based negotiation, rights-based negotiation, or power-based negotiation, depending on the context (Shamir, 2003). Depending on social, political, economic, climatic and hydrological circumstances, other dispute resolution mechanisms such as mediation, arbitration, and decentralization are also used in the context of water conflict.

When conflicts occur, dispute resolution mechanisms must be appropriate to not only the context, but also the sector of water use and jurisdictional boundary. For example, irrigated agricultural production is a significant contributor to water user conflicts in Canada and abroad. Irrigation production activities tend to be concentrated within adjoining areas, water demands tend to be “intensive, cumulative and overlapping; and these demands typically coincide with periods of lowest water availability” (J. Kinkead Consulting, 2006). In contrast, municipal/urban water demands tend to be driven by urban expansion and population growth, as well as the water demands of industrial and commercial activities associated with this expansion/growth (J. Kinkead Consulting, 2006). Given the differing derivatives of water demand and scale of users, the dispute resolution mechanisms appropriate for this sector, or between these or another sector may vary even within one jurisdiction. Further, jurisdictional boundaries are fundamental to what dispute mechanisms are used to resolve water related conflicts. For example, court adjudication may be most appropriate for in-state/province disputes, Indigenous-led mediation may be most suitable for on-reserve/reservation water disputes, and public consultation may be used primarily in a municipal context. Given the state/province/regional focus of this jurisdictional review, the dispute/conflict resolution processes and mechanisms that emerged from the review of the jurisdictions in this review tended to be those suited to each context and to state-scale mechanisms/processes. The main conflict resolution mechanisms that are in use within the reviewed jurisdictions include litigation or appeal hearings (England, Wisconsin, Pennsylvania, Ohio, New Brunswick, Yukon, Minnesota, Michigan, New Zealand), arbitration (California, Manitoba) and mediation (Indiana,



Michigan (informal meetings), Florida) processes through criminal courts or specific tribunal or review bodies (e.g., Ontario, Montana, New Zealand). In some jurisdictions multiple tools are available. Other mechanisms among the jurisdictions include the option of appointing a water bailiff to manage water use conflicts in BC and the use of Groundwater Management Areas in Minnesota to collaboratively negotiate through area-based conflict. Sections 3.7.1 and 3.7.2 discuss the mechanisms/processes that have been legislated and/or implemented for the Phase One and Two jurisdictions respectively.

3.7.1 Phase One Jurisdictions – Conflict/Dispute Resolution

3.7.1.1 Canada

In **British Columbia**, under S. 38 in the Water Sustainability Act (WSA), the Comptroller of Water Rights, or water manager, can appoint a water bailiff to act on behalf of the province to manage conflicts in a stream before or during a drought. These people are given the authority to enter on any land and to regulate and control the diversion and use of water by all users (authorization holders as well as users that are not authorization holders) and control all diversion works on streams or aquifers. In **Manitoba**, the Water Rights Act 14(4) outlines arbitration when a license is canceled or when rights are restricted. In **New Brunswick**, conflict resolution in the Clean Water Act includes: S.39 “A person whose registration, licence, permit or approval has been suspended or cancelled or whose application for a registration, licence, permit or approval or for the transfer, renewal or reinstatement of a registration, licence, permit or approval has been refused may appeal the suspension, cancellation or refusal in accordance with the regulations.” In **Ontario**, the Environmental Review Tribunal is an independent and impartial tribunal established by provincial legislation that “holds public hearings on appeals arising from, decisions regarding the issuance, alteration, revocation, cancellation or closure of an order, approval, licence, permit, registration or account under the Clean Water Act, 2006, the Climate Change Mitigation and Low-carbon Economy Act, 2016, the Environmental Protection Act, the Nutrient Management Act, 2002, the Ontario Water Resources Act, the Pesticides Act, the Resource Recovery and Circular Economy Act, 2016, the Safe Drinking Water Act, 2002, the Toxics Reduction Act, 2009, and the Waste Diversion Transition Act, 2016” (Government of Ontario, 2018). Additionally, the PTTW program is designed to minimize problems associated with interference with water supply and quality, and to provide for the settlement of interference if they do occur (Ministry of the Environment, 2005). Standard conditions in PTTWs (Ministry of the Environment, Conservation and Parks, pers. comm.) include a requirement for the permit holder to notify the local District Office of



any complaint arising from the taking, at which point the local District Office and, if needed, the Technical Support Section, investigate the conflict. Standard permit conditions also require holders to restore water supply where the taking of groundwater is observed to cause negative impact to other water supplies obtained from any adequate sources prior to the initial issuance of the permit for the taking in question. For surface water takings, the taking must be carried out in a manner that streamflow is not stopped and is not reduced to a rate that will cause interference with downstream uses of water or with the natural functions of the stream. In **PEI**, information on conflict mechanisms were not readily available. However, section 8 of the PEI Water Act ("Water Act," 2017) "authorizes the Minister to direct that an approval not be issued for a water withdrawal for commercial, industrial or recreational purposes if it would interfere with the availability of water for domestic purposes or for [environmental] water flow needs of a watercourse." **Quebec's** Water Policy (Ministère de l'Environnement du Québec, 2002) states: "...the government intends to create the necessary instruments so that they may give precedence, in the event of conflict, to the fundamental right of individuals to access this resource for their basic needs." The **Yukon** Act ("Waters Act," 2003) specifies the following related to dispute resolution: s.26 "Appeal to the Supreme Court 26(1) An appeal lies from a decision or order of the Board to the Supreme Court on a question of law or a question of jurisdiction, on leave being obtained from that Court on application made within forty-five days after the making of that decision or order or within such further time as that Court, or a judge of it, under special circumstances allows. (2) No appeal lies after leave has been obtained under subsection (1) unless the notice of appeal is filed in the Supreme Court within sixty days after the making of the order granting leave to appeal."

3.7.1.2 US – Great Lake States

In **Illinois**, conflict resolution is guided by reasonable use doctrine in the Water Use Act. State laws permit reasonable use of water resources, but the courts often determine what is reasonable and resolve conflicts (Illinois Department of Natural Resources, 2003). In **Indiana**, Rule 312 IAC 6.3-4-1, ("Water Withdrawal Contracts from State Reservoirs," 2008) Sec. 8 on mediation of disputes state that "Whenever a dispute arises between the users of surface water in a watershed area, any party to the dispute may request that the commission mediate the dispute using the mediation provisions under IC 4-21.5-3.5." Further, IC 14-25-3-10 withdrawal permits; judicial review (Groundwater) states that "Sec. 10. A refusal to grant a permit is subject to court review under IC 4-21.5-5." In **Ohio**, litigation is the primary mechanism to resolve disputes over water use (Kroncelik, 2016). The Revised Code 1521 ("Conservation of Natural Resources," 2006) requires the Chief of the Division of Water to hold



meetings or public hearings, whichever is considered appropriate by the Chief, to assist in the resolution of conflicts between groundwater users. The meetings or hearings must be called upon written request from boards of health of city or general health districts or certain other authorities having the duties of a board of health, boards of county commissioners, boards of township trustees, legislative authorities of municipal corporations, or boards of directors of conservancy district. In **Pennsylvania**, litigation acts as a conflict resolution system according to the Citizens Advisory Council to the Department of Environmental Protection (Citizens Advisory Council, 2000); however, no resolution for competing uses was noted. In **Wisconsin**, hearings before a court with jurisdictional review and civil action are outlined. Equitable relief and civil penalties are possible remedies. For **New York**, no information on conflict/dispute regarding water allocation was readily available.

3.7.1.3 US – Non-Great Lake States

The **California** State Water Board plays a central role in water allocation dispute. “California’s judicial system also plays an important role in water governance, with the courts serving as arbiters of disputes over particular water management and use issues that often affect or reflect broader policies. State courts, rather than the legislature, established the initial contours of California’s hybrid system of water rights, and courts continue to define and redefine those contours (such as the meaning of ‘reasonable use’)” (Hanak et al., 2011). Finally, the California Water Commission plays a role in water conflict. The Commission “consists of nine members appointed by the Governor and confirmed by the State Senate. Seven members are chosen for their general expertise related to the control, storage, and beneficial use of water and two are chosen for their knowledge of the environment. In **North Carolina**, where water supplies are perceived to be sufficient to meet in-stream and consumptive needs, there are no restrictions on water use. However, the North Carolina Environmental Management Commission may designate “capacity use areas” where water use requires coordination and limited regulation to protect the rights of residents, property owners or the public interest. For these and other water conflicts, the courts often determine what is reasonable and resolve conflicts.

3.7.1.4 International

In **South Australia**, the Environment, Resources and Development (ERD) Court has jurisdiction over a wide range of legislation including the Natural Resources Management Act ("Natural Resources Management Act," 2004). The ERD is a specialist court which deals with disputes, and the enforcement of laws relating to land development and management, “the natural and built environment and natural resources” (Courts Administration Authority of South Australia,



2018). In **England/Wales**, conflict resolution mechanisms exist for monitored withdrawals including agriculture, domestic, industrial, energy production, environment and national security. "Enforcement action (specifically the imposition of a sanction) can normally be appealed either through the criminal court process or as a result of specific appeal provisions. [Enforcement] notices set out the rights of appeal which apply in the specific circumstances of each sanction or provision" (OECD, 2015).

3.7.2 Phase Two Jurisdictions – Conflict/Dispute Resolution

3.7.2.1 Minnesota

Minnesota has an established process to investigate water use conflicts such as well interference claims. Minnesota Rules 6115.0740: defines conflict as follows:

...whenever the total withdrawals and uses of ground or surface waters would exceed the available supply based on established resource protection limits, including protection elevations and protected flows for surface water and safe yields for groundwater, resulting in a conflict among proposed users and existing legal user (Subp2.).

Mechanisms to deal with such conflicts include the modification of appropriation of the proposed and existing user by the Minnesota DNR, acting as a state agency. If this is not possible, on the basis of existing priorities of use that (a) if users are of the same priority class than a plan is developed to provide for proportionate distribution or (b) if the unresolved conflict involves users from a different priority class than the highest priority are satisfied first. For the first case, where users are of the same priority class, the DNR would modify the water appropriation permits and would also develop the plan for allocation among users and implement the plan. In practice, this is already occurring in the form of Groundwater Management Areas planning to address water use conflicts. The Minnesota DNR has designated three Groundwater Management Areas and has employed collaborative efforts to address water use conflicts. However, this is not the only process. In another area of the state, Little Rock Creek, the DNR is working with permit holders and developing a groundwater model to help understand water availability and whether permits need to be modified to avoid water use conflicts. If conflicts occur between users in the same priority class (i.e., agricultural irrigation), the permitted users within the same priority class will have an opportunity to develop a plan to provide for the proportionate distribution of the limited water available among all users. If the Commissioner approves the plan, new permits can be issued and existing permits would be



amended according to the plan. If the proposed plan is not practical or reasonable, the Commissioner can develop a new plan or modify the proposed plan to provide proportionate share of water among the users involved.

In the second case, where users are of different priority classes, Minnesota Rule 6115.0740 Subp. 2.D(2) outlines a slightly modified strategy for conflicts with users from multiple priority classes. Highest priority users (domestic water supply) are satisfied first and then remaining water is allocated to subsequent priority class users.

Additionally, specific to well interference, Minnesota Rules 6115.0730 outlines procedures dealing with problems involving appropriation. Procedures are described in this rule if the Commissioner determines that there is a probable interference from a lower priority user with public water supply well(s) or private domestic well(s) which may result in reducing the water levels beyond the reach of those wells. Approximately a dozen cases a year are handled following these guidelines (Ekman, 2018).

Decisions by the DNR can also be legally challenged: the applicant, the mayor of the municipality, the watershed district or the soil and water conservation district can demand a hearing. (Minn. Rule, 6115.0250, subp. 3). This practice has been utilized numerous times in the recent past. An appeal process is also outlined for orders issued by the South Dakota-Minnesota Boundary Waters Commission utilizing district or circuit court as a dispute mechanism - 103B.451 (Subd. 5).

3.7.2.2 Michigan

Natural Resources and Environmental Protection Act (NREPA) Part 317 specifically outlines aquifer protection and dispute resolution. In MCL 324.31702 procedures are outlined for the process of submitting a complaint for a groundwater dispute. Actions such as informal meetings between parties and the duties of the director of the Michigan Department of Agriculture and Rural Development (MDARD) in the dispute are outlined. MDARD has jurisdiction over complaints involving agricultural high capacity wells. MDEQ has jurisdiction over other industrial high capacity wells (except for dewatering wells, which are exempt). Appeal processes and compensation requirements and conditions are specified. To date, several complaints involving agricultural high capacity wells and industrial high capacity wells have been resolved by settlements between the high capacity and small well owners (Milne, 2018). The Directors of MDARD and DEQ have the authority to declare a groundwater dispute if the



high capacity well owner and the impacted small capacity well owner(s) are unable to settle the dispute. The Directors can order the high capacity wells to cease or reduce their pumping; however, have not yet had to declare a groundwater dispute or issue such an order (Milne, 2018).

Part 327 provides for water user groups of all the water users and local governments in a depleted Water Management Area (WMA) to manage the water uses in the WMA. If needed, local water users would have the opportunity to form a water user committee for the purposes of shared planning and management of water resources. The intent is for the committee to come up with remedies based on reasonable use and equitable apportionment principles that would otherwise take place in civil litigation, but outside of a formal legal proceeding. If a water user committee has not already been formed in watersheds where an adverse resource impact occurred, MDEQ may convene a meeting of all the water users, along with local units of government. MDEQ gives the users 30 days to come up with their own plan to avoid an adverse resource impact. If they do not, MDEQ can propose a plan but the water users are not required to follow it. While such a water user group has yet to form in Michigan (Milne, 2018), if it did, local users would “manage” uses in their WMA by making voluntary adjustments to existing large quantity withdrawals to free up additional stream flow to authorize new withdrawals. This approach represents an alternative to civil litigation, which remains available to affected property owners who want to protect their property and water rights. Recommendations could be made by local water users about permitting adjustments and then MDEQ would have to revise existing large quantity withdrawal registrations and/or permits (Milne, 2018).

3.7.2.3 Florida

Conflict resolution protocol for competing water use applications are found in Chapter 373.233 of the Florida Statutes. Conflict resolution regarding water use applications is addressed in Chapter 120 of the Florida Statutes. Legal challenges for pending water use applications are infrequent; however, follow Chapter 120 protocol. Mechanisms mentioned include litigation, unanimous vote, mediation, and hearings. Specifically, for the SJRWMD, all of these mechanisms have been used to resolve issues related to permitting and proposed rules; however, no competing applications have been mediated by the District to date (Laidlaw, 2018).



3.7.2.4 Montana

Montana's approach to water dispute resolution reflects a legal/negotiation approach to anticipating and approaching water conflict. In 1979, the Montana Legislature created the Montana Water Court for the purpose of expediting and facilitating the adjudication of over 219,000 law-based water rights in the State (primarily those with a pre-1973 priority date). The Water Court also adjudicates Indigenous and Federal reserved water rights claims, and asserts "exclusive jurisdiction over the adjudication of water rights claims" (Montana Judicial Branch, 2018). The Montana Water Court is assisted on the adjudication of pre-1973 claims by the Water Adjudication Bureau which:

...examines all claims pursuant to Supreme Court rules and provides a summary report to the Water Court on each of the basins (85) in the state. Pursuant to legislation passed in 2005, the Bureau completed the examination of the remaining 57,000 claims (as of 2005) by June 30, 2015 and must provide summary reports to the Water Court for the remaining 30 basins by June 30, 2020. As of July 1, 2015, the Bureau is responsible for the re-examination of 90,000 claims in 44 basins. These were previously decreed under the verification process and not the claim examination rules. In accordance with SB57, which sets certain benchmarks for the Bureau, all re-examination of these basins are to be completed by June, 30, 2023. The Bureau is required to report progress quarterly to the Water Policy Interim Committee (WPIC). The Bureau also provides post decree assistance to the Water Court as requested and to District Courts as Water Court decrees are placed under enforcement (upon petition to the District Court) (Montana Department of Natural Resources & Conservation, 2018d).

However, new water appropriations (post-1973 water rights¹⁵) fall under the jurisdiction of District Court. A citizen may initiate a complaint with DNRC, but unless a user voluntarily complies with water use adjustment requested by DNRC, the final arena for resolution is District Court.

¹⁵Respondents for Montana suggested the Water Rights in Montana booklet (Montana Department of Natural Resources & Conservation *et al.*, 2014) as a helpful resource on a variety of water right related topics.



3.7.2.5 New Zealand (Waikato Region)

In New Zealand, the *Resource Management Act 1991* (RMA) ("Resource Management Act," 1991) designates the roles and responsibilities of the country's Environment Court, which is a specialist court with the same powers as the District Court (New Zealand Ministry for the Environment, 2015). The Environmental Court has the power to (New Zealand Ministry for the Environment, 2015, p. 4):

- *“direct councils to make changes to their policy statements or plans*
- *direct councils to review resource consents that have been granted*
- *confirm, amend or cancel decisions on applications for resource consents and designations*
- *stay or confirm abatement notices*
- *make or decline to make declarations, and make or refuse to make enforcement orders*
- *award costs in favour of one or other of the parties involved*
- *direct appellants to provide a deposit to pay for legal costs in case they lose the appeal”*

Although these powers relate broadly to all-natural resources, they apply to dispute resolution for water. The primary functions of the Environmental Court are (1) to hear appeals (e.g., recommendations for water conservation orders), (2) hearing and deciding significant water applications, and (3) enforcement (e.g., confirming/amending/canceling decisions related to water applications or other resource consents and designations). In some cases, the Environmental Court may conduct an inquiry into the “report of a special tribunal on a water conservation order” and the Court then makes recommendations to the Minister for the Environment as to whether the report should be accepted or rejected (New Zealand Ministry for the Environment, 2015). The Environmental Court's closest registry to the Waikato Region is in Auckland. In addition to those water shortage measures required under the Regional Plan, section 329 RMA provides for formal Water Shortage Directions to be applied (see Waikato Regional Plan Policies 17 & 18 and Standard 3.3.4.27).

Notably, and in terms of conflict around implementation, one of the biggest challenges for the Waikato Regional Council has been in implementing change to water take rules. There have been many long-standing water take consent holders who, in applying to ‘renew’ their consents have been daunted/unwilling to accept, the more ‘rigorous’ conditions and terms required under the plan. This is an on-going challenge due to the variability in term (15-35 years) and



expiry date of consents issued before the Plan became operative (effectively 2006) (Davenport, 2018).

3.8 COLLABORATIVE APPROACHES¹⁶

There is a global trend toward inclusive decision making for environmental challenges including decision making for water (von der Porten & de Loë, 2013). This trend is demonstrated by the global growth of multi-actor, collaborative processes for environmental governance (Holley *et al.*, 2012). Governance of natural resources, including addressing their challenges and opportunities, can include a range of actors such as industry groups, Indigenous governments, citizens, municipalities, non-government organizations, and interest groups (de Loë & Patterson, 2017; Scott & Thomas, 2017). In fact, in some policy contexts, governance has become contingent on the collaboration between state and non-state actors (Compagnon *et al.*, 2012; Peters & Pierre, 2000). One of the many reasons driving this shift in governance is the need for more adaptive and robust systems of environmental management (Pahl-Wostl, 2009). In the realm of water governance specifically, collaboration to build these systems of management is occurring in a wide range of settings including watershed councils, regulatory negotiation, and water management (Ansell & Gash, 2007; Booher & Innes, 2010). Collaborative water governance is a prevalent way in which multiple competing uses for water can be understood, and social, cultural, economic, political, and ecological impacts of water use can be factored into decisions.

However, multi-actor approaches to the governance of water are not without their challenges. One of those challenges is the selection of what approach to use: many forms of multi-actor governance can be applied to water management including collaborative governance, collaborative planning, inter-organizational collaboration, collaborative public management, network governance, co-management, and adaptive co-management. Depending on the water policy context, some of these models may be more appropriate than others. Another challenge may be the relative complexity of collaborative water governance. Although state governments are increasingly sharing responsibility and authority with a wide range of actors and organizations (Compagnon *et al.*, 2012), maintaining engagement and fairness among actors, particularly in the realm of water allocation, in multi-actor approaches are potentially more complex than top-down, state-centric approaches. However, despite these and other

¹⁶ RFB 6792 3.2.1 h



challenges, many jurisdictions, to varying degrees, are engaging with multiple actors in their water allocation decision making.

Indigenous roles in water allocation are becoming increasingly prominent within jurisdictions worldwide (von der Porten & de Loë, 2014). This prominence has emerged in part because of broader international- and national-level recognition of Indigenous rights (e.g., United Nations General Assembly, 2007), as well as the advancement of Indigenous self-determination in the specific context of collaborative environmental governance (Ohlson *et al.*, 2008). While some inclusion of Indigenous peoples in state-led water allocation decision-making is driven by formal or legal requirements (e.g., Section 35 Canada Constitution Act 1982; *Winters v. United States* 207 U.S. 564), other motivations include the desire or need to meaningfully include Indigenous peoples and Indigenous knowledge systems into water allocation planning. The following sections outline formalized collaborative approaches to water allocation decision-making, as well as transparency, equity, and the roles of Indigenous peoples and Indigenous knowledge systems. Section 3.8.1 summarizes these aspects of the 16 Phase One jurisdictions as well as Ontario. Section 3.8.2 then explores these aspects in detail for the five Phase Two jurisdictions.

Among the reviewed jurisdictions, the involvement of the public or water users in water allocation decision-making ranges from no requirement for external involvement to codified shared decision-making. Most commonly legislated across the majority of reviewed jurisdictions as a means of public participation in water use permitting or licencing is the use of public hearings or opportunities for commenting or consulting in the review of an application. Exceptions include California and Waikato Region of New Zealand where public hearings and consultation were not legislatively noted. In Minnesota, Michigan, North Carolina, Illinois, and England public hearings and consultation were legislated, but only for certain types of permitting or in certain basins. Specific to collaboration engagement of stakeholders or water users, Florida, New Zealand, Michigan, Minnesota, South Australia, British Columbia, and Illinois all have forms of collaborative engagement in statute. The use of collaboration in practice in these jurisdictions is advisory in nature for water use planning or management purposes. The only exception is New Zealand, where water user groups are used to voluntarily form agreements to schedule and manage allocations communally.



3.8.1 Collaborative Approaches - Phase One Jurisdictions

3.8.1.1 Canada

In **British Columbia**, there is currently no formal role for stakeholders in water allocation decisions. A decision maker can accept comment about an application, but in the end, the decision maker must not be fettered. See sections 12, 13, 14 of the Water Sustainability Act (WSA). Section 115 of the act allows the minister to establish advisory boards to advise on matters under the WSA, which could include water allocation. Section 126 of the WSA provides for the conferring of decisions of the Comptroller, Water Manager, Officer or Engineer on another person/entity – this could be an allocation decision. Water Objectives could also be developed with stakeholders and a decision maker is required to consider these in a decision. These are currently being developed and are part of the Cumulative Effects Framework. Under Section 66 of the WSA, the minister may mandate that a water sustainability plan be developed for a particular area; the task of preparing the plan may be assigned to the government or another person; in the latter case, the responsible person may in turn be required to establish one or more technical advisory committees in relation to the development of the plan. In **Manitoba**, there are public hearings for licensing processes: Water Rights Act s.6 states that “(4) Upon expiry of the 15 days provided in subsection (3) in respect of any application, and before the minister determines whether or not to grant the application, a public hearing shall be held before the Municipal Board at which any person may make representations, either himself or through counsel, for or against the application.” Public and non-government consultation is a key component in the development of a Water Strategy. In **New Brunswick**, Regulation 90-80 (1990) s.16 states that “(1) At any time after an application has been submitted under this Regulation, the Minister may require the person submitting the application or the person on whose behalf the application is submitted to do any of or any combination of the following: (a) publish notice of the application in The Royal Gazette and in such newspaper as the Minister may require, including in the notice such details of the application as the Minister may require; (b) serve a copy of the notice of application upon such persons as the Minister may require; (c) attend at any public meeting arranged by the Minister; or (d) make submissions with respect to the application. 16(2) If publication or service of a notice of application is required under subsection (1), any person may file with the Minister a written objection to the issuance of the permit sought at any time within thirty days after the publication or service.” In **Ontario**, when an application for a PTTW requires posting in accordance with the Environmental Bill of Rights (EBR) Act and supporting regulations, a Proposal Notice is posted for a minimum of 30 days on the Environmental Registry to allow



public commenting. Some Permit to Take Water applications are not required to be posted to the Environmental Registry because of regulatory exemptions and/or exceptions. The Water Taking and Transfer Regulation requires the Director to notify municipalities and Conservation Authorities of a proposed water taking in their jurisdiction. The Director may also require proponents to notify and consult with others, as necessary. Proposals to renew existing permitted takings for bottled water have additional proponent-led consultation requirements to be completed prior to submitting a PTTW application (Ministry of the Environment and Climate Change, 2017): the preparation, and submission to the MECP for review and comment, a consultation plan outlining the applicant's proposed consultation activities; consultation with municipalities, agencies, indigenous communities/organizations and other interested parties; written notification about the proposed water bottling activity must be provided to the consulted parties; and the submission of a record of consultation with the PTTW application. Bottled water renewal applications under consideration by the Director will be posted on the Environmental Registry for a minimum 90-day public commenting period, rather than the standard minimum 30-day period for other PTTW applications. If a PTTW for water bottling is issued, the permit holder must also develop and maintain a publicly-available website that includes (among other items) a copy of the permit, all technical reports submitted in support of the application, and data on daily water takings. In addition, the MECP has a legal duty to consult, and potentially accommodate, Indigenous communities where a proposed water taking of any kind may negatively impact on existing or asserted Indigenous or Treaty rights. While it is ultimately the ministry's responsibility to fulfill the Crown's consultation requirements, procedural aspects of the Duty to Consult may be delegated to proponents (e.g. providing notification and information to Indigenous communities and organizations about the proposal). On **Prince Edward Island**, the "governance approach to developing plans is bottom-up, with participation and collaboration with stakeholders at the local order of government to develop *[integrated watershed management]* plans" (Canadian Council of Ministers of the Environment, 2016a). PEI Water Act 2017 ("Water Act," 2017) Article 35(2)(i) specified that, in Municipal Water Supply Areas, any water supply plan shall specify requirements for "consultation with stakeholders, residents of the area to which the plan may apply and other persons who may potentially be affected by the provisions of the plan, with respect to the development of the plan". In **Quebec**, under the Environment Quality Act ("Environment Quality Act, R.S.Q. 2005, c.Q-2. (Consolidated 2007)," 2005), some major projects affecting watercourses (e.g., dredging or digging of lakes and watercourses and some of dams) may be subject to an environmental assessment and review procedure; The Quebec Water Policy (Ministère de l'Environnement du Québec, 2002) c.3 states "The first orientation of the Québec Water Policy stipulates that water



governance must be reformed...Interventions on the part of water-management stakeholders in Québec will have to incorporate social, economic, environmental and health concerns.” In **Yukon**, anyone, including stakeholders, can intervene on the Yukon Water Board on any application before it, to provide evidence regarding potential effects from the proposed use. The Board must consider all evidence provided, and provide reasons for decision that explain how they considered the interventions (Salvin, 2018). Yukon Environmental and Socio-economic Assessment Act (“Yukon Environmental and Socio-Economic Assessment Act,” 2003): “Water licences 86 A body established by territorial law and having jurisdiction in relation to rights in respect of waters may not, under territorial law, (a) grant or renew rights in respect of waters contrary to a decision document issued by a federal agency or a decision document that is to be implemented by a territorial agency, municipal government or first nation under subsection 83(2) or 84(2) or (3); or (b) set terms of such rights that conflict with such a decision document, to the extent that the decision document is required to be implemented by a federal agency or a territorial agency, municipal government or first nation.”

3.8.1.2 US – Great Lake States

The **Illinois** Lake Michigan Water Allocation Program (Illinois Department of Natural Resources, 2017) manages Illinois’ diversion of water from Lake Michigan in response to a 1967 Supreme Court Decree (amended 1980). The allocation process of this program explicitly involves and active public participation process. Further, the Regional Water Supply Planning Program under Executive Order 2006-01 administers and provides technical assistance to the regional committee to identify local supply and demand to determine water supply shortfall and conflicts. The regional committee is formed from the various water supply sector stakeholders to develop a plan to address these conflicts and shortfalls. In **Indiana**, Chapter 2 of the Maumee River Basin Commission (2015) states that “C 14-34 1-3(9) Assure that appropriate procedures are provided for the public participation in the development, revision, and enforcement of regulations, standards, reclamation plans, or programs established by the state.” In **New York**, the Water Resource Planning Council may involve public stakeholders under Environmental Conservation Law ENV § 15-2909 “Upon receipt of the statewide water Resource Management strategy from the department of environmental conservation, the council shall promptly publish once a week for three consecutive weeks in newspapers of general circulation notice of public hearings thereon. Public hearings shall be conducted in each of the substate areas represented in the statewide strategy and shall be in accordance with regulations adopted by the department...” In **Ohio**, determinations for application approval and in ORC 1501.32 permit for diverting more than 100,000 gallons (378,541.18 litres) of water a day from Ohio River watershed, the director may hold public hearings upon any application for a permit. In ORC



1522 (Great Lakes Compact) Articles 6 outlines public participation requirements as a necessity for promoting the management of the water resources of the basin. In **Pennsylvania**, and outside of basin commissions, there is a 30-day comment period from the date of publication in the Pennsylvania Bulletin, and during the review process, the application is forwarded to many other review agencies for their approval, such as relevant a regional Bureau of Water Supply and Community Health, a Bureau of Water Quality Management, or a River Basin Commission. Further, Act 14, P.L. 834, enacted February 17, 1984, requires that each applicant give written notice to the municipality(ies) and the county(ies) in which the permitted activity is located. The written notice shall be received by the municipality(ies) and the county(ies) at least 30 days prior to the issue or denial of the permit by the DEP. In **Wisconsin**, there are lengthy statutes for applications concerning water resources inventory, registration and reporting, public participation, and public notice. (See Appendix A for the statute language and references).

3.8.1.3 US – Non-Great Lake States

In **North Carolina**, “For most water uses, water users must register with the state. There is no formal public notification process for a registration although information on registrations is available on the department’s website” (AMEC, 2008). However, North Carolina statute 143-214.24 on the Riparian Buffer Protection Program: Coordination with River Basin Associations states “(a) Prior to drafting temporary or permanent rules that require the preservation of riparian buffers in a river basin, the Department shall consult with major stakeholders who may have an interest in the proposed rules, including the board of directors or representatives designated by the board of directors of any river basin association in the affected river basin that meets all of the following criteria: [Please see statute for the full list of stakeholder specifications]”. In **California**, information on collaborative approaches was not readily available.

3.8.1.4 International

In **England**, in times of severe drought, environmental agencies will work extensively with abstractor and stakeholders. National Drought Group (NDG) is an external stakeholder group that is activated at the prolonged dry weather or drought stage (Environment Agency Government of the United Kingdom, 2017). In **Wales**, the Drought Plan gives extensive detail on stakeholder engagement (Dŵr Cymru Welsh Water, 2015). In **South Australia**, Water Allocation Plans, which outline the allocation of water by region within the state, and that are required in accordance with the Natural Resource Management Act (“Natural Resources Management Act,” 2004) s.76 are developed with the community, industry and key stakeholders for each



water resource identified as being significant, or 'prescribed', under the Natural Resource Management Act 2004 (Department of Environment, 2018).

Note: For information on Indigenous collaboration for each of these jurisdictions, see the detailed information outlined in Section 6.11.

3.8.2 Collaborative Approaches – Phase Two Jurisdictions

3.8.2.1 Minnesota

At the state level in Minnesota, permit applications are typically sent to the municipality, county, watershed district and soil and water conservation district for comment. However, individual members of the public are not specifically contacted for comment on most permit applications but they can work through their local government if they have concerns. Some major/unique applications have been posted for public review. Public hearings are also a requirement in areas overseen by the South Dakota-Minnesota Boundary Waters Commission (103B.451 (2) for issues pertaining to boundary waters.

Equity and transparency protocol are also noted in stakeholder engagement efforts. For example, transparency is apparent in Statute 103G.251 Subd. 2. Investigating Activities Affecting Waters of the State:

(b) A copy of the findings and order must be served on the person to whom the order is issued.

(c) If the commissioner issues the findings and order without a hearing, the person to whom the order is issued may file a demand for a hearing with the commissioner.

Likewise, equity efforts are noted in Statute 103G.282 concerning monitoring to evaluate impacts from appropriations: "The cost of drilling additional monitoring wells must be shared proportionally by all permit holders that are directly affecting a particular water resources feature (subd.1)" Monitoring costs for water resources that supply more than one appropriator may be distributed among all users within a monitoring area determined by the commissioner and assessed based on volumes of water appropriated and proximity to resources of concern (subd.3.b)." Minnesota rules and statutes apply to everyone. Water use data is published and available online following Minnesota Statute, Chapter 13.03 Access to Government Data: "All



government data collected, created, received, maintained or disseminated by a government entity shall be public...”

Collaborative efforts are also utilized in Minnesota. Notably, in times of deficiency (defined by the DNR as a serious hydrologic imbalance during times of drought (Minnesota Department of Natural Resources, 2018a)), actions outlined in 103G.291 Public Water Supply Plans: Appropriation during deficiency include the required use of collaborative process to achieve demand reduction measures as a part of the water supply plan review process (Subd 3.c).

Additionally, Community Aquifer Management Partnerships (CAMP) are occurring in areas of southern Minnesota as locally driven efforts that make local governments, planners and water users aware of DNR aquifer management and to help plan for current and future groundwater management needs. This effort is built on the objective of helping small communities learn about current permittees using the same aquifer and current stress limitations on their aquifer. An assumption is made that these communities need more information about the limits of their aquifer and state-level aquifer management to be able to provide input or change zoning or local permit decisions. In turn, the DNR is also actively collecting scientific information about aquifers around the state by reviewing local aquifer tests, investigating well interferences, and producing geologic atlases in an effort to improve understanding of future demands. These processes are still fairly new (all areas are still in their first five-year effort). The collaborative nature of this management process has helped allow the DNR to consider and develop allocation plans for all groundwater users without focusing in on one certain sector or user alone (Ekman, 2018).

Finally, in terms of tribal involvement in water allocation, there is inclusion of tribal governments on advisory committees for the South Dakota-Minnesota Boundary Waters Commission (103B.451) and through the Great Lakes – St-Lawrence River Basin Compact. However, permits cannot be required of tribal members conducting projects on tribal land and Minnesota has adopted the correlative rights doctrine which awards equitable rights in groundwater to all overlying landowners (including for Native tribes) TARLOCK, *supra* note 35, § 4:15.



3.8.2.2 Michigan

Authorizations by the WWAT and SSRs are not subject to public notice. However, Act 451 Part 327 "Great Lakes Preservation" permit applications are subject to public notice as a result of the Natural Resource and Environmental Protection Act (NREPA) 2008 update (MCL § 324.32723(4)) that ensures adequate public participation by providing public notification of any water withdrawal application and a public comment period of at least 45 days. Moreover, under Section 17(5) of the Safe Drinking Water Act (Section 325.1017) bottled water producers specifically must also consult with interested community members before withdrawal approval can be made.

Transparency and equity protocol are not explicitly notated in legislation relating to water withdrawal. However, indirect measures pertaining to transparency are noted in NREPA (Act 451 of 1994) 324.32710 in terms of stakeholder engagement for the sake of openness. For example, transparency is evident in Section 1(f) which states that the duties of the department include the development of (f) "procedures for notifying water users and potential water users of the requirements" pertaining to the effects of Great Lakes water withdrawals and consumptive uses. Likewise, in Section 3, equity is transparent in requirements such as "meetings of water resources assessment and education committees shall be open to the general public." Such meetings may concern matters related to long-term water resource planning, use of conservation measures, drought management activities, and other water use topics. Similarly, In Zone B cold-transitional WMAs and all Zone C WMAs registered water users, local units of government, local health departments, and other interested parties, are notified of the change in status of the WMA and are encouraged to form water user committees (Milne, 2018).

Collaborative efforts are also common in the Michigan context in the form of advisory councils. For example, the Southwest Michigan Water Resources Council, an external stakeholder group, met between 2011 and 2014 (Southwest Michigan Water Resources Council, 2014). Likewise, the Water Use Advisory Council (WUAC) is a statewide external stakeholder group that began meeting in 2012 and is still meeting (Water Use Advisory Council, 2014). The WUAC's members include agricultural irrigators, golf courses, utilities, industry, local governments, state and federal agencies, environmental groups, tribes, conservation groups, the aggregate industry, university researchers, among others. Local units of government can also form ad hoc subcommittees of local residents to advise the Water Users Committees; the latter are committees which may be formed by water use registrants, permit holders and local



governments, for the purposes of evaluating the status of current water resources, water use and trends in water use within the watershed, and assisting in long-term water resources planning (Water Use Advisory Council, 2014b). On the WUAC, Tribal organizations from the 12 federally recognized Native American Tribes in Michigan are represented. Tribal consultation meetings are also held for high profile permit reviews or any other decisions at the Tribes' request (Milne, 2018).

As far as these collaborative efforts relate to state water withdrawal permitting, the WUAC in particular provides a stakeholder forum to vet proposed modifications to Michigan's regulatory program, including policy and technical aspects (Milne, 2018). The WUAC has made a number of recommendations to improve the Water Use Program, including recommendations to collect additional geologic, groundwater, and stream flow data to aid in making better informed and more accurate assessments related to registering and permitting new withdrawals. The WUAC also continues to provide input to the MDEQ on various aspects of the Water Use Program as well as addressing other relevant topics (e.g., proposed amendments to Part 327 "Great Lakes Preservation" in Michigan's legislature).

Examples of other collaborative efforts that influence water withdrawal permitting include: MDEQ & USGS co-funding Michigan's stream gage network and collecting miscellaneous stream flow measurements in other locations; MDEQ & USGS co-funding a USGS study in the west central Lower Peninsula to identify groundwater discharge zones, measure stream flow, and develop a numeric groundwater model of the response of stream flow to pumping high capacity wells; Michigan's Quality of Life Agencies (MDEQ, MI Dept. of Natural Resources, and MI Dept. of Agriculture & Rural Development) co-funding a study with the Southwest Michigan Farmers for Responsible Water Use to collect geology, groundwater, and stream flow data in Cass County (one of the most heavily irrigated counties in Southwest Michigan), compare several different data collection methods, and create numerical models of five watersheds in Cass County; and the Michigan Geological Survey receiving state and federal funding to map Michigan's glacial geology in 3 dimensions (at the quadrangle scale).

Finally, concerning the use of Indigenous knowledge in water management decision-making, although not legislated, the Michigan Department of Natural Resource was a founding member in 2003 of the Environmental Information Exchange Network (EIEN). EIEN is an internet-based system used by state, tribal and territorial partners to securely share environmental and health information with one another (United States Environmental Protection Agency, 2017). Review



of Michigan's Water Conservation and Efficiency Annual Program under the Great Lakes-St. Lawrence River Basin Water Resources Compact emphasizes the value of this sharing as a way for the state to gain a greater understanding of traditional knowledge and practices of Basin Tribes pertaining to water (Great Lake States Regional Body, 2012). However, how this information is included in permitting decisions is not clear.

3.8.2.3 Florida

Stakeholder involvement and input is legislated as a requirement in areas of water management including setting minimum flow/levels (Statute: 373.042), planning (Statute 373.036), and conservation management (Statute 373.246) at the water management districts. To set minimum flows/levels the Florida Department of Environmental Protection and five Water Management Districts are required to allow the opportunity for "participation by the public and local governments. Public workshops are held at least 90 days prior to plan acceptance or amendment by the Water Management District board" (Ecofish Research Ltd. *et al.*, 2017). Additionally, the public also can be informed by project discussions and associated FAQ sections on district websites, as is done at SJRWMD. There are also periodic newsletters and social media posts utilized to inform the public (Laidlaw, 2018).

With regards to water planning, the districts are required to develop 20-year plans that cover water supply, water quality, flood protection and floodplain management. To do so, the district governing boards are required to hold public hearings at least 30 days in advance of completing the development or revision of the district water management plan (revisions happen on a five-year basis). Likewise, the development of conservation programming for public water supplies requires collaboration with water suppliers, water users, and water management agencies. A key example of how these requirements play out as collaboration and public engagement across the water management districts is the Central Florida Water Management Initiative, which brings together three of the five water management districts for Water Supply Planning. Legislated consideration for equity and transparency in these public processes and water allocation decision making is limited, with the exception of ensuring equitable distribution of water resources during time of water shortage or emergency (Statute 373.246(1)).

Consideration of Indigenous peoples broadly in water use decision-making in Florida Statute is limited. However, Florida has the second oldest US Water Rights Compact with a specific Indigenous peoples. Through EL. 100—228, 101 Stat. 1556 ("Seminole Indian Land Claims Settlement Act of 1987," 1987), Florida has established the 1987 Water Rights Compact, which



defines the rights and obligations of the Seminole Tribe and the State pertaining to water and allows the Tribe to govern their water resources. To do so, the Seminole Tribe has created a tribal constitution, tribal council and Seminole Tribe of Florida Inc. (Walker & Baker, 2012). In 1987 the Seminole Tribe entered into a water settlement agreement with the State of Florida and the federal government (Fla. Stat. §285.165), which has led the state to include the Seminole Tribe water needs in long-term plans. As a result of this Compact, the Seminole Tribe is actively engaged in water use decision-making. For example, the Tribe has entered into 14 landowner agreements that allow them to resolve water disputes with other landowners. For example, with the South Florida Water Management District and other private land owners an agreement was made to establish water quality and quantity standards for water control structures upstream from tribal lands (Walker & Baker, 2012). Additionally, in the context of the Everglades system, the Seminole Tribe is a partner in restoration projects with 50% cost sharing. Outside of this Compact, land held in trust for Indigenous tribes is also recognized as a priority area to receive funding for Everglade water quality improvement projects, such as those that restore aquifer level (e.g., the Northern Everglades and Estuaries Protection Program) (South Florida Water Management District, 2009)

3.8.2.4 Montana

Montana's Title 85 Water Use Chapter 1 Water Resources ("Water Use," 2017) is where communication regarding water planning is legislated:

State water plan. (1) The department shall gather from any source reliable information relating to Montana's water resources and prepare from the information a continuing comprehensive inventory of the water resources of the state. In preparing this inventory, the department may... (d) hold public hearings in affected areas at which all interested parties must be given an opportunity to appear. (5) Before adopting the state water plan or any section of the plan, the department shall hold public hearings in the state or in an area of the state encompassed by a section of the plan if adoption of a section is proposed.

Additionally, any proposed permits, change authorizations, and basin closures are publicly noticed prior to issuance. In practice, the DNRC individually contacts neighbors and certain interested groups as well as publishes the proposed appropriation/change in a newspaper of general circulation. Citizens are allowed to object to the application if they have good cause. Any proposed changes to administrative rules are also publicly noticed in newspapers prior to



adoption. In some cases, if DNRC proposes water-related legislation, stakeholders are involved in initial bill drafting to attempt to craft a solution to issues that will “work well for everyone”. Citizens are allowed to participate in public hearings prior to legislation enactment. This is a legislative process and is not governed by DNRC (Ferch, 2018).

Montana has relied upon the use of negotiated settlements as opposed to courts to resolve water rights claims for federal and tribal entities (Montana Department of Natural Resources & Conservation, 2015). While it is the federal government which holds authority to enter into treaties with Indigenous peoples, treaties are the basis for many of the reserved water rights of [Indigenous] tribes in the state (Montana Watercourse at the Montana Water Center, 2014). Addressing Indigenous roles in water allocation specifically, the Montana Reserved Water Rights Compact Commission (RWRCC) was established by the State Legislature in 1979 as part of the “state-wide general stream adjudication process for the purpose of negotiating and quantifying federal and tribal reserved water rights” (Montana Department of Natural Resources & Conservation, 2018c). The Commission negotiates settlements with federal agencies and tribes that claim federal reserved water rights within the State of Montana (Montana Department of Natural Resources & Conservation, 2018c). The mission of the RWRCC is to conclude “compacts” for the equitable apportionment of water among the State, its people, tribes claiming reserved water rights (“Water Use,” 2017) and federal claims to non-Indigenous reserved water (“Water Use,” 2017).

The Montana Legislature has approved water right Compacts for all seven Indian Reservations in the state, including Fort Peck, Northern Cheyenne, Rocky Boy's, Crow, Fort Belknap, Blackfeet, Flathead. Each of the reserved water right compacts is different, and for each, a user's ability to obtain permits on Native American Reservations varies. Compacts may include measures to protect existing uses of water (including existing tribal uses), quantification of tribal water rights on- and off-reservation, processes to permit new water uses, and Indigenous knowledge systems requirements. However, if a user seeks a state-based water right on land not within a Native American Reservation, Indigenous inclusion is not required (Ferch, 2018).



3.8.2.5 New Zealand (Waikato Region)

Stakeholder involvement is codified in the Water Module of the Waikato Regional Plan (Waikato Regional Council, 2010) s.3.3.4.3 on Water User Groups/Voluntary Agreements:

The Waikato Regional Council will, in order to assist and support the community to understand water management and allocation as an essential element of restoring and protecting water bodies: a) promote water user groups, or voluntary agreements between water users, to schedule takes and manage allocations. b) initiate and support water user groups to assist with allocations during times of restrictions or when the catchment is fully or over allocated. c) provide, where available, accurate technical information on which user groups can make decisions. The Waikato Regional Council will further investigate how water user groups can be used to: a) assist with management of water allocated to abstractors; b) provide opportunities for shared investment in, and optimal use of water transport and storage infrastructure; c) make best use of available water.

Further, the Resource Management Act ("Resource Management Act," 1991) Part 4 contains detailed legislation on the "Collaborative planning process" where a collaborative group is defined as "a group of persons appointed by a local authority under clause 40 for the purpose of assisting the local authority to prepare or change a proposed policy statement or plan that relates to its functions under section 30 or 31, as the case may be". Though not specific to water allocation, Part 4 s.37 is certainly applicable to water:

Considerations relevant to decision on choice of process (1) A local authority may decide to use the collaborative planning process to prepare or change a policy statement or plan. (2) In determining whether the collaborative planning process is to be used to prepare or change a policy statement or plan, a local authority must consider—(a) whether the resource management issues to be dealt with in the policy statement or plan would benefit from the use of the collaborative planning process, having regard to the scale and significance of the relevant resource management issues; and (b) the views and preferences expressed by persons who are likely to be affected by those resource management issues or who have an interest in them; and (c) whether the local authority has the capacity to support the collaborative planning process, having regard to the financial and other costs of the process; and (d)



whether a requirement, designation, or heritage order could be considered within a collaborative planning process; and (e) whether there are people in the community able and willing to participate effectively in the collaborative planning process as members of a collaborative group; and (f) whether any matters of national significance are likely to arise and, if so, whether these could be dealt with in the collaborative planning process; and (g) whether the relevant provisions of any iwi [Maori tribe] participation legislation that applies in an area could be accommodated within the collaborative planning process, as required by this Part. (3) Before determining to use the collaborative planning process, a local authority must be satisfied that use of the process is not inconsistent with the local authority's obligations under any relevant iwi participation legislation or Mana Whakahono a Rohe [Indigenous peoples].

While the legislation does not contain a reference to equity, transparency is discussed in the Resource Management Act ("Resource Management Act," 1991), in a way that is relevant but not specific to water: s.58N states that in "initiating, developing, and implementing a Mana Whakahono a Rohe, the participating authorities must use their best endeavours—... (e) to communicate with each other in an open, transparent, and honest manner". Similarly, the Waikato Regional Plan chapter on Water Use, while not legislation, refers to transparency in two sections: "Policy 7 - Landowner involvement in catchment management; Promote sound working relationships between landowners in the catchment and Waikato Regional Council, that: b) Confirm that the regulatory auditing process is fair and transparent" and "Policy 12: Public Fund to share costs of reducing nitrogen from rural land in the Lake Taupo catchment Ensure a public fund assists research and development of low nitrogen leaching land uses and management alternatives, and contributes to a permanent reduction in nitrogen outputs from farming land use activities. The administration of a public fund that is contributed to by local, regional and national communities, shall follow the guiding principles of... e) Open and transparent process."



The Waikato Regional Plan contains specific policies relating to the including of Maori people:

Policies which, subject to achieving the overarching purpose of the Vision and Strategy, establish allocable and environmental flows from surface water and sustainable yields from groundwater based on a range of factors including mātauranga Maori. The policies should also provide for the input of iwi [Maori] in determining any allocable and environmental flows, and allocation priorities, with respect to the Waikato River Catchment, as well as state how ground and surface water will be allocated” (Waikato Regional Council, 2010).

Further, according to Davenport (2018):

Maori groups were participants in the formal Schedule 1 processes of the Plans’ notification and subsequent hearings and deliberations of the Environment Court. The allocation regime inclusive of the allocable flow limits incorporated all those matters provided for in Policies 1 & 2 of chap 3.3. Implementation of the allocation regime through the regulatory process incorporates Maori & their participation via Joint Management Agreements developed by and with the relevant iwi (tribe). These are in place for many parts, but not all of, the Region.

The Waikato Regional Council also has explicit policy (8.5.2) on the approach to joint management with Indigenous peoples in the Waikato River catchment “Waikato Regional Council, in partnership with Waikato-Tainui, Ngāti Tūwharetoa, Te Arawa River Iwi, Maniapoto and Raukawa, will: provide for Joint Management Agreements and Integrated River Plans to be developed and agreed; establish monitoring programmes, which shall incorporate mātauranga Māori, to determine and monitor the health status of the Waikato River; work with the Waikato River Authority to ensure targets are established for improving the health and wellbeing of the Waikato River; and develop and implement a programme of action to achieve those targets, including recommendations for changes to regional and district plans. Finally, while no formal requirements for Indigenous knowledge systems were identified, there were several agreements within the Waikato Region which relate to Indigenous decision making on water. These agreements are listed in Table 2.



Table 2: Waikato Region Agreements with Indigenous Peoples

Agreement Type	Name of Agreement
Treaty settlement legislation	Waikato Tainui Raupatu Claims (Waikato River) Settlement Act
Treaty settlement legislation	Ngāti Tuwharetoa, Raukawa, Te Arawa River Iwi Waikato River Act
Treaty settlement legislation	Ngāti Tuwharetoa, Raukawa, Te Arawa River Iwi Waikato River Act
Joint Management Agreement	Waikato Raupatu River Trust (Waikato-Tainui) and Waikato Regional Council (Co-management Agreement for Waikato River Related Lands)
Joint Management Agreement	Te Poari Matua O Raukawa (Raukawa Settlement Trust) and Waikato Regional Council
Joint Management Agreement	Addendum to the joint management agreement - Raukawa Settlement Trust and Waikato Regional Council
Joint Management Agreement	Te Arawa River Iwi Trust and Waikato Regional Council
Joint Management Agreement	Maniapoto Māori Trust Board and Ōtorohanga District Council, Waikato District Council, Waikato Regional Council, Waipa District Council and Waitomo District Council
Joint Management Agreement	Waikato Raupatu River Trust and Waikato Regional Council
Joint Management Agreement	Tuwharetoa Maori Trust Board and Waikato Regional Council
Co-Management Agreement	Waikato River Co-Management Framework



4. DISCUSSION

4.1 SUMMARY OF FINDINGS

For jurisdictions around the world which face issues of population growth, climate change and/or impacts on the availability of safe and sanitary water, managing for water quantity is becoming increasingly complex. To better understand how this complexity is managed at a legislative/policy level, 21 jurisdictions were scanned for this study to identify a range of policies and legislation within the realm of water quantity management. The study included a number of Canadian jurisdictions (British Columbia, Manitoba, New Brunswick, Quebec, Prince Edward Island, Yukon) but also many states in the US (California, Indiana, Illinois, Florida, Michigan, Minnesota, Montana, New York, North Carolina, Ohio, Pennsylvania, Wisconsin), and three international jurisdictions (England/Wales, New Zealand (Waikato Region), South Australia). This diversity of jurisdictional focus was important because, while Canada increasingly faces water quantity challenges, this study reviewed jurisdictions with challenges significantly more severe than those yet faced in Canada (e.g., South Australia, Montana, Florida, and California). In this way, the review has significant potential to inform any Canadian jurisdiction anticipating challenges to water quantity, and the complexity associated with managing those challenges.

In this study, water quantity was framed in terms of eight topics of inquiry:

- Legal Framework
- Integrated Management/Cumulative Effects
- Adaptive Management
- Ecosystem Protection
- Drought Management and Water Stress
- Priority of Water Use
- Conflict Resolution Mechanisms
- Collaborative Approaches

Sections 3.1-3.8 in this report outlines the findings, by topic of inquiry, how each studied jurisdiction have addressed these topics in their legislation, policy, plans, etc. This is provided in the form of an overview for the 21 Phase One jurisdictions, and a detailed assessment for the five focus jurisdictions (Minnesota, Michigan, Florida, Montana, New Zealand (Waikato Region)). Broadly speaking, many of the water quantity policy frameworks of the



jurisdictions reviewed in this study revealed a patchwork of legislation, policy, statutes, and plans which often constitute the regime by which water quantity is governed. However, from topic to topic, the review revealed that some jurisdictions had more comprehensive policy than others, driven by the circumstances of those jurisdictions. Table 3 below gives a synopsis of findings by topic of inquiry:



Table 3: Summary of Findings for Focus Jurisdictions by Water Quantity Topic of Inquiry

Topic of Inquiry	Indicator Questions ¹⁷	Summary of Findings for Focus Jurisdictions
Legal Framework	<i>What is the legal structure and the scale at which authority is exercised?</i>	<ul style="list-style-type: none"> • Prior appropriation principles primarily inform the New Zealand and Montana legal structures • Regulated riparianism and common law inform Florida, Michigan, and Minnesota • US State or Regional Council (New Zealand) are the dominant authorities in each case. • Authority is also shared in Florida, Michigan and Minnesota by Water Management Districts (Florida) and Basin Commissions (Michigan and Minnesota – outside of the Great Lakes Basin)
	<i>How are water users identified and what are their water taking limits?</i>	<ul style="list-style-type: none"> • Water users are identified by volume in Florida, Michigan and Minnesota; in Montana and New Zealand water users are identified by both water use type and volume • No one jurisdiction of the five has the same baseline rate of water extraction that indicates when a withdrawal permit or license is required
	<i>Is there a fee structure for water users to acquire water rights and use water?</i>	<ul style="list-style-type: none"> • Fee structures have a large range among jurisdictions, areas, and types of use that range from \$25 to \$2,000/year for water use
	<i>Are the rights of/limits on water bottlers and fee structures pertaining to water use addressed in policy as a specific system consideration? If measures are taken to explicitly define the rights or limits on water bottlers, how are the measures challenged or upheld?</i>	<ul style="list-style-type: none"> • Michigan and Florida have explicit regulations and considerations for water bottler appropriations • Water bottlers in Montana and Minnesota are considered to be no different than any other purpose • Water bottlers are not noted in New Zealand allocation policy

¹⁷ See Appendix B for the questions provided to the five focus jurisdictions.



Table 3: Summary of Findings for Focus Jurisdictions by Water Quantity Topic of Inquiry
(continued)

Topic of Inquiry	Indicator Questions ¹⁸	Summary of Findings for Focus Jurisdictions
Integrated Management/ Cumulative Effects	<i>How does your jurisdiction's water allocation system formally integrate concerns for groundwater and surface water into legislation?</i>	<ul style="list-style-type: none"> All five jurisdictions consider groundwater and surface water interactions in allocation statute and policy Notably, Michigan's WWAT tool uses a threefold model system focused on groundwater, stream flow, and fish impacts to make assessments; Minnesota may designate groundwater protection areas and apply a sustainability standard to combat integrated risks
	<i>How does your jurisdiction's water allocation system formally integrate concerns for water quantity and quality into legislation?</i>	<ul style="list-style-type: none"> Interactions of water quality and quantity are considered by all five jurisdictions in decision making through varying monitoring, sampling and analysis procedures in cooperation with other departments and agencies focused on water quality and pollution concerns
	<i>Are cumulative effects considered in your jurisdiction's approach to water allocation? What approach is used? To what extent are cumulative effects data considered in water allocation decision at the watershed/aquifer scale?</i>	<ul style="list-style-type: none"> Michigan and Minnesota, following the Great Lake St. Lawrence River Basin Compact, must consider cumulative effects in appropriation decisions – this is done on a sub-watershed and county scale respectively Florida and Montana cumulative effects consideration are minimal and less formalized in statute compared to the other jurisdictions New Zealand -Waikato Region considers cumulative effects in water taking at length; including formal recognition for Indigenous uses and values in assessments

¹⁸ See Appendix B for the questions provided to the five focus jurisdictions.



Table 3: Summary of Findings for Focus Jurisdictions by Water Quantity Topic of Inquiry
(continued)

Topic of Inquiry	Indicator Questions ¹⁹	Summary of Findings for Focus Jurisdictions
Adaptive Management	<i>Does your jurisdiction use adaptive management strategies including tools and practices for implementing an adaptive management approach?</i>	<ul style="list-style-type: none"> • Minnesota has the authority to limit or cancel permits to protect the public interest and requires Local Water Supply Plans to be updated on ten-year cycles and used as an assessment tool when viewing changes to allocation • In Michigan, adaptive management is limited to incorporating changes through the process of water withdrawal assessment and water user committees • Florida's explicit adaptive management protocols have been outlined for certain activities or areas; mitigation banks are noted as an innovative approach to offset adverse impacts of certain activities • Montana and New Zealand have limited adaptive measures
	<i>How and to what extent are jurisdictions incorporating adaptive strategies into water allocation? If relevant, how are these adaptive management strategies enforced? If there is a water rights system, can rights be amended for adaptive management? How?</i>	<ul style="list-style-type: none"> • In all five jurisdictions, adaptive measures are not overly detailed • Enforcement mechanisms are limited in all jurisdictions • Water rights in all jurisdictions (excluding Minnesota, which does not have a water right system) can typically not be amended unless going through a court/civil litigation process

¹⁹ See Appendix B for the questions provided to the five focus jurisdictions.



Table 3: Summary of Findings for Focus Jurisdictions by Water Quantity Topic of Inquiry
(continued)

Topic of Inquiry	Indicator Questions ²⁰	Summary of Findings for Focus Jurisdictions
Ecosystem Protection	<i>How does your jurisdiction allocate for environmental flows, habitat, and in-stream needs?</i>	<ul style="list-style-type: none"> All five jurisdictions consider in-stream flow needs; only in Michigan is this flow need connected to ecosystem or fish needs specifically In Florida, Minnesota, and New Zealand a percentage-based minimum flow and water level based on a low flow record within a set number of years is used as a guide.
	<i>Are there monitoring and enforcement legislation/regulation for environmental flows?</i>	<ul style="list-style-type: none"> Monitoring protocol are required across all jurisdictions to varying degrees; Florida has an innovative priority process at the district level where minimum flows and levels are set based on an annually developed list of priority streams Enforcement of environmental flows is not explicitly addressed in legislation for any of the five jurisdictions
	<i>How is ecological knowledge for decision making acquired? What innovative environmental protection procedures or policy emerged?</i>	<ul style="list-style-type: none"> All jurisdictions use slightly different methods to determine minimum flow levels; Florida uses water budget computer models; Michigan's WWAT estimates stream index flows based on a regression model from a stream gauge network; outside parties' data also is used in support; Minnesota is still in the process of developing annual exceedance flow

²⁰ See Appendix B for the questions provided to the five focus jurisdictions.



Table 3: Summary of Findings for Focus Jurisdictions by Water Quantity Topic of Inquiry
(continued)

Topic of Inquiry	Indicator Questions ²¹	Summary of Findings for Focus Jurisdictions
Drought Management and Water Quantity Stress	<i>What are the structure of plans and primary concerns related to drought?</i>	<ul style="list-style-type: none"> All five jurisdictions have drought plans which outline a wide range of action plans for times of shortage, drought thresholds, flow releases, monitoring and reporting. Drought plans released by Minnesota and Florida were written/updated more recently than those of Montana, Michigan, and New Zealand.
	<i>What formal conservation measures exist for the restriction of water allocation across different uses during water stress/shortage/drought?</i>	<ul style="list-style-type: none"> In each jurisdiction, conservation measures for the restriction of water allocation are in place and are specified in either statutes/legislation, policy and/or in the drought plan.
	<i>How does your jurisdiction identify water quantity stress areas? How is water quantity stress defined in your jurisdiction?</i>	<ul style="list-style-type: none"> Most jurisdictions do not use the term water stress, and thus there are no comparative definitions. In Michigan, stress areas are identified as a part of “zones of risk”
Priority of Water Use	<i>Is priority assigned to any specific water use?</i>	<ul style="list-style-type: none"> Minnesota, New Zealand, and Florida assign priority to different water users in times of shortage/stress. Montana’s water priority is based on FITFIR, but first priority is given to those who appropriated prior to 1973.
Conflict Resolution Mechanisms	<i>What dispute/conflict resolution mechanisms are legislated and implemented to deal with surface or groundwater allocation disputes</i>	<ul style="list-style-type: none"> All five jurisdictions have dispute/conflict resolution mechanisms in place through legislation or policy. Montana and New Zealand each have dedicated water/environmental courts for the adjudication of water rights.

²¹ See Appendix B for the questions provided to the five focus jurisdictions.



Table 3: Summary of Findings for Focus Jurisdictions by Water Quantity Topic of Inquiry
(continued)

Topic of Inquiry	Indicator Questions ²²	Summary of Findings for Focus Jurisdictions
Collaborative Approaches	<i>What is the communication policy/collaborative approaches to water allocation decisions?</i>	<ul style="list-style-type: none"> • All five jurisdictions have codified/legislated requirements for stakeholder engagement/public engagement for various aspects of water allocation decisions. • In Michigan, additional requirements exist for public consultation before approval for bottled water withdrawal.
	<i>Are equality and transparency procedures formally incorporated into water allocation legislation?</i>	<ul style="list-style-type: none"> • There is a wide range in the extent to which the jurisdictions address equality and transparency. • For example, Florida addresses equitability of distribution of water resources only during water shortage or emergency. In contrast, the allocation process of the Illinois Lake Michigan Water Allocation Program explicitly involves an active public participation process.
	<i>Are Indigenous Knowledge Systems legislated in allocation decisions?</i>	<ul style="list-style-type: none"> • None of the jurisdictions legislate the incorporation of Indigenous knowledge systems into allocation decisions. • Michigan has created an online exchange network for the purposes of sharing environmental knowledge among state, tribal and territorial partners.
	<i>Are there any agreements or actions of note regarding Indigenous decision making on water?</i>	<ul style="list-style-type: none"> • To varying degrees, each jurisdiction addresses Indigenous involvement or engagement on decision making on water. • The Waikato Region (NZ) has numerous agreements with Indigenous peoples in the region that pertain to water decision making.

²² See Appendix B for the questions provided to the five focus jurisdictions.



The findings presented above in Table 3 provide only a snapshot of the rich diversity with which water quantity is managed in the five focus jurisdictions. The breadth of this diversity is found in sections 3.1-3.8, as well as in Appendix A which provides findings for the 21 jurisdictions of the initial scan. During the collection and review of the data from the jurisdictions, a number of both practical and conceptual insights and limitations were noted:

Insights:

- Many jurisdictions manage groundwater and surface water separately and have not yet integrated the management of these two sources into one comprehensive permitting system.
- While explicit statutory rules have been developed for water extraction for bottled water in Michigan and Florida, other jurisdictions do not formally recognize water bottlers as a water user type. For example, BC groups water bottlers with industrial purposes and New Brunswick and South Australia group water bottlers under commercial use. By doing so, these jurisdictions establish a consistent precedent for how extraction for certain economic purposes should be treated without having to develop specific regulatory language for one user type alone.
- Many jurisdictions appear to have collaborative measures for water allocation decision-making. A further in-depth study has the potential to reveal whether this indicates a trend of increasing inclusion of the public/stakeholders.
- Some novel institutions unveiled in the review may provide insight into planning for other jurisdictions (e.g., the Interagency Drought Task Force (California); the Environmental Court (New Zealand); the Water Court (Montana) water bailiff (British Columbia)).
- The Great Lakes -St. Lawrence River Basin Sustainable Water Resources Agreement (and companion U.S. Compact that applies to the U.S. jurisdictions) establishes a baseline of requirements for the Great Lake States and Provinces that provides uniform and binding water standards for the region. Notable consistencies include strict rules governing transfers of water out of and within the Basin, water conservation measures, public participation, Indigenous consultation, adaptive flexibility, and consideration for cumulative effects. Although there are variations in how the Agreement has been adapted by each jurisdiction, it exemplifies rules that are agreeable or generally thought of as beneficial water allocation management practices to multiple jurisdictions.



- Most jurisdictions have not yet utilized the opportunity to implement Indigenous knowledge into water allocation decision making. However, the Yukon may be an opportunity for further review for how Indigenous knowledge can be incorporated into water quantity frameworks.
- Similarly, because of a variety of different circumstances and gaps in integrated decision making, there are potentially missed opportunities by all jurisdictions in the degree to which Indigenous peoples are involved in decision making for water quantity governance.
- There is general recognition of cumulative effects and the need for their assessment relative to water withdrawal across jurisdictions.
- Adaptive management in the context of water withdrawal is predominantly about the flexibility to adjust water allocation limits and withdrawal assessment processes in times of uncertainty. This process is not always explicitly labeled as 'adaptive management'.
- The principles of equity and transparency connected to public or stakeholder participation are not always explicitly outlined as procedures; however, efforts such as open meetings, public hearings and collaborative efforts are indicative of such principles.
- In many of the jurisdictions, there is a great deal of institutional complexity when their water quantity frameworks are viewed as a whole. Because many of the pieces of the frameworks have been created in a piecemeal fashion, the frameworks in some ways lack a unified vision of water quantity governance. Further, some of these more complex frameworks (e.g., California, Montana, Florida) may eclipse the broader approach of the jurisdiction for the purposes of gaining insights to inform other contexts.
- There is no one *single* jurisdiction where all management practices and rules should be considered as a model from which to draw entirely from for changes to Ontario's approach to water quantity management. Innovative approaches developed by different jurisdictions have evolved in response to certain water quantity issues. As such a thematic approach considering multiple jurisdictions' approaches to a certain issue with consideration for contextual differences may be more beneficial to assessing applicability to Ontario.



Limitations

- A limitation of this study is the gap in knowledge that remains regarding the implementation of the findings of legislation, statutes, policy, plans, etc. For example, has implementation been effective? What factors have hindered implementation of specific measures? How could the implementation be done differently? How could the policy/legislation have been written differently to facilitate smoother implementation? While questions regarding implementation were posed to respondents in the five focus jurisdictions, responses on this matter were limited. These responses may be limited by (1) the fact that describing implementation is inherently complex and requires a comprehensive understanding of context, (2) describing the nuances of implementation may require an understanding of the history of the jurisdiction, and/or (3) the respondents for this study were given a long list of questions and may not have had the time/resources to adequately describe implementation in light of points (1) and (2). Therefore, where specific findings from the study are selected and used to inform legislative updates to water quantity frameworks, follow-up with jurisdictional contacts is recommended for gaining deeper insight on this matter.
- Another limitation of this study is that any of the policy, statutes or legislation may not be fully understood from a perspective outside that jurisdiction. For example, if someone outside of Canada were to read s.35 of the Canadian Constitution, they would see that Aboriginal rights have been recognized, but may not understand the fraught and complicated history which led to the writing of that section, and how the Canadian courts have been left to interpret this section of the Constitution through case law. Thus, while the findings of this study have been written to try to maximize available details, the historical and present-day context may require further investigation.
- A final limitation of this study is that it does not comprehensively address how various jurisdictions address the concept of the human right to water. In California, water has been legislated as a human right and thus affects approaches to other water legislation, water planning and strategies. A potential future study could include a focused jurisdictional review identifying how values and principles surrounding water are addressed. The study could review jurisdictional policies recognizing water as a human right and economic value of water resources in the context of water quantity management.



4.2 HOW THESE FINDINGS RELATE TO ONTARIO

Like many of the other jurisdictions reviewed in the research for this report, Ontario's approach to water quantity management is currently made up of laws, regulations, policies, programs and agreements that were each developed at different points in time and in response to changing management needs, as well as evolving political, social, economic, and environmental circumstances. This jurisdictional review has identified practices, policies, and law in other jurisdictions that could be used to inform the review of Ontario's framework. This review addresses the opportunity identified by de Loë (de Loë, 2009) for Ontario to prioritize learning from neighboring and other jurisdictions in creating "clearer rules and procedures for protecting aquatic ecosystems, ensuring equitable sharing of water during shortages, and balancing economic interests against broader environmental and social goals".

Broadly speaking, all of the information gathered in this review has the potential to inform or influence the future direction of Ontario's approach to water quantity management. Specifically, Appendix A of this report summarizes the findings of all 21 jurisdictions scanned in the review and this summary is intended to serve as a touchpoint for how jurisdictions are addressing each individual topic of inquiry. While the Task 5 Evaluation Report provides recommendations, based on these jurisdictional findings that may be most suited to the Ontario context, the 21-jurisdictional scan (Appendix A) is a core resource of findings that may continue to inform policy, legislation and decision-making as political, environmental, social, and/or economic circumstances in Ontario shift. In the Evaluation Report (Task 5), to which this Jurisdictional Review Report (Task 2) is an appendix, the findings of this Task 2 Jurisdictional Review are analyzed in relation to Ontario by topic. It includes a discussion of how the findings from specific jurisdictions may inform Ontario's approach to water quantity management approach going forward. The analysis is done for each of the following topics of inquiry:

- Integrated Management/ Cumulative Effects
- Adaptive Management
- Ecosystem Protection
- Drought Management/Water Quantity Stress
- Priority of Water Use
- Conflict Resolution Mechanisms
- Collaborative Approaches



For each of these topics, an approach to that topic from the Jurisdictional Review will be recommended in the Task 5 Evaluation Report. Recommendations of jurisdictional approaches or practices are assessed according to applicability to Ontario and environmental conditions.

4.3 HOW THESE FINDINGS RELATE TO SUBSEQUENT TASKS

This Jurisdictional Review is Task 2 of the larger 7-Task Assessment of Water Resources to Support a Review of Ontario's approach to water quantity management. Table 4 below summarizes, by Task, how the findings from this review will inform subsequent Tasks.



Table 4: Relevance of Task 2 Findings to Subsequent Tasks

Task	Task 2 Relevant Areas for Evaluation
Task 3: Workshops with Water Managers	In Task 3, Water Managers were presented with the findings of this jurisdictional review, including relevant policies and legislation, any implementation concerns identified, and novel processes that emerged from the review. The workshops focused on the findings of this review (along with the Task 1 science review) for selected topics, in order for Water Managers, with intimate knowledge of Ontario's framework, to identify relatability and feasibility to Ontario.
Task 4: Presentations to the Ministry's Water Quantity Protection External Working Group	In Task 4, the External Working Group will be presented the same findings, policies, legislation, concerns and novel processes as those in Task 3. This Task 4 presentation should focus on feedback from the External Working Group Members to identify recommended jurisdictions by topic (3.1-3.8). This feedback and expertise from Members will inform recommendations in the Task 5 Evaluation Report.
Task 5: Evaluation Report	The findings from this jurisdictional review will have an important role in the Task 5 Evaluation Report as it relates to integrated management, cumulative effects, water quantity stress, adaptive management, ecosystem protection, drought management, priority of water use, conflict resolution mechanisms, and collaborative approaches. For more detail see section 4.2 above.
Task 6: Assessment of Ontario's Water Quantity Resources in Water Quantity Study Areas	The findings from the following sections of this report are anticipated to have direct application in the assessment of WQSA's on the topics of cumulative effects and environmental flows: Section 3.2 Integrated Management, Section 3.5 Environmental Protection, and Section 3.1 Legal Framework. Further information for assessment may also be supported by sections 6.4, 6.6, 6.1, and 6.2 of Appendix A below.
Task 7: Assessment of Ontario's Water Quantity Resources in Water Bottling Study Areas	The findings from this jurisdictional review included water bottling legislation/policy for all 21 jurisdictions (see Appendix A section 6.12 below on water bottlers for a summary of approaches to water bottling policy for the 21 jurisdictions). Notably, Michigan and Florida are among the in-depth jurisdictions reviewed with legislation/policy on water bottlers (see section 3.1.2 of this report). The approach to water bottlers by these jurisdictions may help to frame the assessment of water quantity resources in Ontario's water bottling study areas.



5. CLOSING

Respectfully submitted,



Suzanne von der Porten, B.Sc., MBA, Ph.D.
Independent Consultant



Natalya Melnychuk, B.PAPM, Ph.D.
Independent Consultant



Muriel Kim-Brissou, M.Sc.
Environmental Scientist



Tiffany Svensson, M.Sc., P.Geo.
Project Manager, Senior Hydrogeologist



6. APPENDIX A

Comparison of Water Management Frameworks – Summary Table



Jurisdiction	Legal Framework and permitting limit	Groundwater and Surface Water Integrated Management	Consideration for Environmental Flow	Drought Management Plan Coverage	Priority of Use	Main Conflict Resolution Mechanism	Main form of involvement of public or water users as noted in legislation
<i>Canada</i>							
British Columbia	Prior Allocation (ground and surface water); licencing with no specified volume requirement	Integrated water objectives, water sustainability plans, drilling authorizations, and basin closing	Requirement led to development of Environmental Flow Needs Policy; mean annual discharge used	Drought plan with local, regional and provincial actions to prepare for and respond to drought	Priority for the use of water is first given to essential household needs and critical environmental flows, and then managed according to the precedence of water rights or first-in-time, first-in-right within the Water Sustainability Act	Water Bailiff appointed to manage conflicts; civil litigation option	No formal role for collaboration but advisory boards may be established
Manitoba	Hybrid system - riparian and groundwater rights; licencing for >25,000 Litre/day.	Not noted	Guidelines under development; Tessman rule used on case-by case basis	Provincial strategy to prepare for and respond to drought	Priority of the purposes within the Water Rights Act	Arbitration	Mainly through public hearings



Jurisdiction	Legal Framework and permitting limit	Groundwater and Surface Water Integrated Management	Consideration for Environmental Flow	Drought Management Plan Coverage	Priority of Use	Main Conflict Resolution Mechanism	Main form of involvement of public or water users as noted in legislation
New Brunswick	No rights assigned; waterworks using 50 cubic meters of water daily require a permit	Well field and watershed protection; water classification systems; Biodiversity Strategy	Downstream flow requirements (70% of monthly median flow) for water intake structures	No plan	Priority not assigned	Appeal process	Mainly through public hearings
Ontario	Riparian/no water rights; permitting required for >50,000 litres per day withdrawals	GW/SW consideration in PTTW	Requirement to consider in permitting;	Ontario Low Water Response plan outlines provincial and local actions that should be taken at different levels of low water	Priority of water uses are outlined in two policies: the MECP Water Management Policy, Guidelines and Provincial Water Quality Objectives (1994) and in the Ontario Low Water Response Plan	Appeal process through Environmental Review Tribunal	Designated applications are posted on the Environmental Registry in accordance with the Environmental Bill of Rights. The MECP will consider public comments in its decision. Some applications are exempted to the posting requirement, e.g. takings for less than 1 year, for irrigation of agricultural crops.



Jurisdiction	Legal Framework and permitting limit	Groundwater and Surface Water Integrated Management	Consideration for Environmental Flow	Drought Management Plan Coverage	Priority of Use	Main Conflict Resolution Mechanism	Main form of involvement of public or water users as noted in legislation
Prince Edward Island	Riparian rights; permit required for 50 imperial gallons (189 litres) per minute or when the total daily withdrawal exceed 10,000 imperial gallons (37,854 litres)	Not noted	Requirement in Water Act; no noted guidance	No plan	Water Act provides outlines priority uses to be considered in permitting	Not noted	Required public consultation to develop plans
Quebec	Riparian/no water rights; licence for water withdrawal < 75,000 litres/day	Integrated water management (IWM) a mandate for Minister of State for the Environment and Water	Streamflow requirement for fish and fish habitat set by river	No plan	Priority not assigned	In process of developing policy instruments	Stakeholder engagement in permitting reviews
Yukon	Prior allocation; license requirement of 300 m ³ /day	No direct IWM mandate	Requirement to consider; limited guidance/ understanding	No plan	Priority outlined in Waters Act for licensing	Appeal process to Supreme Court	Stakeholder intervention in permitting challenges



Jurisdiction	Legal Framework and permitting limit	Groundwater and Surface Water Integrated Management	Consideration for Environmental Flow	Drought Management Plan Coverage	Priority of Use	Main Conflict Resolution Mechanism	Main form of involvement of public or water users as noted in legislation
<i>Great Lake States</i>							
Illinois	Riparian, common law, reasonable use; registration system for high capacity wells >100,000 gpd; permitting for all high capacity Lake Michigan withdrawals	Source water assessment program for wellhead and watershed protection of public drinking water supplies	Permanent intake structures have required restrictions during low flow periods to avoid adverse impacts	Drought Preparedness and Response Plan for responding to different levels of drought	Priority not assigned	Appeal process	Active participation for Lake Michigan water allocation, regional committees – water supply stakeholders to address conflicts and supply shortfalls
Indiana	Riparian, common law, reasonable use; registration for Significant Water Withdrawal Facility >100,000 gpd; permitting for navigable waterway withdrawals		In-stream uses not listed for consideration of Significant Water Withdrawal Facilities	Water Shortage Plan outlines actions for different water uses during different levels of shortage	Priority of use assigned in Statute for state financed reservoirs and for public water courses	Mediation	Public participation for water use planning



Jurisdiction	Legal Framework and permitting limit	Groundwater and Surface Water Integrated Management	Consideration for Environmental Flow	Drought Management Plan Coverage	Priority of Use	Main Conflict Resolution Mechanism	Main form of involvement of public or water users as noted in legislation
Michigan	Riparian, common law, reasonable use; permitting for 2,000,000 gallons (7,570,824 litres) of water per day	Integration considered in WWAT assessment using stream flow, GW, and fish population modeling	Water permitting determined based on ecological wellbeing taking into account stream flow, GW, and fish populations	Drought Response Plan with short and long-term actions	No priority assigned	Mediation (informal meetings)	No public notice required for WWAT or SSR, but public participation/comment period possible for permitting / bottled water must consult with community; use of collaborative advisory councils for water use management
Minnesota	Riparian, common law, reasonable use; permitting for >10,000 gallons (37,854 litres) of water per day	Groundwater Management Areas that consider integration using water allocation planning	Restrictions on water appropriations during low-flow periods; currently determined by annual Q90 exceedance flow value	Statewide Drought Plan outlines state, federal, water user and supplier's actions during various levels of drought	Priority assigned during times of shortage in Statute	Appeal hearings	Public not contacted usually, but some major or unique applications receive public review, public hearings for South Dakota Boundary waters, collaborative involvement of water users drought management and community aquifer management planning
New York	Riparian, common law, reasonable use; permitting for >100,000 gpd (378,541 litres/day)	Information on integrated water management was not identified	Flow-related conditions considered in issuing withdrawal permits	Drought plan to prepare to and respond to different levels of drought	Only priority of public health noted in drought plan	Not noted	Public hearings



Jurisdiction	Legal Framework and permitting limit	Groundwater and Surface Water Integrated Management	Consideration for Environmental Flow	Drought Management Plan Coverage	Priority of Use	Main Conflict Resolution Mechanism	Main form of involvement of public or water users as noted in legislation
Ohio	Riparian, common law, reasonable use; registration > 100,000 gpd (378,541 litres/day) over a 30 day period; permitting for >100,000 gpd		Limits on permitting for flows determined by Water Inventory Program	Drought Incident Response Annex outlines actions for pre-drought and emergency response	Priority not assigned.	Litigation	Public hearings
Pennsylvania	Riparian, common law, reasonable use; registration for withdrawals >10,000 gpd (37,854 litres/day)	GW and SW withdrawal assessed for local impact	Minimum flow guidelines for damned waterways	Drought emergency regulations outlines reductions and local water rationing plans	Priority only declared in a state of drought emergency in Statute	Litigation	Public hearings
Wisconsin	Riparian, common law, reasonable use; permitting >100,000 gpd (378,541 litres/day) in 30 days (general use permit)	GW withdrawal assessed for impact on springs	Flow requirements for stream/lake diversions	Emergency Response Plan includes a Drought Incident Annex that outlines recognition, response, and mitigation actions	Priority is only outlined in the Drought Incident Annex	Hearings/ review and civil action	Public participation in application reviews



Jurisdiction	Legal Framework and permitting limit	Groundwater and Surface Water Integrated Management	Consideration for Environmental Flow	Drought Management Plan Coverage	Priority of Use	Main Conflict Resolution Mechanism	Main form of involvement of public or water users as noted in legislation
<i>Non-Great Lake States</i>							
California	Hybrid, primarily prior appropriation riparian and appropriative surface water rights;	Mandatory groundwater sustainability plans require protection of groundwater including consideration surface flow and water quality	Surface flow and groundwater levels considered well rights	Drought Contingency Plan with actions to prepare for, respond to, and recover from drought	Priority of rights based on prior appropriation; however, difficult to determine unless all rights for a water course are adjudicated	Arbitration	Not openly stated
Florida	Riparian and common law; permitting for consumption of 100,000 gpd (378,541 litres/day), a capacity to use pump 1,000,000 gpd (3,785,412 litres/day) and, for wells greater than six inches in diameter, or withdrawals from surface water bodies with an intake diameter or cumulative intake diameter of 8 inches or greater	Water budgeting and minimal flows and level mandate considers GW/SW interaction	Mandatory consideration for Minimum Flows and Levels determined through a priority schedule for water bodies	Drought Action Plan includes monitoring, assessment, coordination and mitigation/preparation actions	Priority among water users is address in Statute for shortages or emergencies	Mediation	Public input legislated for determining Minimum Flows and Levels as public workshops, communication; opportunity of public hearings



Jurisdiction	Legal Framework and permitting limit	Groundwater and Surface Water Integrated Management	Consideration for Environmental Flow	Drought Management Plan Coverage	Priority of Use	Main Conflict Resolution Mechanism	Main form of involvement of public or water users as noted in legislation
Montana	Prior appropriation and beneficial use; permitting for more than 35 gallons per minute (190,785 litres/day) and 10 acre-feet per year	GW/SW integration considered in appropriations; use of basin closures recognizing IWM	Environmental flows and in-stream needs considered in all permit applications	Drought Response Plan includes monitoring, reporting, assessment, response actions by state, federal and local bodies	Priority is based upon the time that water was first appropriated	Water Court for appeal hearings	Stakeholders individually contacted for proposed permits to neighbour and groups, opportunity for public notice/hearings
North Carolina	Riparian and common law structure; registration system required for agriculture users >1 million gpd (3,785,412 litres/day) and all others 100,000 gpd (378,541 litres/day)	Not noted	In-stream Flow Unit determines flows and considers for permitting	Drought Assessment and Response Plan with action items including monitoring, assessment, impact identification, reporting, and response dividing actions by water use type task force	Priority possibly assigned in capacity use areas	Appeal Process	Public consultation for preservation of buffers but not for water use



Jurisdiction	Legal Framework and permitting limit	Groundwater and Surface Water Integrated Management	Consideration for Environmental Flow	Drought Management Plan Coverage	Priority of Use	Main Conflict Resolution Mechanism	Main form of involvement of public or water users as noted in legislation
<i>International</i>							
England/ Wales	Common law and Roman/statutory law; license > 20m ³ /d	Not noted	Environmental Flow Indicators using a flow duration curve considered as part of European Water Framework Directive	Drought response: Our Framework for England - action items include responding to environmental incidents, drought permits and orders to protect the environment, spray irrigation restrictions, monitoring and reporting, and communication	Water permits/orders include prioritization into Tier 1 and Tier 2 uses	Appeal process through court providing sanctions or provisions	Stakeholder engagement for drought planning and response
South Australia	Prior allocation; no- water-rights; license system for water resources that are prescribed under the NRM Act	Water allocation plans can regulate one or more of the following: takings of groundwater, surface water (such as farm dams), and water extracted directly from watercourses.	Water Allocation Plans required to account for ecosystem needs	Water for Good Plan affords for the creation of a Drought Response Plan, among other options, in both short-term emergencies and long term permanent change	South Australia's Natural Resource Management Act outlines priority in relation to the ability of a person to take and use water; preference is given to existing users over new users.	No conflict mechanisms identified	Water allocation plans developed collaboratively



Jurisdiction	Legal Framework and permitting limit	Groundwater and Surface Water Integrated Management	Consideration for Environmental Flow	Drought Management Plan Coverage	Priority of Use	Main Conflict Resolution Mechanism	Main form of involvement of public or water users as noted in legislation
Waikato Region (New Zealand)	Common commodity/no ownership; first-in, first-take system	Explicit IWM policy outlining work with Territorial Authorities to consider SW and GW in catchment management	Allocation is conservatively limited to that proportion of the low flow or aquifer management level (Q5)	Water Shortage Risk Mitigation Plan includes action items of reducing adverse effects, response and recovery, and monitor and review	Regional Plan outlines a hierarchy of water use priorities during water shortages	Environmental Court holds hearings	Codified collaboration as water user groups to form voluntary agreements to schedule water takes and manage allocations



7. APPENDIX B

COMPARISON OF WATER MANAGEMENT FRAMEWORKS – LONG FORM



7.1 AT WHAT SCALE DOES THE MAIN WATER AGENCY MANAGE WATER QUANTITY?

Jurisdiction	Scale of Legal Framework	Scale of Management
<i>Canada</i>		
British Columbia	Provincial	Provincial
Manitoba	Provincial	Provincial
New Brunswick	Provincial	Provincial
Ontario	Provincial	Provincial, regional and site-specific
Prince Edward Island	Provincial	Provincial
Quebec	Provincial	Provincial
Yukon	Territorial with an independent administrative tribunal	Territorial
<i>Great Lake States</i>		
Illinois	State & Basin (i.e. Watershed)	State
Indiana	State & Basin (i.e. Watershed)	State
Michigan	State	State
Minnesota	State & Regional	State
New York	State & Basin (i.e. Watershed)	State
Ohio	State & Basin (i.e. Watershed)	State
Pennsylvania	State & Basin (i.e. Watershed)	Regional and State
Wisconsin	State	State
<i>Non-Great Lake States</i>		
California	State	State
Florida	State and regional water management districts	Regional and state
Montana	State and regional water management districts	State and court
North Carolina	State	State
<i>International</i>		
England/ Wales	National	National
South Australia	Regional	Regional
Waikato Region (New Zealand)	State	State



Canada

British Columbia

Provincial scale - All water in British Columbia is owned by the Crown on behalf of the residents of the province. Water Sustainability Act (WSA) s. 5 (1) "The property in and the right to the use and flow of all the water at any time in a stream in British Columbia are for all purposes vested in the government, except insofar as private rights have been established under authorizations.

(2) The property in and the right to the use, percolation and flow of groundwater, wherever groundwater is found in British Columbia, are for all purposes vested in the government and are conclusively deemed to have always been vested in the government except insofar as private rights have been (a) established under authorizations, or (b) deemed under section 22 (8) [precedence of rights]."

Manitoba

Provincial scale - Manitoba Water Stewardship operates under the authority of the Water Rights Act (2000) s.2 "Except as otherwise provided in this Act, all property in, and all rights to the use, diversion or control of, all water in the province, insofar as the legislative jurisdiction of the Legislature extends thereto, are vested in the Crown in right of Manitoba." Water is managed at the Provincial scale. However, Manitoba also has 16 Conservation Districts, which are "comprised of groups of neighbouring rural municipalities within a watershed that partner with the provincial government to develop programs to effectively manage their natural resources. Each Conservation District develops an Integrated Resource Management Plan, in consultation with local ratepayers and provincial partners" (de Loë *et al.*, 2007).

New Brunswick

Provincial scale - The Department of Environment and Local Government oversees legislation and policy related to water management including planning and management of land use, wastewater management and zoning development (de Loë *et al.*, 2007); Clean Water Act (1989) s.9 "The control of all water within the confines of the Province is declared to be, and to have been at all times past, vested in the Crown in right of the Province and no right to use or divert water can be acquired by prescription."



Ontario

Provincial, regional, site specific scales – most water is controlled through the provincial-level Ontario Water Resources Act. The stated purpose of the Act is “to provide for the conservation, protection and management of Ontario’s waters and for their efficient and sustainable use, in order to promote Ontario’s long-term environmental, social and economic well-being”. Under section 29(1) of the Act, “for the purposes of [the] Act, the Minister [of the Environment and Climate Change] has the supervision of all surface waters and ground waters in Ontario”. The MECP requires a permit (Permit To Take Water) for water taking at a specific location for amounts of 50,000 litres a day or more with some exceptions (e.g., domestic, livestock, emergency uses). The Ontario Water Resources Act prohibits the transfer of 379,000 litres of water a day or greater out of any Ontario’s three major water basins (Great Lakes-St. Lawrence, Nelson, Hudson). The Ontario Water Resources Act and Water Taking and Transfer Regulation (Ontario Regulation 387/04) restrict/regulate transfers of water from one Great Lake watershed to another (intra-basin transfers) and large consumptive water takings according to the GL-St. Lawrence River Basin Sustainable Water Resources Agreement (Agreement). The Water Taking and Transfer Regulation identifies “high use watersheds” and prohibits new/increasing high consumptive water takings (e.g., where water is incorporated into product) in these areas (Ontario Ministry of Environment and Climate Change, 2018). Additionally, Conservation Authorities, legislated under the Conservation Authorities Act, are organized on a watershed basis, and are mandated to “ensure the conservation, restoration and responsible management of Ontario’s water, land and natural habitats through programs that balance human, environmental and economic needs” (Conservation Ontario, 2018).

Prince Edward Island

Provincial scale - Department of Communities, Land and Environment; PEI Water Act ("Water Act," 2017) Article 2 (a): the Government has a guardianship role to play in ensuring that the quality, quantity, allocation, conservation and protection of water is managed in the interests of a common good that benefits and accommodates all living things in the province and their supporting ecosystems; management is at a watershed scale.



Quebec

Provincial scale - Ministère du Développement durable, de l'Environnement et des Parcs's (MDDEP) is the primary agency responsible for the implementation of the regulatory framework governing water allocation. Ministry office in charge of administration of authorization certificates for water taking: Direction générale des opérations régionales; Ministry office in charge of water policy: Direction générale des politiques (de Loë *et al.*, 2007).

Yukon

Territorial scale- Yukon's Executive Council Office administers the Yukon Water Board, an independent administrative tribunal established under the Waters Act ("Waters Act," 2003). The Board determines whether or not to grant an application for water use, and the terms and conditions under which the right can be exercised (Salvin, 2018).

US – Great Lake States

Illinois

State scale - The State of Illinois uses two departments to manage its waters. The Water Use Act of 1983 (Illinois General Assembly, 1983) granted the power to the Department of Agriculture to manage its groundwater's for public interest. The Illinois Department of Natural Resources (ILDNR) has jurisdiction of Illinois' surface waters from the Rivers, Lakes, and Streams Act [615 ILCS 5]. The ILDNR also regulates the allocation of water from Lake Michigan, through the Level of Lake Michigan Act [615 ILCS 50] and the Kaskaskia River watershed through the Kaskaskia River Watershed and Basin Act [615 ILCS 75].

Indiana

State scale - The Department of Natural Resources (INDNR) manages water resources within the state ("Water Resource Management Act," 1983); regional management terms as well through the Great Lakes Compact and the Upper Mississippi River Basin Association.

New York

State scale - The Department of Environmental Conservation (DEC) is responsible for planning for the protection, conservation, and development of state water resources. New York Environmental Conservation Law (2012); regional role played by interstate basin commission compacts as well (e.g., SRBC (Susquehanna River Basin Commission) and the DRBC (Delaware River Basin Commission)), which can approve permitting.



Michigan

State scale - With limited exceptions, surface water bodies are held in trust by the state via the Department of Environmental Quality for the public. Groundwater is not subject to the public trust. Groundwater and surface water are managed as parts of one hydrologic system at the regional level through the Great Lakes-St. Lawrence River Basin Compact. Part 327, "Great Lakes Preservation," of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA), is Michigan's statute containing the Great Lakes-St. Lawrence River Basin Compact (Part 342 of the NREPA).

Minnesota

State scale - Minnesota Statutes Chapter 103G requires the Department of Natural Resources to manage water resources to ensure an adequate supply to meet long-range seasonal requirements for domestic, agricultural, fish and wildlife, recreational, power, navigation, and quality control purposes. The water itself is a public trust resource. Minnesota Department of Natural Resources administers the water use permit program on a statewide basis. Local soil and water conservation districts, watershed districts, cities etc. have an opportunity to comment on permit applications to ensure consistency with local water and land management plans.

Ohio

State scale - Under Statute 1521 "Conservation of Natural Resources", waters of the state include all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and other bodies or accumulations of water, surface and underground, natural or artificial, (regardless of the depth of strata in which underground water is located) that are situated wholly or partly within or border on this state or are within its jurisdiction. The state is divided into two watersheds - the Ohio River and Lake Erie Watersheds. The Lake Erie Watershed is governed by water withdrawal regulations that were adopted as part of the Great Lakes Compact. The Department of Natural Resources is the main agency that oversees and administers water withdrawals and water quantity concerns.

Pennsylvania

Regional and state scales - ownership of water not vested in the right of the state; Department of Environmental Protection charged as trustee of the common property resource; DRBC (Delaware River Basin Commission) and SRBC (Susquehanna River Basin Commission) provide regional authority for water withdrawals and diversions within their respective basins.



Wisconsin

State scale - The Wisconsin Constitution provides the state with direct authority over water for purposes of public trust; Wisconsin Statute 281.11 ("Water and Sewage," 2011) – The Department of Natural Resources is charged with serving “as the central unit of state government to protect, maintain, and improve the quality and management of the waters of the state, ground and surface, public and private...”; permitting handled both statewide and regionally.

US – Non-Great Lake States

California

State scale - California Water Resources Control Board - Water Rights Division. The responsibility of the Board is:

To preserve, enhance, and restore the quality of California's water resources and drinking water for the protection of the environment, public health, and all beneficial uses, and to ensure proper water resource allocation and efficient use, for the benefit of present and future generations.

California Water Code Division 1. General state powers over water ch.102 states that “All water within the State is the property of the people of the State, but the right to the use of water may be acquired by appropriation in the manner provided by law” (“Water Code DIVISION 1. GENERAL STATE POWERS OVER WATER [100 - 540],” 1943).

Florida

State and regional scales - Riparian and common law structure; - Florida Department of Environmental Protection is responsible for water quantity management. However, water management is also shared by five districts: (1) Southwest Florida Water Management District (SWFWMD), (2) Northwest Florida WMD, Suwannee River WMD, (3) St. Johns River WMD, (4) South Florida WMD, and (5) Suwannee River Management District (SRWMMD). Chapter 373, Florida Statutes enables and directs the five water management districts to regulate water use within their jurisdictional boundaries.



Montana

State and court scales - Montana Department of Natural Resources and Conservation (DNRC). Water rights in Montana are broken down into two groups. Water rights that were established prior to July 1, 1973 are administered by the Adjudication Bureau and under the jurisdiction of the Montana Water Court. Water rights that were established from July 1, 1973 through the present are administered by the New Appropriations Program of the DNRC (Montana Department of Natural Resources & Conservation, 2018e). Under Article IX of the Montana Constitution, all waters belong to the state for the use of its people and are subject to appropriation for beneficial uses. Legal structure is hybrid - primarily prior appropriation - first in time, first in right. There is no hierarchy of uses in Montana Water Law.

North Carolina

State scale - North Carolina Department of Environmental Quality, Water Resources Division; The Division of Water Resources is divided into administrative offices and five sections: (1) Public Water Supply, (2) Water Planning, (3) Water Quality Permitting, (4) Water Quality Regional Operations and (5) Water Sciences. These sections work together to “protect the state's surface water and groundwater resources through quality monitoring programs, efficient permitting, responsible management, fair and effective enforcement and excellence in public service” (North Carolina Department of Environmental Quality, 2018a). For an organizational chart of the Department please see: <https://files.nc.gov/ncdeq/Water%20Resources/DWR%20Ochart-Feb%202018.pdf>

International

England/Wales

National scale- Department for Environment, Food and National Rural Affairs; Welsh Government; Environment Agency; Natural Resources Wales.

New Zealand (Waikato Region)

Regional scale- Waikato Regional Council



South Australia

State scale - Department of Environment, Water and Natural Resources; Natural Resource Management Boards are responsible for preparing Water Allocation Plans for all “prescribed” water resources, which could be at the scale of catchment(s) or a groundwater area (aquifer or portion of aquifer).; DEWNR licenses water allocations for individual uses (site scale), consistent with policies in the Water Allocation Plans (Department of Environment, 2018).

7.2 WHAT IS THE TYPE OF DOCTRINE/SYSTEM OF WATER ALLOCATION?

Canada

British Columbia

Water licencing or use approval (collectively called ‘authorizations’) are subject to the first in time, first in right system of prior allocation and is applied to both groundwater and surface water (Precedence of rights: Water Sustainability Act s. 22). BC does not have any form of riparian right. While all water licences are appurtenant to land, a person can apply for water that is on another person’s land or can cross another person’s land as long as that person gives permission (Vigano, 2018). A person can also expropriate land for the purposes of accessing water. Note also that surface runoff is not vested in the crown. The only place where surface runoff may be managed is through water objectives (s. 43) and water sustainability plans (s. 64-85).

Manitoba

Hybrid system – Licence-based; right to divert based on riparian and groundwater rights with domestic (<9dam³) exceptions; formally prior allocation based on precedence of license according to application submission date

New Brunswick

No rights-based system; permits are required for water withdrawals from surface water

Ontario

Common Law / Riparian Rights modified by statute. Water Takings are regulated under the Ontario Water Resources Act (OWRA) and its regulations. Their purpose is to “provide for the conservation, protection and management of Ontario’s waters and for their efficient and sustainable use, in order to promote Ontario’s long-term environmental, social and economic well-being”. The legislation provides for a permit system that governs the taking of large



amounts of surface or ground water (greater than or equal to 50,000 litres per day) (Ontario Ministry of Environment and Climate Change, 2018).

Prince Edward Island

Riparian rights under common law apply to surface water for smaller withdrawals; the Province has vested ownership over water, and also claims “guardianship” under the Water Act (“Water Act,” 2017) for both groundwater and surface water. “Overall ... there is a lack of competition for groundwater in PEI which normally prevents prioritization of uses from becoming an issue” (Nowlan, 2005). To this effect, PEI’s Water Act (“Water Act,” 2017) Part I s. 2(a) states

(a) the Government has a guardianship role to play in ensuring that the quality, quantity, allocation, conservation and protection of water is managed in the interests of a common good that benefits and accommodates all living things in the province and their supporting ecosystems;

PEI’s Water Act (“Water Act,” 2017) Part I s. 3 states:

Control of water resources vested in the province. The control of the water resources within the jurisdiction of the province is declared to be, and to have always been, vested in Her Majesty in right of the province, and no right to use, divert or withdraw water from the water resources can be, has been, or ever could have been, acquired by prescription.

Quebec

Riparian. No water use priorities have been established. The Quebec Water Policy (Ministère de l'Environnement du Québec, 2002) addresses this: “Recognition of Water as a Collective Heritage of All Quebecers: The Québec government first wishes to reaffirm, through this Policy, its determination to recognize this resource as a valuable asset of Québec society and an integral part of its collective heritage. Water, both surface and groundwater is recognized in the Civil Code of Québec as something whose use is common to all, subject to rights of use or limited appropriation rights that may be recognized. This “common to all” status implies that all members of society have the right to access water and use it in a manner consistent with its nature, and that the government has a responsibility to regulate water use, establish priority uses and preserve its quality and quantity, while taking the public interest into account. Therefore, the government intends to create the necessary instruments so that they may give



precedence, in the event of conflict, to the fundamental right of individuals to access this resource for their basic needs.”

Yukon

First in time principle - Waters Act ("Waters Act," 2003) s.27 “(1) Where two licensees have licences permitting the use of waters, the licensee who first filed an application with the Board in accordance with the regulations made under paragraphs 31(1)(d) and (e) is entitled to the use of waters in accordance with that licensee's licence in precedence to any use of the waters by the other licensee. (2) Subsection (1) applies, with such modifications as the circumstances require, in respect of any rights acquired by a licensee through an amendment to the licensee's licence. (3) Subject to subsection (2), a licence that has been renewed or assigned shall, for the purposes of this section, be deemed to be a continuation of the original licence”.

US – Great Lake States

Illinois

Water Use Act of 1983 establishes doctrine of reasonable use for groundwater doctrine; prior to 1983 groundwater was unsettled as apparent in common law *Edwards v. Haeger*, 1899; *Behrens v. Schaninghausen*, 1959; and *Lee v. City of Pontiac*, 1981. Surface water is guided by riparian doctrine and reasonable use rule which was established by *Evans vs. Merriweather*, 1842.

Indiana

Registration system for surface and groundwater withdrawals.

New York

Permitting system based on common law; riparian doctrine (*Bromberg v. Elish, Inc.*, 64 A.D.2d 684, 685 (N.Y. App. Div. 1978)). Both riparian and littoral owners are subject to the rule of reasonable use. A riparian owner's use must be reasonable and must not unreasonably interfere with other riparian owners' uses (*Barkley v. Wilcox*, 86 N.Y. 140, 146-47 (N.Y. 1881)). The Delaware River Basin Commission and the Susquehanna River Basin Commission are responsible for permitting within their respective basins within the state.



Michigan

Michigan's water law is based on riparian doctrine and common law; large quantity withdrawals are subject to reasonable use doctrine. MCL 324.32728 states that nothing in Part 327 of the NREPA shall be construed to affect, or in any way alter or interfere, with common law water rights or property rights.

Minnesota

Permitting system based on the English common law doctrine of riparian rights and the concept of reasonable use. Water Appropriation Permit Program (Minnesota Statutes (103G.255 to 103G.315) and Minnesota Rules (6115.0600 – 6115.0810) provide authority and criteria for implementation of permit program)

Ohio

The doctrine of riparian rights governs surface water, which is restricted by common law; reasonable use doctrine is applied to both surface and groundwater (R.C. §1521.16 and 1521.17). This right to a reasonable use is a property right protected by Article 1 Section 19b of the Ohio Constitution.

Pennsylvania

Water allocation permit system followed by the state and interstate river basin commissions based on riparian doctrine and common law; withdrawals subject to reasonable use doctrine. In the Delaware River Basin, as guided by the Delaware River Basin Compact, and the Susquehanna River Basin, as guided by the Susquehanna River Basin Compact, both surface and ground water are the responsibility of interstate commissions. For the rest of the state, only surface water is included in permitting (Credit Valley Conservation Authority & Grand River Conservation Authority, 2003).

Wisconsin

The doctrine of riparian rights governs private surface water rights and is restricted by common law and reasonable use doctrine; groundwater and surface water withdrawal are regulated by either Water Use General Permits or Water Use Individual Permits within the Great Lakes Basin.



US – Non-Great Lake States

California

Hybrid, primarily prior appropriation riparian and appropriative surface water rights:

California law allows surface water to be diverted at one point and used (appropriated) beneficially at a separate point. This is in contrast to a riparian right, which is based on ownership of the property adjacent to the water. An appropriative right to use water exists without regard to the special relationship between land and water. It is based on physical control, beneficial use and, if initiated after 1914, on a permit or license. Appropriative rights may attach to surface water that exists in excess of superior riparian claims, and to groundwater. They depend upon continued use and may be lost by non-use. Appropriative rights may be sold or transferred. Unlike riparian rights, long-term storage of water is considered an acceptable exercise of an appropriative right (Water Education Foundation, 2018).

California Constitution ("California Constitution," 1879) Article 10 Water specifies some riparian rights, but is limited to riparian parcel (AMEC, 2008). Recognizes pueblo water rights (Spanish Law):

In addition to riparian and appropriative water rights, there are two other types of surface water rights in California: pueblo rights and federal reserved rights. California cities that are successors of Spanish or Mexican pueblos (settlements), and followed claim procedures establishing their pueblo rights, possess a paramount right to the beneficial use of all needed, naturally occurring surface and subsurface water from the entire watershed of the stream flowing through the original pueblo. Water use under a pueblo right must occur within the modern city limits, and excess water may not be sold outside the city. The quantity of water available for use under a pueblo right increases with population and with extensions of city limits by annexation of land not within the original pueblo (Foundation, 2018)

Florida

Riparian and common law structure.



Montana

Hybrid - primarily prior appropriation - appropriate for beneficial use; since 1973 new rights can only be acquired via a permit.

North Carolina

Riparian - Can take water for use as long as the rights of other users are not impaired (common law right) (AMEC, 2008).

International

England/Wales

Common Law and Roman/Statutory Law - "Entitlements can be unbundled from property titles, riparian entitlements and defined by a system of prior appropriation, where reliability is a function of the year when the entitlement was first issued" (OECD, 2015).

New Zealand (Waikato Region)

Water is allocated on a "first-in, first-served" basis.

South Australia

"The Natural Resource Management Act 2004 provides rights in relation to the ability of a person to access take and use water. This means that riparian or common law rights to take water (e.g. water rights based on land ownership or possession) have been extinguished. According to South Australia's Principal Policy Officer Laurie Poppleton (Poppleton, 2018):

The fact that no one owns water in South Australia is because common law rights have been extinguished. Extinguishing common law rights sets up a common foundation for all water users and is the key premise for the management of water by the Government. The Government reserves the right to manage water for the benefit of the community. As a common commodity that can't be owned, the Government is able to create systems that allow the taking and use of water in ways that are considered fair and equitable to the wider community, thereby allowing access to this common commodity on conditions that are acceptable to (the majority of) the community. In high value, high demand water resources, the Government system of management includes water licensing which essentially manages the common water resource by creating entitlements to access the water in the resource. In this



case, what is owned is not the water but rather an entitlement to access an amount of water as defined by the conditions on a water licence. These entitlements are considered intangible property in that nothing is physically owned (unlike land for instance) but rather the ownership relates to an access right, and as an access right to a limited resource it has a monetary value and a tradeable value.

In South Australia, no one owns water but rather the Government reserves the right to manage water. In prescribed water resources the taking of water is managed by a water licensing regime. Prescribed water resources are those resources that are considered to be high value and high demand water resources that require the management provided by a licensing regime. This is the highest level of management available to a water resource. Groundwater, water in watercourses or water running off land (surface water) can all be prescribed. High value, high demand water resources are those that are important for supplying water for towns and cities, for commercial purposes such as irrigation, and are critical to water dependent ecosystems. They are usually water resources that are approaching or are at the limits of sustainable use. A water resource is prescribed by a regulation (subordinate legislation) made by the South Australian Governor on recommendation of the Minister for Environment and Water. The process is set out in section 125 of the *Natural Resources Management Act 2004* (Poppleton, 2018). Water licenses provide an entitlement to access a share of the available water resource. These water rights may have a monetary value on the water market and may be able to be bought and sold, or traded. As personal property rights, it may be possible for these water rights to be leased, bequeathed and used as collateral” (Government of South Australia, 2018).

Licenses for water allocation and withdrawal are only required for water resources that are prescribed under the NRM Act (i.e., if you're not within a prescribed area, you don't need an allocation license). Within prescribed areas, water used for domestic and livestock watering are exempt from the licensing requirement. In prescribed areas water for domestic and/or livestock watering can either be exempt from requiring a licence or can be required to have a licence, depending on how the regulation declaring the prescribed resource is written up. In South Australia there are a few areas where water used for domestic and stock watering does require a licence (Poppleton, 2018).



7.3 HOW ARE DIFFERENT WATER USERS IDENTIFIED (BY VOLUME OR PURPOSE OF USE)?

Canada

British Columbia

The *Water Sustainability Act* (WSA s. 2) establishes the water use purposes. The *Water Sustainability Regulation*, the *Water Sustainability Fees, Rentals and Charges Tariff Regulation* and the supporting *Definitions for Water Use Purposes and Categories of Water Use Purposes* (Government of British Columbia, 2016b) document provide additional detail as to the more specific nature of water use within these water use purposes. Water use purposes include: conservation purpose (construct works, stored water, use of water), domestic purpose (drinking water, food preparation and sanitation; fire prevention; providing water to animals or poultry kept for household use or as pets; irrigation of garden not exceeding 1000 cubic meters), industrial purpose (camp and public facility, commercial enterprise, cooling, crop harvesting and processing, fish hatcheries, fresh water bottling, greenhouse and nursery, heat exchange, ice and snow making, lawn/fairway/garden, miscellaneous industrial, pond and aquaculture, processing and manufacturing, pulp mills, residential heat exchange, swimming pool, vehicle and equipment, waste management, water well drilling and transportation or utility corridor management), irrigation purpose (general or water conveyed by a local provider), land improvement purpose (general or industrial rehabilitation or remediation purposes), mineralized water purpose (bottling and commercial distribution or commercial bathing pools), mining purpose (hydraulic, placer, processing ore, washing coal), oil and gas purpose (drilling, oil field injection (deep groundwater and other), hydraulic fracturing (deep groundwater and other)), power purpose (commercial, residential, general), storage purpose (stream storage (non-power and power), aquifer storage (non-power and power)), and waterworks purpose (water sales, other, water delivery, local provider).

While the WSA does not specify a particular volume for any particular water use, for the purposes of determining application fees and annual water rentals, some volume classes have been identified (see the *Water Sustainability Fees, Rentals, Tariffs and Charges Regulation*).



In most cases an application must be made for the right to use water under an authorization (e.g., water licence or use approval) and pay an application fee and annual rental water for use. Exceptions are found in s. 6 WSA and include domestic groundwater, unrecorded stream water for domestic purpose, water for prospecting for a mineral, extinguishing a fire and conducting a flow test. The Water Sustainability Regulation provides additional requirements where water use can occur without an authorization as long as the requirements of the regulation are met. For new uses, water use cannot commence until an authorization is granted.

Manitoba

Permit not needed for <25,000 litres/day for groundwater or surface water. License is required for use of water for domestic or industrial/agricultural purposes or use >25,000 Litre/day.

New Brunswick

The New Brunswick Regulation 90-80 (1990) states that all waterworks using greater than 50 cubic meters of water daily require a permit to operate, except in the case of a domestic well not connected to a distribution system. The Clean Environmental Act - Environmental Impact Assessment Registration, 1987 (Schedule A) indicates the specific undertakings that require a project to be registered under the EIA Regulation and a WSSA (Water Supply Source Assessment) to be completed. These undertakings are: (1) The development of a waterworks with a capacity greater than 50 cubic meters of water daily (Schedule A, Section (s)). This could include, but is not limited to, water supply wells for municipalities or industries, as well as, communal wells for housing developments. (2) All major residential developments outside incorporated areas (Schedule A, Section (t)). A WSSA would be required in cases where the area is not serviced by a municipal water supply.

Ontario

Volume and purpose of use. Ontario's Permit To Take Water (Ontario Ministry of the Environment, 2005b) identifies:

- The volume – total volume in a day
- Total days per year water will be taken
- The rate per minute of water taking
- The purpose of water taking (e.g., water supply, agricultural, industrial, commercial, etc.)
- The source of water taking (e.g. groundwater, watercourse, lake, pond)
- The name of the source if available



Proposals for water taking are classified according to their anticipated risk to the environment. There are 3 types of permit application categories: Category 1: is considered low risk and includes renewals where there is no history of complaints; Category 2: is for water takings with a greater potential to cause adverse environmental impact; and Category 3: is considered highest risk potential.

Prince Edward Island

Volume: "40. Daily rate (1) Except as permitted by the regulations, no person shall, on any day, withdraw water from a well, watercourse or wetland at a rate that exceeds 25 cubic metres per day ("Water Act," 2017)." (Note: the criteria below are for the current regime, to be replaced by the criteria above once the Act is proclaimed). Formerly: "A watercourse or Wetland Activity Permit is required when withdrawing water from a surface water body at a rate in excess of 50 igpm [imperial gallons per minute – 189,270.59 metric litres per minute] or when the total daily withdrawal exceed 10,000 imperial gallons [37,854.12 litres] (Ecofish Research Ltd. *et al.*, 2017)." The Environmental Protection Act Water Well Regulations Article 6 state "Groundwater exploration permit (1) No person shall construct a well (a) intended or required to be pumped at a rate of 4 litres per second or greater; or (b) intended to be used to provide water to a central water supply system, unless the person holds a groundwater exploration permit issued under subsection (2). Form and conditions (2) The Minister may issue a groundwater exploration permit to a well contractor, engineer or hydrogeologist which shall be in such form, and subject to such conditions as he sees fit."

Quebec

Purpose of use and volume: Water Resources Preservation Act ("Water Resources Preservation Act," 1999) differentiates users by purpose of use: water taken for electric power; water intended for human consumption (packaged in containers of 20 L capacity or less); water to supply dwellings; and water to supply vehicles. Need a water license for water withdrawal < 75,000 litres/day. Generally, need a provincial authorization as well if withdrawing 75,000 litres/day of water, or more. For agriculture, it is forbidden to withdraw more than 20% of the minimal flow in a watercourse. This flow is defined as the Q2-7, which is the lowest flow one year out of two, calculated over a period of 7 consecutive days.



Yukon

Purpose of use and volume - Waters Act ("Waters Act," 2003) sets criteria and thresholds for Type A and Type B licences for amount and type of water use including mining, power, industrial, agricultural, and recreational. "Water use threshold to licence requirement of 100 m³/day for industrial, municipal, Msc. Water Use threshold to licence requirement of 300 m³/day for agriculture, conservation, mining, recreation" (Ecofish Research Ltd. *et al.*, 2017). Water licences fall into nine categories: Agricultural (AG), Conservation (CN), Hydro (HY), Industrial (IN), Municipal (MN), Miscellaneous (MS), Placer (PM), Quartz (QZ), and Recreational (RE). Other criteria that can trigger the requirement for a water licence under the Waters Regulation include watercourse crossings, diversions, and the deposit of waste (Water Resources Branch, 2014).

US – Great Lake States

Illinois

According to the Water Use Act, a high capacity well is any well with the capacity to withdraw >100,000 gallons (378,541.18 litres) per day from a groundwater source. The Dept. of Agriculture requires high capacity well users to register. A High-capacity intake is one with the capacity to withdraw >100,000 gallons (378,541.18 litres) per day from a surface water source. In Illinois, permits are not required for the sole activity of withdrawing water from a ground or surface water source. If the withdrawal involves construction of a permanent intake structure in a public body of water an ILDNR, Office of Water Resources (ILDNR/OWR) permit will be required. These permits will generally be subject to special conditions restricting the withdrawal of water during periods of low flow to prevent adverse effects on navigation, natural resources or other public interests in the public body of water. The ILDNR/OWR issues allocations for the withdrawal of water from Federal Reservoirs. The IDNR/OWR also oversees the allocation of water from Lake Michigan. This program provides Lake Michigan water to approximately 7,000,000 users in Northeastern Illinois. All entities wishing to divert water from Lake Michigan must first apply for and receive an Illinois Lake Michigan Water Allocation permit from the IDNR/OWR. All Lake Michigan Water Allocation permittees are subject to conservation requirements including but not limited to a maximum limit of percent of non-revenue water to water supplied. All Lake Michigan Water Allocation permittees are required to submit an annual water use audit form (LMO-2). In addition to the LMO-2 form all direct diverters are required to submit monthly water use forms (LMO-3).



Indiana

Indiana does not require groundwater permits. However, for a high-capacity water well, it may be necessary to register the well as a Significant Water Withdrawal Facility (SWWF). A SWWF includes any combination of wells, surface water intakes, and pumping apparatus that supply, or can supply, at least 100,000 gallons (378,541.18 litres) per day to a common collection or distribution point. Additionally, under the Navigable Waterway Rights Act (2015), a permit is required for any withdrawal volume from a navigable waterway.

New York

Under Environmental Conservation Law (ECL) Article 15, Title 15 water withdrawal permits are required for any type of surface or groundwater withdrawal of 100,000 gallons (378,541.18 litres) per day or more. Uses that require a permit for activities include: withdrawal from an existing or new source, increased withdrawal from permitted source, taking of land, construction of water works, extension of a water supply system, provision of water to other states, significant change in permitted use.

Michigan

By volume: 324. Sec. 32723.(1) Except as provided in subsection (13), the following persons shall obtain a water withdrawal permit prior to making the withdrawal:

(a) A person who proposes to develop withdrawal capacity to make a new withdrawal of more than 2,000,000 gallons [7,570,823.568 litres] of water per day from the waters of the state to supply a common distribution system. (b) A person who proposes to develop increased withdrawal capacity beyond baseline capacity of more than 2,000,000 gallons [7,570,823.568 litres] of water per day from the waters of the state to supply a common distribution system. (c) A person who proposes to develop withdrawal capacity to make a new or increased large quantity withdrawal of more than 1,000,000 gallons (3,785,411.78 litres) of water per day from the waters of the state to supply a common distribution system that a site-specific review has determined is a zone C withdrawal. (d) A person who proposes to develop a new or increased withdrawal capacity that will result in an intrabasin transfer of more than 100,000 gallons (378,541.18 litres) per day average over any 90-day period.



Minnesota

Minnesota requires a water use (appropriation) permit for users withdrawing more than 10,000 gallons [37,854.12 litres] of water per day or 1 million gallons [3,785,412 litres] per year for both surface and groundwater.

Ohio

Section 1521.16 of the Ohio Revised code requires any owner of a facility, or combination of facilities, with the capacity to withdraw water at a quantity greater than 100,000 gallons (378,541.18 litres) per day (about 70 gallons per minute) to register such facilities with the Ohio Department of Natural Resources Division of Soil and Water Resources. It is important to note that the law requires registration if a facility has the capacity to withdraw 100,000 gallons (378,541.18 litres) per day even if a lower volume is actually withdrawn. Registration under this program is not a permit to withdraw water, nor does registration impose any restrictions on withdrawals. Withdrawal registration requirements pertain to all of Ohio. Specific to Lake Erie, a permit is required for a new or increased withdrawal or consumptive use directly from Lake Erie of at least 2.5 million gallons (9,463,529.46 litres) per day averaged over any 90 day period. A permit is also required for a new or increased withdrawal or consumptive use of at least one million gallons (3.8 million litres) per day, averaged over any 90 day period, from any river or stream or from ground water in the Lake Erie watershed.

Additionally, a permit is required for a new or increased withdrawal or consumptive use of one hundred thousand gallons (378,541 litres) per day from any river, stream, or segment, and the entire watershed upstream; if the river, stream, or segment is a high-quality water. If the drainage area upstream of the intake is greater than 100 square miles (259 square kilometers), there is a 90-day averaging period that applies to the permit requirement. If the drainage area upstream of the intake is less than 100 but more than 50 square miles (129.5 square kilometers), a 45 day averaging period applies. If the drainage area upstream of the intake is 50 square miles (129.5 square kilometers) or less, no averaging period applies. High quality water means a river or stream segment that has been designated by the EPA under Chapter 3745-1 of the Administrative Code as an exceptional warm water habitat, cold water habitat, outstanding state water, or superior high-quality water.

The following are exempt from the permit requirement: [1] a new facility whose proposed withdrawal and consumptive use capacity is below the applicable threshold quantity; [2] an existing facility whose proposed increase in withdrawal and consumptive use capacity is below the applicable threshold quantity; [3] a new facility whose actual maximum daily withdrawal



will be less than the applicable threshold quantity when averaged over any 90-day period (45-day period if the withdrawal is from a high quality river or stream and the drainage area at the withdrawal point is between 50 and 100 square miles (129.5 and 259 square kilometers)); [4] an existing facility whose increase in actual maximum daily withdrawal will be less than the applicable threshold quantity when averaged over any 90-day period (45-day period if the withdrawal is from a high quality river or stream and the drainage area at the withdrawal point is between 50 and 100 square miles (129.5 and 259 square kilometers)); [5] an existing electric generating facility that increases its consumptive use due to a requirement imposed by federal regulation that is unrelated to an increase in electricity production; [6] a facility that is making a withdrawal for purposes other than industrial use or public water supply from an impoundment collected primarily from diffused surface water sources, including a farm pond, golf course pond, nursery pond, storm water retention pond, or other private pond; [7] a facility that is making a withdrawal for purposes other than industrial use or public water supply from a river or stream to augment the water supply of an impoundment used for firefighting purposes; [8] a facility that must temporarily establish a new or increased withdrawal and consumptive use capacity as a result of an emergency (for the duration of the emergency) that, without the new or increased capacity, would result in imminent harm to human health and property; [9] a facility that is establishing a new or increased withdrawal and consumptive use capacity in compliance with an experimental use permit; [10] a facility that must temporarily establish a new or increased withdrawal and consumptive use capacity in order to respond to a humanitarian crisis (for the duration of that crisis) if the new or increased capacity is necessary to assist in the management of that crisis; [11] a major utility facility that is subject to regulation under Chapter 4906 of the Ohio Revised Code or a facility that is increasing its withdrawal and consumptive use capacity directly related to supplying such a major utility facility; [12] a public water system whose increase in withdrawal and consumptive use capacity is proposed and reviewed in accordance with the requirements of §1501.33(C) of the Ohio Revised Code; [13] a facility that is subject to regulation under Chapter 1514 of the Ohio Revised Code; [14] a facility that purchases all of its water from a public water system; and [15] a facility that is withdrawing or consumptively using water from an off-stream impoundment that has been substantially filled with an existing stream withdrawal or a new or increased stream withdrawal that is subject to a withdrawal and consumptive use permit.



Pennsylvania

All withdrawals exceeding 10,000 gallons per day [37,854.12 litres] are registered through the Water Resources Planning Act (2002) ("Water Resources Planning Act," 2002) 27 Pa.C.S. Chapter 31

Permitted water uses identified as: public water supply agencies (surface water withdrawals only) ("Water Rights Law," 1939), 32 P.S. §631 et seq, hydroelectric and thermal-electric projects in non-navigable waters ("Limited Power and Water Supply Act," 1923), 32 P.S. §592 et seq, dams and encroachments ("Dam Safety and Encroachments Act," 1978), 32 P.S. §693.1 et seq., drillers and rigs ("Water Well Drillers License Act," 1956), 32 P.S. §645.1 et seq. public water systems ("Pennsylvania Safe Drinking Water Act," 1971), 35 P.S. §721.1 et seq.. All other withdrawals, surface or groundwaters, are subject to common laws that govern landowners to use water on their own property.

The Susquehanna River Basin Commission (SRBC) and the Delaware River Basin Commission (DRBC) grant water allocation permits for withdrawals of surface or groundwater greater than 100,000 gallons per day (378,541.18 litres). In addition, the DRBC requires permits for withdrawals greater than 10,000 gallons per day [37,854.12 litres] in Groundwater Protection Areas.

Wisconsin

Chapter NR 860 Water Use Permitting:

Water Use General Permit - Required for withdrawals that average 100,000 gallons per day (378,541.18 litres) or more in any 30-day period but do not equal at least 1,000,000 gallons per day (3,785,411.78 litres) for 30 consecutive days.

Water Use Individual Permit - Required for withdrawals that equal at least 1,000,000 gallons (3,785,411.78 litres) per day for 30 consecutive days.

s. 281.35, Wis. Stat. requires a water loss approval for new or increased withdrawals that will result in a water loss averaging 2,000,000 gallons (7,570,823.568 litres) per day in any 30-day period.

s. 281.17, Wis. Stat. states that a well may not be constructed, installed, or operated to withdraw groundwater where the capacity and rate of withdrawal of all wells on one property is more than 100,000 gallons (378,541.18 litres) per day without first obtaining the approval of the department.



s. 30.18, Wis. Stat. states that a permit is required for water loss of 2,000,000 gallons (7,570,823.568 litres) per day in any 30-day period, or for diversion of water from lakes and streams for the purposes of watering agricultural crops, tree plantations or golf courses

Water withdrawal approval required for well construction (s. 281.17, Wis. Stat.) and for the development/extension of water and sewage facilities (s. 281.41, Wis. Stat.).

Water withdrawal permit required for the diversion of water from lakes and streams (s. 30.18, Wis. Stat.), only an owner or lessee of riparian land can receive a permit to divert water.

US – Non-Great Lake States

California

Purpose of use - Sustainable ("Sustainable Groundwater Management Act ", 2014) Groundwater Management Legislation (7) describes agricultural, commercial, industrial, and residential users. California Water Code Division 1. General state powers over water ch.106 states that "It is hereby declared to be the established policy of this State that the use of water for domestic purposes is the highest use of water and that the next highest use is for irrigation" ("Water Code DIVISION 1. GENERAL STATE POWERS OVER WATER [100 - 540]," 1943).

Florida

Volume – "Rules regarding the trigger levels for permits and the degree of reporting of water use data vary from one district to another, with rules being more stringent in critical water use areas. In general, permits are required for all users having a cumulative average annual average daily consumption of 100,000 gallons (378,541.18 litres) per day, a capacity to use pump 1,000,000 gallons (3,785,411.78 litres) per day and, for wells greater than six inches in diameter, or withdrawals from surface water bodies with an intake diameter or cumulative intake diameter of 8 inches or greater. Some projects require an Environmental Resource Permit (ERP) before a WUP will be issued.

For example, in the Southwest Water district, there are three types of WUPs based on the amount of water used in one year: - Individual: 500,000 gpd (1,892,706 litres/day) or more- General: 100,000 gallons (378,541.18 litres) per day or more, but less than 500,000 gpd (1,892,706 litres/day) - Small General: less than 100,000 gallons (378,541.18 litres) per day (Ecofish, 2017).



In the St Johns River Water Management District, the same water quantity thresholds of permit tiers as the Southwest Florida Water Management District is used, however the permit titles are slightly different. This is explained in section 1.4.2 Thresholds in the SJRWMD Applicant's Handbook, 40C-2.041 Permits Required from SJRWMD Permitting of Consumptive Uses of Water (Ecofish Research Ltd. *et al.*, 2017).

Montana

§ 85-2-102(1), MCA, defines, in part, "appropriate" to mean "to divert, impound, or withdraw, including by stock for stock water, a quantity of water for beneficial use". "Montana law recognizes a wide range of beneficial uses including, but not limited to, agriculture, mining, stock, commercial, domestic, industrial, municipal, navigation, wildlife, fish and fish protection, power generation and recreational uses. § 85-2-302, MCA, discusses permitting of all new surface water and "big" groundwater new appropriations or changes to existing water rights. A permit is not required if a person proposes to develop a well or groundwater spring with an anticipated use of up to 35 gallons (132.489 litres) per minute and 10 acre-feet per year (12,334.8 cubic metres per year) § 85-2-306, MCA. (12 dam³)." (AMEC, 2008; Olsen, 2018).

North Carolina

Volume and rights – "Agricultural users who withdraw more than 1 million gallons (3,785,411.78 litres) per day (1,380 dam³ per year) or other users withdrawing more than 100,000 gallons (378,541.18 litres) per day (138 dam³ per year) are required to register with the state. Non-riparian landowners must obtain a registration. All registered water users have equal priority among themselves. Registrations must be renewed every five years" (AMEC, 2008).

International

England/Wales

Purpose and volume – Detailed information on the differentiation of water users was not found. However, the following does indicated charges by user. "Abstraction is charged in agriculture, domestic [exception abstractor who take less than 20m³/d from surface or ground water] and public water supply, and industrial and energy production. The charges are metered and reflect scarcity, as the costs vary for the size of the licence, how consumptive it is, the source of supply and when, in the year, the licence can operate" (Environment Agency Government of the United Kingdom, 2013b; OECD, 2015).



New Zealand (Waikato Region)

Purpose of use and volume (see Policy 18 Levels of Priority to Apply During Water Shortages in the Waikato Regional Plan). When water shortage conditions are not occurring, then the relevant water shortage (restriction or cessation of take) conditions do not apply (Davenport, 2018). See section 6.8 for detail on Policy 18 purpose and volume categories.

South Australia

All water taken for consumptive purposes in South Australia is regulated under the Natural Resource Management Act 2004. Consumptive purposes are defined as all water used for unlicensed purposes subject to section 124 of the NRM Act (primarily water used by the occupier of land for domestic purposes, e.g., drawing water from a well for supplying house needs, and for watering stock), plus all water on water licences irrespective of the purpose of use, plus water authorised by the Minister for Environment and Water to be used subject to section 128 of the NRM Act, plus all water held by the Minister in reserve subject to section 166/167 of the NRM Act. Essentially this is all water used for human purposes. It excludes water required by and set aside for environmental purposes such as the water needs of dependent ecosystems, aquifer throughflow, etc. (Poppleton, 2018). Under the Act, rights in relation to the ability of a person to take and use water include: water access entitlements and water allocations subject to a water licence, site use approvals, water resource works approvals, stock and domestic rights, and Notice of Authorisation under s128 of the Act (Government of South Australia, 2018).

7.4 ARE THERE MECHANISMS TO INCLUDE WATERSHED/AQUIFER SCALE CUMULATIVE/INCREMENTAL ADVERSE EFFECTS ASSESSMENTS IN WATER ALLOCATION DECISION-MAKING? IF SO, BY WHAT MECHANISMS?

Canada

British Columbia

The Water Sustainability Act has tools such as water objectives which can require statutory decision makers under a broad range of statutes to consider cumulative effects; future water sustainability plans can also support this requirement. Also, while not watershed (including aquifer) based, the cumulative withdrawals from a source are commonly considered across the province in the technical review of an application.



Under the Ministry of Forests, Lands and Natural Resource Operations & Rural Development and the Ministry of Environment and Climate Change Strategy, the use of Water Allocation Plans (Government of British Columbia, 2013) provides direction for the Water Manager or Comptroller of Water Rights when adjudicating water allocation decisions. The use of a Water Allocation Plan presents an opportunity to undertake a comprehensive supply/demand analysis for an entire watershed; however, the use of allocation plans are not widespread in BC (Vigano, 2018).

Additionally, BC is in the process of developing a cumulative effects framework (Government of British Columbia, 2016a). This framework establishes procedures for cumulative effects assessment and management in resource decision-making.

Manitoba

Yes, Regional Cumulative Affects Assessment through Ministry of Sustainable Development required for all Manitoba Hydro projects and associated infrastructure in the Nelson River sub-watershed (joint Manitoba Hydro and Manitoba Government action). The Regional Cumulative Effects Assessment is intended to address Clean Environment Commission non-licensing recommendation 13.2 from the 2013 Clean Environment Commission Bipole III Report (Manitoba Clean Environment Commission, 2013), that states:

“Manitoba Hydro, in cooperation with the Manitoba Government, conduct a Regional Cumulative Effects Assessment for all Manitoba Hydro projects and associated infrastructure in the Nelson River sub-watershed; and that this be undertaken prior to the licensing of any additional projects in the Nelson River sub-watershed after the Bipole III project.” To date, the Manitoba Government and Manitoba Hydro have developed an agreed to Terms of Reference that outlines a joint approach for the government and Manitoba Hydro to undertake a Regional Cumulative Effects Assessment of hydroelectric developments in a manner that addresses Clean Environment Commission Recommendation 13.2. The Terms of Reference provide for a 2-phase approach to undertaking the Regional Cumulative Effects Assessment, and outline the scope of the assessment, the approach to the study, end products, a process for collaboration between the Manitoba Government and Manitoba Hydro, and a project schedule (Manitoba Hydro). Consideration for cumulative effects with respect to water quantity is not noted elsewhere in Manitoba legislation or policy.



New Brunswick

Consideration for cumulative effects in water allocation decision making not formalized in Clean Water Act or supporting regulations.

Ontario

Broad authority exists in the current PTTW framework to consider the cumulative impacts of water takings at a regional scale (e.g., sub-watershed). This authority is at the Director's discretion. There is limited guidance provided in PTTW Manual for what could trigger regional scale actions (e.g., recurring drought conditions according to OLWR), methods to undertake a regional assessment or to develop a management strategy. Additionally, the Water Taking and Transfer Regulation identifies "high use watersheds" and prohibits new/increasing high consumptive water takings (e.g., where water is incorporated into product) in these areas (Ontario Ministry of Environment and Climate Change, 2017, 2018). This approach to managing highly consumptive water takings high use watersheds is a type of cumulative effects assessment at a tertiary watershed scale.

At the permit scale, the Permit to Take Water Manual (Ontario Ministry of the Environment, 2005a) provides guidance to consider cumulative effects in evaluating a permit application. For example, principle #4 states that the

Ministry will consider the cumulative impact of water takings. Where relevant information about watershed/aquifer conditions exists (e.g., water availability and potential impacts to the environment and other uses) the Ministry will take this into account when reviewing individual permit applications. Where the Ministry believes that cumulative impacts need to be considered, the Ministry may initiate a watershed scale or aquifer scale assessment beyond a local-scale impact assessment, and may engage water takers to collectively reduce the burden on the watershed and to better manage the demand for water.

This is supported by Section 4(2)2A of O.Reg. 387/04, which states that one of the matters to be considered by the Director with regards to a PTTW, is whether the taking may have an impact on the water balance and sustainable aquifer yield.



At a Great Lakes Basin scale, the Ontario Water Resources Act ("Ontario Water Resources Act," 1990) s.34.6 includes requirements for the Ministry to publish, consider, and potentially respond to regional cumulative impact assessments that are required to be completed under the Great Lakes – St. Lawrence River Basin Sustainable Water Resources Agreement.

Prince Edward Island

A Guide to Watershed Management Planning on Prince Edward Island identifies recommended watershed plan elements for the province; Prince Edward Island is currently developing a strategy to guide the watershed program on the Island in collaboration with the Watershed Alliance. Prince Edward Island has no plans to create mandatory requirements but does encourage best practices through its third-party funding allocations" (Canadian Council of Ministers of the Environment, 2016a). Surface water extraction must be stopped when the maintenance flow in the stream is less than 70% of the median monthly flow as measured from a monitoring station. Pumping test and numerical modelling tools are used to determine stream flow impact by proposed well to extract groundwater (Ecofish Research Ltd. *et al.*, 2017). Groundwater withdrawals must not cause a reduction in stream baseflow of more than 35% of monthly values during the low flow periods of July – September.

Allocation decisions are made on the basis of collective water demand in a watershed, not just the demand by the proponent. For groundwater, in addition to the provisions regarding baseflow reduction, groundwater extraction is not to exceed 50% of the estimated annual recharge to the aquifer. While "geologically" the Province is underlain by essentially a single, relatively flat lying sandstone aquifer, there are many individual groundwater flow systems, the boundaries of which are generally defined by surface watershed boundaries. This makes the calculation of water budgets and application of the surface water and groundwater extraction criteria simpler than might be the case in more complex geological environments.

Provisions on Water Management Areas have been legislated in PEI's Water Act s.25 (1-2) ("Water Act," 2017). Four types of provisions have been created with a recommendation by the Minister for a designated water management area:

(1) Where, in the opinion of the Minister, it is in the public interest having regard to the purpose of this Act to have special conditions apply to the management or use of water resources, or to activities, matters or things that may affect water resources, within one or more geographic areas of the



province, the Minister may, in accordance with this Part, recommend to the Lieutenant Governor in Council that the Lieutenant Governor in Council make regulations to designate the area as a water management area, using one of the following designations: (a) water sustainability plan area; (b) aquatic ecosystem protection area; (c) municipal water supply area; (d) well-field protection area.

Preliminary requirements (2) In assessing whether or not to recommend an area for designation as a water management area and what regulations should apply within the area, the Minister (a) may seek public input and the input of individuals with technical expertise in relevant fields; and (b) shall ensure that the requirements for assessment, consultation and notice and any other processes and procedures prescribed by this Part and the regulations have been followed before a recommendation is made.

The rationale for Water Sustainability Plan Areas is to allow for the development of plans to target water quality or quantity issues. Aquatic Ecosystems Protection Areas will recognize the importance in maintaining the integrity of populations of specific aquatic species; Municipal Water Supply Areas protect part or entire watersheds that are critical in their role in supplying the needs of large urban populations; and Well Field Protection Areas are designated specifically for the source protection of municipal drinking water supplies (PEI Department of Communities Land and Environment).

Quebec

No mechanisms. Quebec Water Policy (Ministère de l'Environnement du Québec, 2002) states that because Québec is a signatory to the Annex to the Great Lakes Charter, "Québec must ensure that the management of water withdrawals from the Great Lakes–St. Lawrence River system takes its concerns into account. These concerns relate to the cumulative impact of these withdrawals and to maintenance of the flow levels required for the health of the ecosystems and of the socio-economic activities involving the St. Lawrence...rules will be established taking cumulative impact into account in order to ensure sufficient flow for the development and continuing health of aquatic ecosystems, as well as to guarantee other public uses of water."



Yukon

The Waters Act ("Waters Act," 2003) s.12(4) states that:

Where an application for a licence is made, the Board shall not issue a licence unless the applicant satisfies the Board that (a) either (i) the use of waters or the deposit of waste proposed by the applicant would not adversely affect, in a significant way, the use of waters, whether in or outside the water management area to which the application relates, ... (b) compensation that the Board considers appropriate has been or will be paid by the applicant to any other applicant described in clause (a)(i)(B) but to whom paragraph (a) does not apply, and to (i) licensees to whom paragraph (a) does not apply, (ii) domestic users, (iii) instream users, (iv) authorized users, (v) authorized waste depositors, (vi) owners of property, (vii) occupiers of property, and (viii) holders of outfitting concessions, registered trapline holders, and holders of other rights of a similar nature who already were such licensees, users, depositors, owners, occupiers, or holders, whether in or outside the water management area to which the application relates, at the time when the applicant filed an application with the Board in accordance with the regulations made under paragraphs 1(1)(d) and (e), who would be adversely affected by the use of waters or deposit of waste proposed by the applicant, and who have notified the Board in response to the notice of the application given pursuant to subsection 21(1) and within the time period stipulated in that notice for making representations to the Board.

Later, and in reference to the above section of the same legislation, s.12 states "In determining the compensation that is appropriate for the purpose of paragraph (4)(b) [compensation], the Board shall consider all relevant factors, including, without limiting the generality of the foregoing, (c) the extent and duration of the adverse effect, including the incremental adverse effect;". Other than these tangentially related aspects of cumulative effects via incremental adverse effects, Yukon does not address cumulative effects comprehensively.



Yukon does not have a watershed-based approach in structure or planning (Canadian Council of Ministers of the Environment, 2016a). There are some mechanisms through which cumulative effects have the potential to be addressed in the Yukon – mainly through the Yukon Environmental and Socio-economic Assessment Act (YESAA) assessment and decision document terms, which the Board must implement. The YESAA mandates the assessors to assess cumulative effects. The Board can also consider these issues during licensing, particularly if they receive an intervention with evidence related to incremental adverse effects. However, the Waters Act does not specifically mandate the Board to address them. As Federal legislation, the Fisheries Act's authorization for placer mining in Yukon takes precedence over Provincial Acts, and is the legislative tools used for governance of placer mining water licences. It is a watershed based authorization that accounts for cumulative effects (Salvin, 2018).

US – Great Lake States

Illinois

The Great Lakes Compact applies only to waters from the Great Lakes and does not apply to the issuance of new or modification to existing Illinois' Lake Michigan Water Allocations. State laws permit reasonable use of water resources, but the courts often determine what is reasonable and resolve conflicts. Water withdrawals typically are not evaluated based on cumulative impacts or renewable yields (Illinois Department of Natural Resources, 2003).

Indiana

Under the Flood Control Act (IC 14-28-1) and 312 IAC 10 (Flood Plain Management) rules, the Natural Resources Commission must consider cumulative effects study (habitat loss, habitat fragmentation, habitat change, habitat enhancement or conversion) when assessing a proposed project that may result in flooding.

Significant water withdrawal facilities (SWWF) are subject to assessment by the DNR through the Emergency Regulation of Surface Water Rights Indian Code 14-25-5 when there is a significant lowering of the level of a freshwater lake and the SWWF is located 1/2 mile (1.3 square kilometer) from the lake. Assessment includes review of "significant environmental harm" which in Rule 312 IAC 11.5 is defined as "damage to natural or cultural resources, the individual or cumulative effect of which is found by the director to be obvious and measurable (based upon the opinion of a professional qualified to assess the damage)."



New York

ECL § 15-1501 following the Great Lakes Compact ensures that “the proposed water withdrawal will be implemented in a manner to ensure it will result in no significant individual or cumulative adverse impacts to the quantity or quality of the water source and water dependent natural resources, including aquatic life.”

Michigan

Natural Resources and Environmental Protection Act (Act 451 of 1994)

Sec. 32723(6)(b) “The withdrawal will be implemented so as to ensure that the proposal will result in no individual or cumulative adverse resource impacts. Cumulative adverse resource impacts under this subdivision shall be evaluated by the department based upon available information gathered by the department.”

Part 327 “Great Lakes Preservation” also takes into account the cumulative impact of withdrawals Sec. 32706e. “The department shall determine whether an adverse resource impact has occurred under this part and whether a withdrawal is a zone A, a zone B, a zone C, or a zone D withdrawal under this part based upon cumulative withdrawals affecting the same stream reach.”

With the Water Withdrawal Assessment Tool, cumulative impacts of large quantity withdrawals (over 70 gallons per minute – approximately 167 litres per minute) from the waters of the state, including all groundwater and surface water, are taken into consideration either through the WWAT tool or a site-specific review by the state before issuing water withdrawal permits. Cumulative effects using the WWAT are measured on a sub-watershed basis, which in Michigan can range in size from a few acres to 120 square miles (311 square kilometers). Sub-watersheds are designated as ‘water management areas’ and do not take into account downstream watersheds (Ecofish Research Ltd. *et al.*, 2017), except when a cold-transitional sub-watershed is immediately downstream of the affected sub-watershed. In that case, the stream flow depletion limits for the cold-transitional sub-watershed apply.

Minnesota

Minnesota Rule, 6115.0670 states that Minnesota DNR must consider the cumulative long-range ecological effects of the proposed appropriation from a basin.



Minnesota Statute 103G.287, subd. 1(c) requires an assessment of groundwater use proposals prior to drilling a new well so that a project proposer can make an informed decision whether or not to spend money on a well and other equipment in an area where they are unlikely to be successful in obtaining a water use permit from DNR.

Ohio

The Great Lakes—St. Lawrence River Basin Water Resources Compact (ORC § 1522) requires all parties “to coordinate the collection and application of scientific information to further develop a mechanism by which individual and Cumulative Impacts of Withdrawals, Consumptive Uses and Diversions shall be assessed” (Section 4.1). Cumulative effects assessments are not noted elsewhere in Ohio statute.

Pennsylvania

Concern for cumulative effects noted in Chapter 105 of the PA Administrative Code (section 14 and 18) for Water Obstruction and Encroachment Permitting, which is concerned with “any structure or activity which changes, expands or diminishes the course, current or cross section of a watercourse, floodway or body of water (including wetlands).”

Pa. Code §105.14(b)(14):

In reviewing a permit application under this chapter, the Department will use the following factors to make a determination of impact... (14) The cumulative impact of this project and other potential or existing projects. In evaluating the cumulative impact, the Department will consider whether numerous piecemeal changes may result in a major impairment of the wetland resources. The Department will evaluate a particular wetland site for which an application is made with the recognition that it is part of a complete and interrelated wetland area.

Pa. Code §105.18a Wetlands: To approve a permit, the Department must enter written finding that (a) for EV wetlands:

The cumulative effect of this project and other projects will not result in the impairment of the Commonwealth's exceptional value wetland resources... 25 Pa. Code § 105.18a(a)(6) and for non EV wetlands “The cumulative effect of this project and other projects will not result in a major impairment of this Commonwealth's wetland resources



Cumulative effects concern also regulated through the Federal Clean Water Act (General Permits Section 404) which is adhered to by Pennsylvania. Accordingly, 40 C.F.R. § 230.7 (a)(3) outlines that to issue a general permit for the discharge of dredge or fill material, the permitting authority (i.e., the state) must determine that the permitted activities “will have only minimal cumulative adverse effect” on water quality and the aquatic environment. Supporting regulations also require the permitting authority to set forth in writing its evaluation of cumulative impacts and include documented information supporting its finding of minimal cumulative adverse effect (40 C.F.R. §230.7(b)).

In the Delaware River Basin, the DRBC also has explicit regulation for Southeastern Pennsylvania for Ground Water Protected Areas (GWPA) that require cumulative effects assessment for withdrawals. The GWPA regulations incorporate a two-tiered system of water withdrawal limits:

The first tier serves as a warning that a subbasin is “potentially stressed”. In potentially stressed subbasins, applicants for new or expanded ground water withdrawals are required to implement one or more programs to mitigate adverse impacts of additional ground water withdrawals. Acceptable programs include: conjunctive use of ground water and surface water, expanded water conservation programs, programs to control ground water infiltration and artificial recharge and spray irrigation. The second tier serves as the maximum withdrawal limit. Subsequent amendments to Res. No. 1980-18 approved in 1999 set numerical ground water withdrawal limits that cannot be exceeded for certain watersheds that fall either entirely or partly within the GWPA (Delaware River Basin Commission, 2016a).

The Susquehanna River Basin Commission (SRBC) also has a similar groundwater management plan in place for the Susquehanna River Basin to manage groundwater resources. The plan recommends performing water budgets and cumulative impact analyses to manage ground water withdrawals to address any adverse impacts (Susquehanna River Basin Commission, 2005)

Wisconsin

Cumulative adverse impacts to quantity or quality of waters and water dependent resources are noted throughout s. 281.343, Wis. Stat. as a factor to be considered in water management and regulation for (1) the Prohibition of Diversions (281.343(4r), Wis. Stat.), (2) New or Increased Withdrawals and Consumptive uses (s. 281.343(4n)(d)4, Wis. Stat.), (3) as a Decision-making Standard (s. 281.343(4r), Wis. Stat.), and (4) for the explicit Assessment of Cumulative Impacts (281.343(4z), Wis. Stat.).



US – Non-Great Lake States

California

Ecofish: Not readily available

Florida

Cumulative effects of water withdrawal are monitored by each of the five Water Management Districts in Florida. The St. Johns River Water Management District uses a cumulative and a priori regulatory approach to water use such that “new allocations are not permitted until the effects of the proposed and existing water uses are assessed” (Ecofish Research Ltd. *et al.*, 2017; Neubauer *et al.*, 2008). As a result, all applications for water use are evaluated for unmitigated impacts to water quality, wetlands, minimum flow levels, existing legal users, and off-site land uses on both an individual and cumulative basis. If minimum targets for minimum flow/level cannot be met, there is a mandate that a 20-year prevention or recovery plan be developed and implemented. “Water use data are reported monthly, quarterly or annually, depending on the management district, with the exception of agricultural use, which is collected only in some areas of the state. The allowable flow reduction, which is referenced to as previous-day flows at a specified river gauge, can vary with season and with magnitude of flow and includes a ‘hands-off’ low flow threshold, meaning that all withdrawals are curtailed once the flow threshold is reached” (Ecofish Research Ltd. *et al.*, 2017). This approach is used for impacts to rivers only. A regional groundwater modeling approach is utilized to assess the impacts to minimum levels and minimum flows for lakes and springs on both an individual and cumulative basis.

Montana

Minimal – the Montana Environmental Policy Act s.75-1-208 on environmental review procedure specifies that “... (11) An agency shall, when appropriate, evaluate the cumulative impacts of a proposed project. However, related future actions may only be considered when these actions are under concurrent consideration by any agency through pre-impact statement studies, separate impact statement evaluations, or permit processing procedures.” However, cumulative impacts in this Act refers only to “collective impacts on the human environment” (“Montana Environmental Policy Act,” 2002).



North Carolina

The Clean Water Act (CWA) refers to cumulative effects in standards for issuance of permits by the North Carolina Environmental Management Commission. The Act states that the Commission must 'act on permits so as to prevent violation of water quality standards due to the cumulative effects of permit decisions.' (NCGS 143-215.1(b)(2))" (Louis Berger Group, 2001). "Applications for proposed [water] transfers require extensive public notice and public hearings on the proposed transfer are required. Factors considered when evaluating proposals include ...the cumulative effects on the source river basin" (AMEC, 2008). Senate Bill 1299 s.3.4 "Requires registration for withdrawals or transfers of surface or ground water of over 100,000 gpd" [378,541.18 litres per day] except for agricultural withdrawals or transfer, where the threshold remains 1 MGD)" (North Carolina Department of Environmental Quality, 2018b; "Senate Bill 1299 / S.L. 1998-168 (= H1473)," 1998)

International

England/Wales

The Town and Country Planning (Environmental Impact Assessment) Regulations ("The Town and Country Planning (Environmental Impact Assessment) Regulations," 2017) Regulation 5(4) (3)(g) specifies that for screening of a Schedule 2 Development [likely to have significant effects on the environment by virtue of factors such as its nature, size or location], the effects of the development on the environment [including water] must take into account "the cumulation of the impact with the impact of other existing and/or approved development". "The Catchment Abstraction Management Strategies (CAMS) ledgers contain details of all the abstraction licences (e.g., volumes and location and discharges) and are updated every time a new licence is issued, changed or revoked to inform future licensing decisions.

[T]he government periodically assesses water availability across all of its watersheds, or "catchments". Based on these assessments, an "Abstraction Licensing Strategy" is prepared for each catchment that outlines water availability in different parts of the catchment and how water takings (or "abstractions") are to be managed based on availability. Plans identify areas within a catchment where new applications for abstractions will be considered, as well as conditions for restricting water abstractions due to low flows. New or amended licences are typically time-limited with a common expiry date specific to the area they are in. This allows for periodic review and



potential changes to abstractions within an area where circumstances may have changed since licences were granted (ref req).

Each abstraction permit is added to CAMS ledger, which tracks water allocation, the Environmental Flow Indicator (EFI) and Hands Off Flows (HOFs), which are the threshold flows below which abstraction should cease or be very limited (Acreman et al. 2008), and other conditions that will be applied to licence applications. It also includes any local constraints that potential abstractors will need to be aware of such as higher levels of environmental protection for designated conservation sites, or where local information has shown that different amounts of water are available in the catchment (Benitez Sanz et al. 2012). The National Water Resources GIS (WRGIS) is the central system where abstraction, discharge, natural flows and complex impacts information from the CAMS ledgers is uploaded. The WRGIS uses this information to calculate the current resource availability for each waterbody (Benitez Sanz et al. 2012). Many licenses require that a meter to measure actual abstraction be installed and that the abstractor send records of meter reading or abstracted quantities annually to the EA (EA 2013). (Ecofish Research Ltd. *et al.*, 2017). In Wales, the Drought Plan (Dŵr Cymru Welsh Water, 2015) s.4.4.6 addresses cumulative and in-combination effects in the context of drought.

Finally, according to Section 6.1.8 of the Welsh Government's Department for Environment Food & Rural Affairs (2014) document, *Water Framework Directive implementation in England and Wales: new and updated standards to protect the water environment*, and in the context of drinking water supply:

When the cumulative impact of mitigation on the benefits provided by a use reaches a point beyond which it would become significant, any water bodies still classed as worse than Good Ecological Potential and for which no further mitigation can be put in place without a significant impact on use are re-classed as Good Ecological Potential. The [following] contains the definition of significant adverse impact on use that will be used on WR HMWB that are designated as heavily modified due to water supply or storage operated by water companies. The definition of Significant Adverse Impact on Use developed for WR HMWB (i.e. those designated for water supply and storage operated by water companies) is: "The Water Resources Zone affected by the HMWB will go into a supply-demand deficit during the planning period, or experience an earlier or increased deficit during the planning period."



New Zealand (Waikato Region)

Cumulative effects are the keystone of the Water Module of the Waikato Regional Plan. Specifically, Policy 11 (Consent Application Assessment Criteria – Surface Water) and Policy 12 (Consent Application Assessment Criteria – Groundwater) outline the factors that must consider when assessing resource water consent applications for groundwater/surface water “takes” and water use. The policies discuss these factors at length, and include cumulative effects with regard to Indigenous (Tangata Whenua) uses and values.

South Australia

Minimal- the South Australia Natural Resource Management Act ("Natural Resources Management Act," 2004) s.2 (9) states “(1) A person must act reasonably in relation to the management of natural resources within the State. (2) In determining what is reasonable for the purposes of subsection (1), regard must be had, amongst other things, to the objects of this Act, and to ... (g) the extent to which an act or activity may have a cumulative effect on any natural resources”.

The NRM Act provides authority for the state to prescribe water resources within the state. Once a resource (catchment, groundwater area) is prescribed, the local NRM Board is responsible for preparing a Water Allocation Plan for the resource, which is a mechanism to incorporate cumulative effects considerations into their water allocation decisions. The plans set policies for licensing existing water users, new water users (if water is available), trading water licenses, monitoring, and permitting water-affecting activities (e.g., dam and bore construction). The policies are based on the establishment of allocation limits with various management units (e.g., sub-catchments) within the area. The allocation limits are based on assessments of water supply(ies), environmental water requirements/provisions, and existing water user needs (Department of Environment, 2018). Section 76 of the NRM Act sets out the elements that must be included in a water allocation plan. The matters set out in section 76 lead to a consideration of the cumulative effects of allocations in the management of the water resource and the issuing of licences. The Objects of the Act – section 7—are also relevant (Poppleton, 2018).



7.5 ARE CONCERNS FOR INTEGRATED WATER MANAGEMENT (E.G., GROUNDWATER AND SURFACE WATER AND INTEGRATED GROUNDWATER AND SURFACE WATER) INCORPORATED INTO WATER ALLOCATION ASSESSMENT FRAMEWORKS?

Canada

British Columbia

The *Water Sustainability Act (WSA)* integrates stream water and groundwater in multiple ways. The dates of precedence on a source (e.g., a stream and hydraulically connected aquifer) are integrated. The development of water objectives, water sustainability plans, drilling authorizations, and the closing of a basin also consider integrated management principles (Vigano, 2018). Additionally, through the Policy for Mitigating Impacts on Environmental Values (Province of British Columbia, 2014), aquifers connected to sensitive streams are given specific consideration in decision-making for water use applications. A list of sensitive streams attached in the Water Sustainability Regulation is used to determine additional application requirements (for any type of application) and if granted, mitigation can be required to address any impacts, including compensatory mitigation.

Specific language requiring consideration for integrated groundwater and surface water is also noted in the WSA s. 130 (1) (h):

“establishing requirements for the protection of aquifers from activities that are capable of causing a significant adverse impact on

(i) the quality of groundwater in an aquifer, water in a stream that is recharged by the aquifer or groundwater in a well that draws from the aquifer, or

(ii) the existing uses made of groundwater from any well that draws from that aquifer or water in a stream that is recharged by that aquifer.”

Manitoba

N/A



New Brunswick

New Brunswick's Clean Water Act includes well field protection (Wellfield Protected Area Designation Order: Regulation 2000-47 s.5-6), watershed protection (Watershed Protected Area Designation Order: Regulation 2001-83 s.6) and water classification systems (Water Classification Regulation: Regulation 2002-13 s.18) additionally with the province's Biodiversity Strategy (Brunswick, 2009) there is a prioritization of integrated planning and management.

Ontario

Guidance and policies for the PTTW program emphasize the importance of managing both surface and groundwater and/or both water quantity and water quality, but the operational guidance provided in the PTTW Manual (Ontario Ministry of the Environment, 2005a) does not specifically mandate a comprehensive, integrated watershed management approach (Ontario Ministry of Environment and Climate Change, 2018).

Specifically, Ontario Regulation 387/04 Water Taking and Transfer ("Water Taking and Transfer," 1990) Section 4(2) states:

"The Director shall consider the following matters, to the extent that information is available to the Director, and to the extent that the matters are relevant to the water taking or proposed taking in the particular case: 1. Issues relating to the need to protect the natural functions of the ecosystem, including, i. the impact or potential impact of the water taking or proposed water taking on, A. the natural variability of water flow or water levels, B. minimum stream flow, and C. habitat that depends on water flow or water levels, ii. ground water and surface water and their interrelationships that affect or are affected by, or may affect or be affected by, the water taking or proposed water taking, including its impact or potential impact on water quantity and quality, and ii. the potential to restore the hydrologic conditions and functions of the source watershed."

Further, the PTTW Manual (Ontario Ministry of the Environment, 2005a) outlines several different ways in which groundwater and surface water must be considered. For example, it specifies that interrelationships between groundwater and surface water, including impact or potential impact on water quantity and quality, must be considered where information is available and relevant (Ontario Ministry of Environment and Climate Change, 2017).



Prince Edward Island

“Prince Edward Island does not have a formal mandate for IWM [*Integrated Watershed Management*] but it does fund plan development by local community groups and undertakes some capacity development activities to assist the local groups in developing plans. Watershed groups and projects that adopt a watershed approach to planning and management receive funding priority” (Canadian Council of Ministers of the Environment, 2016a). In 2013, the groundwater extraction policy was changed from an assessment of groundwater extraction as a proportion of annual recharge to an assessment of the effect of groundwater extraction on seasonal surface water flows in Prince Edward Island’s streams and rivers (Prince Edward Island Department of Environment, 2013).

Quebec

Quebec Water Policy (Ministère de l'Environnement du Québec, 2002): “It is from this integrated management perspective that the Québec government has appointed a Minister of State for the Environment and Water, whose primary role is to ensure consistency among all government actions pertaining to this resource. In particular, the Minister must coordinate the policies, programs, and various governmental, intergovernmental and international committees likely to have an influence on water and aquatic ecosystems. The Minister will perform these tasks working in collaboration with the ministers involved in water management, each according to their respective fields of expertise and pursuant to the laws and regulations that fall within their specific areas of responsibility.” Québec’s Water Act establishes a framework for watershed planning and enables Watershed Agreements that require Master Plans be developed for each identified watershed. The Agreements do not create legal obligations but instead rely on voluntary signatories to the agreements to implement the measures” (Canadian Council of Ministers of the Environment, 2016a).

Yukon

Voluntary only - the Yukon Waters Act ("Waters Act," 2003) does not have a mandate for integrated water management. Yukon focuses on land use planning and integrated resource management (IRM), which includes water, but water is not the central aspect of the IRM plans (Canadian Council of Ministers of the Environment, 2016a). However, the Mackenzie River Basin Transboundary Waters Master Agreement ("MacKenzie River Basin Transboundary Waters Master Agreement," 1997), to which Yukon is a signatory, “sets principles for inter-jurisdictional collaboration and establishes the Mackenzie River Basin Board. Jurisdictions within the basin are developing bilateral agreements based upon multilateral guidance”



(Canadian Council of Ministers of the Environment, 2016a). Groundwater is a watercourse in the Act, and if a source is authorized separately from surface water sources if licensed together (Salvin, 2018).

US – Great Lake States

Illinois

The Illinois State Water Survey (ISWS) operates a surface and groundwater use reporting program. The “WATER USE ACT OF 1983” (525 ILCS 45/1) as amended by Public Act 096-0222, effective January 1, 2010 requires high capacity well owners and high capacity intake owners, defined as a withdrawal in excess of 100,000 gallons (378,541.18 litres) per day (gpd) to participate in the State Water Survey Water Inventory Program. The Illinois EPA has implemented a source water assessment program (SWAP) to assist with wellhead and watershed protection of public drinking water supplies recognizing GW/SW interconnection. In the Drought Plan (2011) well proximity to surface water are considered in times of drought. Additionally, one of the goals of Illinois’ Lake Michigan Water Allocation Program is to reduce the use of water from the Cambrian-Ordovician aquifer. As a result, any entity receiving a Lake Michigan water allocation is required to cease use of any deep aquifer wells.

Indiana

See Great Lakes-St. Lawrence River Basin Water Resources Compact.

New York

The 1972 Susquehanna River Basin Compact gives the SRBC authority to regulate water withdrawals within the three basin states; provision of watershed management principles. For the SRBC, surface water withdrawal applications must include safe yield estimates of all sources of water supply including a calculation of how the quantity of water withdrawal requested was determined. Groundwater applications must describe other sources of water for an application as well (Credit Valley Conservation Authority & Grand River Conservation Authority, 2003).

Michigan

Part 327 of the NREPA considers groundwater and surface water to be parts of one hydrologic system. The Water Withdrawal Assessment Tool (WWAT) uses three models: a groundwater model that predicts stream flow depletions caused by pumping wells, a regression model that estimates stream index flow everywhere in the state; and a model that predicts the impacts on fish populations from stream flow depletion. Adverse resource impacts to rivers and streams



are defined in terms of impacts to fish populations and stream index flow, based on the size of the water body and the water temperature. Adverse resource impacts to inland lakes are based on impacts to fish populations and other uses of the lake. Site-specific reviews use the best available information to determine whether the WWAT's prediction is accurate. The permit decision criteria in Section 32723 also include (but are not limited to) the requirements in Section 4.11 in the Great Lakes Compact, other applicable local, state, federal, interstate, and international regulations and agreements, and whether the proposed use is reasonable under common and water law.

Minnesota

Surface and groundwater interactions considered in permitting - Minnesota Statute 103A.204. Chapter 103 D. establishes watershed districts with the purpose "to conserve the natural resources of the state by land use planning, flood control, and other conservation projects by using sound scientific principles for the protection of the public health and welfare and the provident use of the natural resource (103D.201 Subd. 1.)". Groundwater, lakes, streams, and wetlands protection, preservation, and improvements are all are all considered possible specific purposes.

103G.271 Subd. 5a. "Maintaining surface water levels. Except as provided in subdivision 5, paragraph (b), the commissioner shall, by January 31, 1994, revoke all existing permits, and may not issue new permits, for the appropriation or use of groundwater in excess of 10,000,000 gallons (37,854,117.84 litres) per year for the primary purpose of maintaining or increasing surface water levels in the seven-county metropolitan area and in other areas of concern as determined by the commissioner..."

103G.287 Groundwater Appropriations "Subd. 2. Relationship to surface water resources. Groundwater appropriations that will have negative impacts to surface waters are subject to applicable provisions in section 103G.285."

In 103G.287 Subd. 3. Protecting groundwater supplies. "The commissioner may establish water appropriation limits to protect groundwater resources. When establishing water appropriation limits to protect groundwater resources, the commissioner must consider the sustainability of the groundwater resource, including the current and projected water levels, water quality, whether the use protects ecosystems, and the ability of future generations to meet their own needs."



Following the establishments of these limits the commissioner may designate groundwater protection areas and follow a sustainability standard to ensure a limited total annual water appropriations and uses in certain areas to ensure the sustainable use, which includes ensuring waters are not degraded.

Minnesota's Department of Agriculture, Pollution Control Agency, Department of Health, and Department of Natural Resources collaborate on addressing water quality issues.

Ohio

The Great Lakes—St. Lawrence River Basin Water Resources Compact (ORC 1522)

Pennsylvania

Groundwater is not included in permitting assessment by the state; however, under the PA Safe Drinking Water Act 35 P.S. §721.1 et seq. (1984) groundwater withdrawal includes evaluation of impact to nearby water resources (Oley Township, et al. v. DEP and Wissahickon Spring Water, Inc., 1996 EHB 1098).

Likewise, for surface water allocation, according to Water Allocation Application and Instructions (3900-PM-WM0001 Rev. 9/2001)

"The quantity of surface water allocation will be determined based upon true safe yield and the conjunctive uses of all developed and proposed sources. Sources include groundwater sources or interconnections with other water suppliers, as well as all surface water sources."

For the SRBC and the DRBC, both groundwater and surface water are considered in permitting. For the DRBC, groundwater withdrawal applications must include an estimate of present average water use from all sources. Integrated Resource Plans are also authorized under the Delaware River Basin Commission Southeastern Pennsylvania Ground Water Protected Area Regulations. These plans evaluate water resource availability on a watershed level. Guidelines for developing integrated resource plans are provided by the Commission (Delaware River Basin Commission, 2002). For the SRBC, surface water withdrawal applications must include safe yield estimates of all sources of water supply including a calculation of how the quantity of water withdrawal requested was determined. Groundwater applications must describe other sources of water for an application as well (Credit Valley Conservation Authority & Grand River Conservation Authority, 2003).



Wisconsin

Specific concern exists for the impact of groundwater withdrawals on springs in s. 281.34.5d., Wis. Stat. "1. Except as provided in subd. 2., if the department determines, under the environmental review process in sub. (4), that an environmental impact report under s. 23.11(5), Wis. Stat. must be prepared for a proposed high capacity well that may have a significant environmental impact on a spring, the department may not approve the high capacity well unless it is able to include and includes in the approval conditions, which may include conditions as to location, depth, pumping capacity, rate of flow, and ultimate use, that ensure that the high capacity well does not cause significant environmental impact."

Additional concern is also noted in the form of research and monitoring: s. 281.34 (10), Wis. Stat.: "To aid in the administration of this section the department shall, with the advice of the groundwater coordinating council, conduct monitoring and research related to all of the following: (a) Interaction of groundwater and surface water."

US – Non-Great Lake States

California

Action 2 of the California Water Plan (California Department of Water Resources, 2017a) states "Increase regional self-reliance and integrated water management across all levels of government." "While large inter-regional water management systems, such as the State Water Project, Central Valley Project, and flood management systems, are important, the majority of California's water resource management investments are made at the local and regional level. IRWM has been critical in helping meet California's water management challenges, including the 2014 drought" (California Department of Water Resources, 2018).

Florida

Florida gives equal weight to surface and groundwater in its permitting system recognizing 'environmental flows and levels' as an integrated concept (Hirji and Davis, 2009). In considering the establishment and implementation of minimum flows and minimum water levels, Chapter 373.0421 outlines that both surface waters and aquifers must be in considered by the governing board or department. Likewise, minimum flow levels are calculated using water budget computer models taking into account both existing surface and groundwater withdrawals on flow levels before issuing a new allocation permit. Water quality of both water sources and any discharges into water bodies are required as a part of the reasonable beneficial



use criteria that each water management district uses to evaluate water use. For this reason, permitting considerations are also addressed in the Integrated Water Quality Assessment for Florida (Florida Department of Environmental Protection, 2016).

Montana

DEQ's Water Quality Planning Bureau (WQPB) mission is accomplished through an integrated approach based on water quality standards development, monitoring and assessment, and development and implementation of quality data management systems. Monitors water quality conditions and trends statewide and assesses sources and severity of pollution problems by (a) operating statewide water quality monitoring networks, (b) conducting inventories of pollution sources, and (c) identifying impaired waterbodies. This monitoring and assessment provides the basis for Montana's Integrated Report, which addresses 75-5-702 of the Montana Water Quality Act and sections 305(b) and 303(d) of the federal Clean Water Act. (Montana Department of Environmental Quality, 2018).

North Carolina

N/A

International

England/Wales

Not specified other than for drought: "The National Drought Group (NDG) was set up by the Defra Secretary of State in February 2012 to manage that drought. The NDG will meet in future droughts to provide a multi sector overview and strategic management of the drought. It commissions working groups to undertake specific pieces of work" (Environment Agency Government of the United Kingdom, 2017).

New Zealand (Waikato Region)

Yes. The Water Module of the Waikato Regional Plan (Waikato Regional Council, 2010) addresses integrated management Policy 11 "Consent Application Assessment Criteria – Surface Water" and Policy 12 "Consent Application Assessment Criteria – Groundwater" for both specifying that the Regional Council consider "Impacts on, and integration with, other existing authorised uses of the relevant water body (including customary uses)". Further, Objective 3.3.4.2 on "Integration with Territorial Authorities" specifies how the Regional Council will work with Territorial Authorities on matters related to both surface and



groundwater. Further, the Waikato Regional Council explicitly focuses on integrated catchment management (Waikato Regional Council, 2018).

South Australia

The objective of the South Australia Natural Resource Management Act ("Natural Resources Management Act," 2004) is to establish "integrated scheme to promote the use and management of natural resources". The Act deals extensively with ground water (the term underground water is used) and surface water in the context of allocation. Water allocation plans can regulate the taking of groundwater, surface water such as farm dams, and/or water extracted directly from watercourses. A single water allocation plan can cover one or more of these three resource types. The Water Allocation Planning process, including technical assessments, considers the interaction of ground and surface water (e.g., baseflow, recharge). Water allocation plans are not well linked with other management activities (Poppleton, 2018).

7.6 ARE THERE LIMITATIONS RELATED TO IN-STREAM OR ENVIRONMENTAL FLOW REQUIREMENTS? IF SO, BY WHAT MECHANISM?

Canada

British Columbia

Section 15 of the Water Sustainability Act requires that a decision maker must consider the environmental flow needs of a stream or an aquifer that is reasonably likely to be hydraulically connected when making a decision on an application, unless a specified decision is exempt under the Water Sustainability Regulation.

Section 14 of the Water Sustainability Act provides the comptroller and the water manager with powers respecting an application for a water licence. These include but are not limited to the following:

- Refuse an application;
- Require additional plans or other information; or
- Issue one or more conditional or final licences on the terms the comptroller or the water manager considers proper.



Section 14 allows the decision maker to issue to an applicant, an authorization "subject to the prescribed terms and conditions and on the terms and conditions the decision maker considers advisable."

Additionally, once a declaration under s. 86 of WSA of a significant water shortage (SWS) is in place for a designated area, and a critical environmental flow threshold (CEFT) order under s.87 of the WSA is in place for an identified water source within that area, CEFT has precedence over water rights (other than for essential household use).

Section 16 of the Water Sustainability Regulation provides for exempted applications where EFN does not need to be considered.

Environmental Flow Needs Policy (2016) outlines the procedures, environmental risk management framework and tools for determining flow requirements; "use of mean annual discharge for characterizing flow sensitivity has precedence in B.C. (e.g., BC Modified Tennant method, described in Hatfield et al. 2003) and is supported by B.C.-specific studies."

Manitoba

There are no public guidelines for establishing environmental flow standards, although the Tessman rule is known to have been used, and site-specific studies have been conducted to determine more specific environmental flow requirements on a case-by-case basis (Linnassari *et al.*, 2013).

New Brunswick

12.1(2) Within two weeks after receiving a notification form, the prescribed fee and all related copies and other documents and information under subsection (1), the Minister shall determine whether or not, in the opinion of the Minister, the planned watercourse or wetland alteration would or could pose a significant threat to the environment, and (a) if the Minister is of the opinion that the planned alteration would not or could not pose a significant threat to the environment, deliver to the applicant a written acknowledgement granting the person a provisional permit, for such period of time and upon such terms and conditions as the Minister may impose, or (b) if the Minister is of the opinion that the planned alteration would or could pose a significant threat to the environment, deliver to the applicant written notice that a provisional permit will not be issued to the applicant.



Additional guidance is provided for water intake structures in the Watercourse and Wetlands Alteration Technical Guidelines ("Watercourse and Wetland Alteration Regulation," 1990, p. 101): "For flowing bodies of water such as streams, creeks, rivers, or brooks, the acceptable rate of water removal or the pumping rate is dependent upon the average annual flow in the channel throughout the withdrawal period. A certain rate of flow must be maintained downstream of the water intake. This rate is known as maintenance flow and is specific to each site. Since channel flows fluctuate on a seasonal basis, acceptable rates of maintenance flows are based on the mean flow in the watercourse throughout the desired withdrawal period and specific criteria regarding water withdrawal during periods of low flow may be necessary.... One method of determining maintenance flow requirements can be calculated as about 70% of the Monthly Median Flow, as derived from the nearest Environment Canada gauging station."

Ontario

Protecting natural functions of aquatic ecosystems is a regulatory requirement through the Water Taking and Transfer Regulation, s.4 that the MECP (PTTW signing Director) must consider when reviewing PTTW applications. Guidance and policies for the PTTW program discuss the importance of managing surface and groundwater for habitat and ecological needs, as well as sustainability of the resource. Individual PTTWs can set specific protections for environmental flows through conditions in the permit; however, no specific minimum flow or water level requirements are prescribed in technical guidance documents, as it is not feasible to recommend one assessment method or low flow method that will be appropriate for all situations (Ontario Ministry of Environment and Climate Change, 2017).

Prince Edward Island

PEI Water Act 2017 ("Water Act," 2017) Section 8 "authorizes the Minister to direct that an approval not be issued for a water withdrawal for commercial, industrial or recreational purposes if it would interfere with the availability of water for domestic purposes or for water flow needs of a watercourse." AND Section 31 (1)(c) states that "The Minister may, by order, establish a process by which a water sustainability plan is to be developed for the purposes of preventing or addressing threats to, or maintaining or restoring the environmental flow needs of a watercourse". "The [current until replaced by the Water Act 2017] Water Extraction Permitting Policy defines to keep a maintenance flow in the stream at 70% of the median month flow for surface water extraction; the joint extraction from both groundwater and surface water would not reduce the mean summer base flow by more than 35%" (Ecofish Research Ltd. *et al.*, 2017). Mechanism: Water Act ("Water Act," 2017) "34. Recommendation



by Minister (1) Where an aquatic ecosystem protection plan is considered satisfactory by the Minister, the Minister may recommend that the Lieutenant Governor in Council make regulations (a) to designate the geographic area identified by the Minister as an aquatic ecosystem protection area; (b) to regulate, limit or prohibit activities, matters or things that contribute or may contribute to the degradation of water quality, negatively affect or may negatively affect water quantity or are creating or may create an adverse effect, in the area being designated; (c) respecting the withdrawal or use of water in the area being designated, including recommending prohibitions, conditions or limits on water withdrawals or water withdrawal approvals that are more stringent than would otherwise apply; and (d) to establish the process by which the plan is to be implemented.

Quebec

Politique de Débits Réservés Écologiques pour la Protection du Poisson et ses Habitats (Policy of Ecological Reserved Flow for Protecting Fish and their Habitat) governs the issuance of authorization certificates for hydro-electric facilities, dams, water diversions and withdrawals, in order to maintain adequate streamflow for fish and fish habitat (Faune et Parcs Québec, 1999; MENVO, 2002b). This policy is implemented by the Ministère du Développement Durable, de l'Environnement et des Parcs (de Loë *et al.*, 2007). Several thresholds are proposed for protecting fish habitat: for example, in the Saint-Charles River, minimal flows are set as:- Q50 [median flow] during low summer flows- Q50 [median flow] during fall spawning- 0.25 times the QMA [mean annual discharge] during winter low flows (Ecofish Research Ltd. *et al.*, 2017).

Yukon

All Water Use Licences include terms and conditions that are intended to avoid or minimize adverse effects on the environment (de Loë *et al.*, 2007). Yukon Environmental and Socio-Economic Assessment Act (de Loë *et al.*, 2007; "Yukon Environmental and Socio-Economic Assessment Act," 2003) effects licencing abilities of the Yukon Water Board who "cannot issue a water licence, or set terms of a licence, that are contrary to a decision document issued under [YESEAA]." Waters Regulation ("Waters Regulation, Y.O.I.C. 2003/58," 2003) s.4 "(1) A person may use water or deposit waste without a licence if the proposed use or deposit (a) has no potential for significant adverse environmental effects". The First Nation Self Government Agreements (based on the Umbrella Final Agreement which is constitutionally protected) state that Yukon First Nations have the right to have substantially unaltered quality, quantity, and rate of flow of water flowing on, through or adjacent to Settlement Land (chapter 14). However, in-stream and environmental flow needs are poorly understood and there is currently



no standard or method to regulate them. It is a concern that is being worked on by many people currently (Salvin, 2018).

US – Great Lake States

Illinois

In-stream flow protection has been investigated extensively by the State Water Plan Task Force (1983) and by the Interagency In-stream Flow Protection Committee mandated under Public Act 86-191 (1991). As stated above if a water withdrawal on a Public Body of Water involves construction of a permanent intake structure an ILDNR, Office of Water Resources (ILDNR/OWR) permit will be required. These permits will generally be subject to special conditions restricting the withdrawal of water during periods of low flow to prevent adverse effects on navigation, natural resources or other public interests in the public body of water.

Indiana

The Significant Water Withdrawal Facilities water withdrawal categories ("Water Resource Management Act," 1983) do not include in-stream uses.

New York

Division of Water technical operations and guidance series 1.3.12 - Incorporation of Flow-Related Conditions in Water Withdrawal Permits (New York State Department of Environmental Conservation, 2017, p. 1) "describes the policies and procedures for incorporating flow-related conditions when issuing Water Withdrawal Permits, pursuant to 6 NYCRR Part 601 ('Water Withdrawal Regulations'). The Environmental Conservation Law ("ECL") Section 15-1501 and accompanying water withdrawal regulations (Part 601, 2013) encourage the responsible use of water resources, including ensuring adequate supplies of potable water, while protecting aquatic life, habitat function, and best usages." Additionally, the Susquehanna River Basin Compact includes environmental flow requirements for New York State.

Michigan

Explicit development of stream flow requirements for fish populations in 2008 updates to Natural Resources and Environmental Protection Act:

Section 324.32701- outlines requirements for varying cold river systems, cold transitional river systems, warm river systems and specific environmental flow requirements specifying the acceptable percent of withdrawal reduction for each.



Section 324.32721 - outlines that "(1) A person shall not make a new or increased large quantity withdrawal from the waters of the state that causes an adverse resource impact." (Large withdrawal framed as a withdrawal over 100,000 gpd [378,541.18 litres per day] averaged over a 30-day period from streams, rivers, or groundwater.)"

Part 327 has a narrative standard for adverse resource impact for inland lakes that includes impacts to fish populations.

The permit review criteria in Section 32723 includes determining that the proposed large quantity withdrawal is in compliance with the decision-making standards in Section 4.11 of the Great Lakes Compact, which includes determining that the proposed large quantity withdrawal will not cause significant individual or cumulative adverse impacts to the quantity and quality of the waters and water dependent natural resources of the affected watershed(s). The permit review criteria in Section 32723 also include determining that the proposed large quantity withdrawal is in compliance with all applicable local, state, federal, interstate, and international regulations. This includes Parts 301, Inland Lakes and Streams; and 303, Wetlands Protection; of the NREPA.

Minnesota

Water Courses (M.S. 103G.285, Subdivision 2). Water appropriations from water courses during low-flow periods may be suspended to protect water availability for in-stream uses and higher priority water users

Natural Flows (MN Rules 6115.0220). DNR Waters is charged with maintaining natural flows and levels. MN Rules 6115.0630 Subp. 12 defines "protected flow" as "as the amount of water required in the watercourse to accommodate in-stream needs such as water-based recreation, navigation, aesthetics, fish and wildlife habitat, water quality, and needs by downstream higher priority users located in reasonable proximity to the site of appropriation."

Ohio

ORC § 1501.32(6) establishes limitations restricting permits for diverting more than 100,000 gallons (378,541.18 litres) a day away from the Ohio River watershed when "The proposed diversion, alone or in combination with other diversions and water losses, will have a significant adverse impact on in-stream uses or on economic or ecological aspects of water levels."



Information to help decision-makers determine whether to impose restrictions is sourced from Water Inventory Program. This is the key state program collecting and generating historic and current data on the status of Ohio's water resources. It supports stream gauging to monitor stream flow and lake levels. It also operates a network groundwater observation wells. The Water Inventory Program continually compiles and stores precipitation, water storage, and streamflow data. Staff hydrologists are responsible for monitoring ground water levels in Ohio and compiling other hydrologic data. A network of 139 observation wells plus many "Special Project" wells are continually monitored and reported on each month. The "Monthly Water Inventory Report for Ohio" summarizes rainfall, trends in ground water, streamflow, and surface water storage in Ohio as well as evaluating the current overall water supply situation.

Pennsylvania

Dam Safety and Encroachments Act (1978) P.L. 1375, No. 325 Cl. 32 grants the DEP authority to regulate the construction, operation, and maintenance of dams and other water obstructions, which includes minimum flow guidelines for dammed waterways.

Under s. 78a.69 ("Oil and Gas Act," 2012) water management plans (WMP) are required for unconventional operations (not those with a water allocation permit or order of confirmation pursuant to the Water Rights Act).

WMP must meet the following requirements: (a)(2)(b) "(1) Protect in-stream flow. (2) Prevent adverse effects on quantity and quality of water available to other users. (3) Protect and maintain designated and existing uses of water sources. (4) Prevent adverse impacts to water quality in the watershed considered as a whole. (5) Protect groundwater resources including nearby water wells. (6) Provide for water reuse."

Wisconsin

When considering an application for a stream/lake diversion, the Department determines the amount of surplus water available in the stream after making a detailed field investigation of the site ("Navigable Waters, Harbours and Navigation," 2015).



US – Non-Great Lake States

California

Threshold: Ecological Base Flow that is equivalent to the monthly 95% exceedance level (Ecofish Research Ltd. *et al.*, 2017). Statute 10727.2 (d)(2) of the California Sustainable Groundwater Management Legislation ("Sustainable Groundwater Management Act ", 2014) states that "A groundwater sustainability plan shall include. The monitoring and management of groundwater quality, groundwater quality degradation, inelastic land surface subsidence, and changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater extraction in the basin. (e) A summary of the type of monitoring sites, type of measurements, and the frequency of monitoring for each location monitoring groundwater levels, groundwater quality, subsidence, streamflow, precipitation, evaporation, and tidal influence. The plan shall include a summary of monitoring information such as well depth, screened intervals, and aquifer zones monitored, and a summary of the type of well relied on for the information, including public, irrigation, domestic, industrial, and monitoring wells." "The board (subject to Sec. 100 policies) may when it is in the public interest approve appropriation by storage for release for in-stream uses" (AMEC, 2008).

Florida

Florida Statutes (2017) 373.0421 Establishment and implementation of minimum flows and minimum water levels states that "when establishing minimum flows and levels, the department or governing board shall consider changes and structural alterations to watersheds, surface waters, and aquifers and the effects such changes or alterations have had, and the constraints such changes or alterations have placed, on the hydrology of an affected watershed, surface water, or aquifer, provided that nothing in this paragraph shall allow significant harm caused by withdrawals." The Florida Waters Resource Act (1972) requires the state's five Water Management Districts to establish minimum flows and levels (limit at which further water withdrawals would be significantly harmful to waters resources or ecology in the area). Each district is required to develop a priority list of waterbodies for minimum flow/level each year. Minimum flow/level is used for permitting, environmental resource permitting, water supply planning and resource projects. If minimum targets for minimum flow/level cannot be met, there is a mandate that a 20-year prevention or recovery plan be developed and implemented (Laidlaw, 2018).



Montana

"The department may issue a state water reservation for in-stream flows and related purposes to the state, any political subdivision of the state, or any agency of the state or of the United States. DNRC reviews all permit applications to determine if pose significant environmental impacts and to determine if EIS required. Water held under an existing consumptive right may be changed, transferred to or leased to an entity (private or Montana Department of Fish, Wildlife and Parks) for in-stream purposes. Requires a Temporary Change Authorization (form 606)." (AMEC, 2008)

North Carolina

North Carolina addresses flow under the Clean Water Act (Federal) ("Federal Water Pollution Control Act," 2002). The Division of Waters Resources has an In-stream Flow Unit which makes decision on flows for natural resources, other in-stream uses, flow volume, low flow periods, permitted discharges, off stream uses, dams, and riparian rights (North Carolina Department of Environmental Quality, 2018c).

International

England/Wales

The EFI is used in the hydrological classification for the European Water Framework Directive (WFD) to identify the water bodies where reduced river flows may be causing or contributing to a failure of good ecological status (OECD, 2015). Environmental Flow Indicators (EFI) are used as an indicator of the flows required by the environment. The EFI is a percentage deviation from the natural river flow represented using a flow duration curve (Environment Agency Government of the United Kingdom, 2013a). Both freshwater and terrestrial biodiversity are taken into account in the EFI.

New Zealand (Waikato Region)

Environmental flows are addressed through the mechanism of policy and done so comprehensively throughout the Water Module of the Waikato Regional Plan. For examples, see, Policy 1 (Establish Allocable and Minimum Flows for Surface Water), Policy 2 (Determining the level of minimum flows, primary, secondary and water harvesting allocable flows), and Policy 4 (Establish Sustainable Yields from Groundwater).



South Australia

Water Allocation Plans are legal documents that are developed by the regions within South Australia legislated under the Natural Resource Management Act ("Natural Resources Management Act," 2004) s.76. Section 76 requires that the Plans account for ecosystem water needs, an assessment of the water resource to meet environmental water requirements, the water that will be set aside for the environment, and a statement of environmental outcomes. Suggested: please see a recent WAP which can be found here, together with supporting docs:

<http://www.naturalresources.sa.gov.au/eyrepeninsula/land-and-water/water-allocation-plan-new>

7.7 WHAT FORMAL CONSERVATION MEASURES EXIST FOR THE RESTRICTION OF WATER ALLOCATION IN TIMES OF WATER STRESS?

Canada

British Columbia

Beyond Protection of Critical Environment Flow Thresholds, other conservation measures include:

- Ministry of Forests, Lands and Natural Resource Operations (FLNRO) staff ability to put a water allocation restriction on a stream or an aquifer to alert other staff to current or potential water allocation concerns, ranging from a possible water shortage to fully recorded with limitations on further licensing.
- Drought Information - <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/drought-information>
- BC Drought Response Plan - <https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/drought-info/drought-response-plan-update-june-2015.pdf>
- WSA s. 22 – FITFIR is the tool for managing access to water when there isn't enough supply to meet licensed demand.



- WSA S. 23 - Thirty-year review of licence terms and conditions (this is a discretionary authority) includes stipulations that a licensee must provide the decision-maker with a water conservation audit (S.23 (3)(a)) if one is requested, and that the decision maker may review the licence taking into account “(a) the best available technology in respect of water use efficiency and water conservation, (b) best practices in respect of water use efficiency and water conservation, (c) any increase in knowledge respecting actual stream flow or aquifer conditions, (d) the effects of climate change...” Such audit requests are only associated with a 30-year review; however, a decision maker can request one as part of assessing beneficial use (see definition in WSA s.1 and requirements in s.30)
- WSA s. 86, 87- Declaration of significant water shortage, critical environmental flow threshold...
- WSA S.88 Fish Population Protection Order: If the flow of water in a stream becomes so low that the survival of a fish population is threatened, a fish population protection order may restrict the uses of water from the stream, its tributaries and hydraulically connected aquifers. Priority can temporarily be given to the recovering fish population above other water uses, regardless of precedence. Prior to giving the order, the Minister must give due consideration to the needs of agricultural users.
- WSA s. 14 outlines the powers of a decision making respecting applications and decisions.
- Refusal of Applications on Over-Subscribed Sources (2013) policy “4. Procedures: Where previous reports, local data and office knowledge clearly document that a source is oversubscribed a decision to refuse future applications may be made without any additional technical assessment of the source of proposed water use.” Note this policy is currently under review to align more directly with the WSA (Vigano, 2018).
- Regulation making authorities for drilling authorizations (S. 62 WSA), closing or restricting access to a water source (s. 135 WSA).
- Water objectives (s.43 WSA) and water sustainability plans (s. 64-85 WSA) can also help address shortage
- Water Use Efficiency Catalogue for British Columbia (1999) - outlines hard and soft conservation measures. Hard measures include legal, economic, financial, operations and management tools.
- Additional conservation bylaws exist at the regional and municipal levels (e.g., sprinkling restrictions), which are enabled under the Local Government Act (Province of British Columbia, 2015) and Community Charter ("Community Charter," 2003).



Manitoba

Water Rights Act S 9.2 “The minister may suspend or restrict the rights under a license for a specified period if (a) in the minister's opinion, (i) a groundwater level, (ii) a water body level, or (iii) an in-stream flow, is insufficient to ensure that aquatic ecosystems are protected and maintained.”

New Brunswick

Section 14 of the Clean Water Act allows the minister to designate all or part of a watershed or aquifer that is being used as a public water supply as a protected area; if done, the Minister may pass regulations about water allocation within these areas.

Clean Water Act s.14 “(1) The Minister, with the approval of the Lieutenant-Governor in Council, may by a Designation Order designate as a protected area all or any portion of a watershed, aquifer or ground water recharge area that is used as a source of water for a public water supply system.”

Clean Water Act s.14 “(3) The Minister may impose requirements in a Designation Order respecting one or more of the following: (a) the prohibition, control or limitation of any activity or thing that might impair the quality or the quantity of the water in a protected area; (b) the allocation of the use of the water in a protected area.”

Ontario

The Ontario Low Water Response (OLWR) plan (led by the Ministry of Natural Resources and Forestry) outlines a program to determine a range of low water levels in a watershed, including the means for measuring and quantifying drought, the conditions leading up to it and recommended action that should be taken in the case of low water conditions (Ministry of Agriculture Food and Rural Affairs, 2018; Ontario Ministry of the Environment and Climate Change, 2018). One such action includes reducing water use during low water conditions. There are three levels of low water conditions: (1) the first indication of a potential water supply problem is managed through water conservation; (2) a potentially serious problem, which is managed through water conservation and restrictions on non-essential water use; and (3) water supply fails to meet demand, managed through water conservation, restrictions and regulation of water use (Ontario Ministry of Natural Resources *et al.*, 2010 Ontario Ministry of Municipal Affairs and Housing, Ontario Ministry of Enterprise Opportunity and Innovation, Association of Municipalities of Ontario, & Conservation Ontario, 2010). Responses to low water conditions and the coordination of activities are determined by local Water Response



Teams, which consist of local water users and local and provincial water managers based on systems of monitoring and reporting.

The Clean Water Act ("Ontario Clean Water Act," 2006) s. 15(1) includes requirements for the source protection committee to prepare assessment reports on topics related to water stress. For example, reports require the description of "any existing or anticipated water shortages in the watershed" and identification of "all the significant groundwater recharge areas and highly vulnerable aquifers". This information is used to inform and calculate a local water budget quantifying the amount of existing and anticipated amounts of water taken from the watershed accounting for water vulnerable areas and considering any activities that are or would be drinking water threats.

Proposed water conservation measures are one consideration by the Director in reviewing the permit application. This is mandated in the Water Taking and Transfer Regulation. Water conservation measures may be included as a mandatory condition on the Permit to Take Water. These conditions may be implemented as mandatory at all times or may be specific to times of water scarcity/low water conditions and also determined on a case by case basis by the Director. The PTTW includes details of the water taking (time, volume, peak withdrawals).

The OWRA S.75 provides for the authority to make regulations with respect to water conservation plans. This is currently an enabling provision, which has not been implemented.

With regards to water budgets Permit to Take Water (Ontario Ministry of the Environment and Climate Change, n.d.) Standard Operating Procedure states:

The Tier 1 and 2 water budgets were developed as screening tools to identify municipal drinking water systems with a potential for water quantity vulnerability. However, the screening level assessment of subwatershed (or study area) stress provide ministry staff with insight into regional surface water and groundwater conditions not specific to municipal wells.

The water budgets with low stress (Tier 1 and Tier 2) and low risk level (Tier 3) indicate where the ministry need take no further action to address water balance and sustainable yield. Further, the Standard Operating Procedure (Ontario Ministry of the Environment and Climate Change, n.d.) states that:

"Ministry staff may consider assessing whether [subwatersheds and groundwater assessment areas under a moderate or significant potential stress] correlate with areas already identified as potentially stressed through other water related program areas, such as high or medium use watersheds or Level II or III low water conditions, or through regional knowledge. The ministry



may consider summarizing measures already taken to mitigate, monitor or investigate these potentially stressed areas. For other areas, the PTTW Director may consider the Tier 2 water budget findings along with the other watershed information listed in the water balance and sustainability section of the PTTW Manual.”

Finally, there are mandatory responses required for PTTW for bottled water in times of drought conditions. Following the Level 1, 2 and 3 framework of low water conditions in the OLWR program, the Procedural and Technical Guidance Document for Bottled Water: Permit to Take Water Applications and Hydrogeological Study Requirements (Ministry of the Environment and Climate Change, 2017) outlines the following decrease in water taking by water bottlers:

- Level 1 – A mandatory decrease of a minimum of 10% in the measured daily average water taking over the preceding 3-month period;
- Level 2 – A mandatory decrease of a minimum of 20% in the measured daily average water taking over the preceding 3-month period.
- Level 3 – A mandatory decrease of a minimum of 30% in the measured daily average water taking over the preceding 3-month period.

The Director also retains the authority under the OWRA to order decreases in water taking at any time.

Prince Edward Island

PEI Water Act 2017 ("Water Act," 2017) Article 4/4(e)(i) states that the Minister “may take the actions that the Minister considers necessary in order to manage, protect or enhance the water resources within the jurisdiction of the province, including monitoring and exercising control over the allocation of the use of water;”. Stress, drought or shortage are not specified in the 2017 Act. In general, shortage has not yet been a problem on the Island, as there is a high recharge rate for groundwater and a relatively low population (Somers, 2017). Sub-section 11(g) of the Water Act anticipates this, and provides the Minister with power to revoke or amend approvals when natural conditions threaten the availability of water for domestic purposes.

Quebec

Conflicts over water are not typically related to the quantity (i.e., water stress in Quebec, as the province has 3% of the world's renewable fresh water reserves (de Loë *et al.*, 2007).



Yukon

No formal measures within Waters Act, Waters Regulation, or Yukon Environmental and Socio-economic Assessment Act. Section 35 (1) (b) of the Waters Act (on “remedial measures”) gives inspectors the power to order an operator or licensee to take any remedial measures necessary to prevent adverse effects of their actions to the environment. The inspector would need to know that the watercourse is stressed, but there is provision in the Act to take action if deemed necessary. In other words, in times of water stress the inspectors can order the cessation of any activity deemed necessary to prevent the stress (Salvin, 2018).

US – Great Lake States

Illinois

All Lake Michigan Water Allocation Permittees are subject to water conservation requirements, however, there are no specific requirements for times of stress.

Emergency Groundwater restrictions are outline in 525 ILCS 45/5.1 ("Water Use Act of 1983," 1983) Ch. 5, par. 1605.1 Sec. 5.1. Recommendations depend on input from the Department of Agriculture.

Indiana

During the three drought stages the following objectives are outlined by the Water Shortage Plan (Indiana Department of Natural Resources, 2015):

Watch – a voluntary 5% reduction

Warning – a voluntary 10-15% reduction

Emergency – a mandatory, of at least, 15% reduction

New York

All applications for water withdrawal permits require a water conservation program to demonstrate an applicant's water conservation and efficiency measures. These must be environmentally sound, economically feasible and minimize inefficiencies and water losses. Contingency measures for limiting water use during seasonal or drought shortages must also be included (ENV § 15-1503). Through the DRBC, conservation planning is also required – see Pennsylvania for details.



Michigan

Public Act 35 of 2006 requires that each water use sector develop voluntary guidelines for generally accepted water management practices or environmentally sound and economically feasible water conservation measures. The Act allows for such guidelines to be developed and adopted by an established statewide professional or trade association representing that sector.

In a drought situation, the Michigan Drought Response plan (1988) outlines three options for water conservation: educational programming for demand conservation that can be carried out by all government levels, mandatory regulation of water uses by municipal governments, and temporary changes to water rate pricing to encourage water users to conserve.

Water Conservation Plan actions are voluntary and do not necessarily outline conservation measures in times of stress. Drought management conservation measures are both. Escalated enforcement actions would have to be undertaken under Part 327 to order previously authorized water users to cease or reduce their pumping. MDEQ would have to show through a preponderance of evidence that these withdrawals are likely to cause adverse resource impacts.

Minnesota

Minnesota Statutes 103G.291 require public water suppliers to adopt and enforce water use restrictions when the governor declares a critical water deficiency. The restrictions must limit sprinkling lawns, washing vehicles, irrigating golf courses and parks, and other nonessential uses and have appropriate penalties for failure to comply with restrictions. Also, since 1996 every public water supplier serving more than 1,000 people must submit a water supply plan to the commissioner. These plans “must address projected demands, adequacy of the water supply system and planned improvements, existing and future water sources, natural resource impacts or limitations, emergency preparedness, water conservation, supply and demand reduction measures, and allocation priorities (103G.291, Subd 3.)”

Ohio

ORC 1522.17 requires an applicant for a water withdrawal and consumptive use permit to submit a facility water conservation plan that, if it reasonably incorporates environmentally sound and economically feasible water conservation measures applicable to the facility, will be considered to be in compliance with Section 4.1 and 4.2 of the Great Lakes- St. Lawrence Basin Compact. All other elements of Ohio's water conservation and efficiency program are voluntary, except those authorized by pre-existing statutes, regulations, or programs. The only



state program that provides for mandatory water use reductions is the Ohio Emergency Management Agency's Emergency Operations Plan (Ohio Emergency Management Annex, 2009) (authorized by ORC §5502.22), and then only when the governor declares a Level Four Drought Emergency.

Pennsylvania

4 Pa. Code Chapters 119-120 outlines non-essential water use restrictions and water rationing.

Ch119 restrictions apply generally to watering of lawns, gardens and shrubs; washing vehicles and paved surfaces; filling swimming pools; and use of water for ornamental purposes.

Ch120 provisions allow a public water supplier or a municipality to request approval to ration water within its service area (requests are reviewed by the Commonwealth Drought Coordinator, acting on behalf of the Governor, to ensure that rationing is justified and appropriate).

The SRBC follows drought management procedures consistent with procedures followed by the state and has rules and regulations in place to manage water in times of drought and low-flow conditions. Public water suppliers in the basin must restrict losses from their distribution systems, install meters for all users and develop and implement a water conservation program. Industrial water users and agricultural water users must also abide by certain conservation regulations (Credit Valley Conservation Authority & Grand River Conservation Authority, 2003).

The DRBC Compact and supporting regulation requires that ground and surface water withdrawal applications include water conservation plans. Under section 3.8 of the Compact, new surface and ground water withdrawals in excess of one million gpd and subject to review by the Commission, must include and describe water-conserving practices and technology designed to minimize the use of water by municipal, industrial and agricultural users. The conservation program must consist of the following elements: monitoring of water distribution and use, establishment of a systematic leak detection and control program, use of water conserving devices and procedures, a contingency plan including use priorities and emergency conservation measures to be instituted in the event of water shortage. All applications submitted after June 30, 1992, must also include an evaluation of the feasibility of implementing a water conservation pricing structure and billing program, as required in Section 2.1.7 of Resolution 92-2. Water users applying for a permit to withdraw in excess of one million gpd for industrial or commercial uses and for agricultural use must also submit various reports and contingency plans (see resolution 81-9, DRB Water Code). Drought emergency plans must



also be prepared by applicants withdrawing groundwater for the purposes of municipal or public, commercial or industrial water supply (Credit Valley Conservation Authority & Grand River Conservation Authority, 2003).

Wisconsin

Statewide Water Conservation and Efficiency established in Chapter 281.346(8) ("Water and Sewage," 2011) outlines that the department shall develop a statewide program to promote environmentally sound and economically feasible conservation measures. Measures are either mandatory or voluntary depending on circumstance and location. Chapter NR 852 ("Water Conservation and Water Use Efficiency," 2010) is Wisconsin's Administrative Code that outlines water use conservation and efficiency measures.

US – Non-Great Lake States

California

The Sustainable Groundwater Management Act ("Sustainable Groundwater Management Act ", 2014) uses the term "undesirable results" (stress) with regard to groundwater in the following contexts: Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply; Significant and unreasonable reduction of groundwater storage; Significant and unreasonable seawater intrusion; Significant and unreasonable degraded water quality; Significant and unreasonable land subsidence; Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water. Measures: The SGMA Requires critically over drafted high and medium priority basins to be managed under a GSP by January 31, 2020; Requires all other groundwater basins designated as high or medium priority basins to be managed under a GSP by January 31, 2022; Adjudicated basins are not required to develop GSPs, but they are required to submit annual reports to DWR beginning April 1, 2016; Local agencies have the option of submitting an Alternative plan by January 1, 2017; Gives GSAs the financial and enforcement authority to carry out effective local sustainable groundwater management.

Florida

The drought plan does not specifically outline conservation measures; however, under Florida Statute 373.175 "Declaration of Water Shortage or Emergency", during times of water shortage a governing board may impose restrictions on one or more classes of water users if necessary to protect water resources in an area. The water management districts also have developed their own Water Shortage Plans; for example, the SJRWMD Water Shortage Plan (St. Johns



River Water Management District, 2005) found in 40C-21 of the Florida Administrative Code. In these plans, both voluntary and mandatory measures are incorporated into water shortage criteria depending on the severity of the shortage.

Montana

As a result of legislation passed in 1939 after the extreme drought conditions of the “Dust Bowl”, conservation districts were created in Montana which are “political subdivisions with broad power and authority under the law to carry out programs that conserve soil and water, protect streams and rivers... The Natural Streambed and Land Preservation Act, also known as ‘The 310 Law’, is administered by the conservation districts. The purpose of the law is to keep rivers and streams in as natural or existing condition as possible, to minimize sedimentation and to recognize beneficial uses” (Montana Department of Natural Resources & Conservation, 2018a). Also, the Montana Fish, Wildlife, and Parks maintains a dewatered stream list. This information may be reviewed during the water permitting process, however, DNRC is limited only by legal availability of water, which means additional water rights may be issued despite the stream being listed on an the dewater stream list.

North Carolina

North Carolina statute 143-215.22L on regulation of surface water transfers states “(n)(2) A drought management plan that specifies how the transfer shall be managed to protect the source river basin during drought conditions or other emergencies that occur within the source river basin. Except in circumstances of technical or economic infeasibility or adverse environmental impact, this drought management plan shall include mandatory reductions in the permitted amount of the transfer based on the severity and duration of a drought occurring within the source river basin and shall provide for the mandatory implementation of a drought management plan by the applicant that equals or exceeds the most stringent water conservation plan implemented by a public water system that withdraws water from the source river basin... (q) Emergency Transfers. - In the case of water supply problems caused by drought, a pollution incident, temporary failure of a water plant, or any other temporary condition in which the public health, safety, or welfare requires a transfer of water, the Secretary of Environmental Quality may grant approval for a temporary transfer.”



International

England/Wales

The Water Act 2014 s.28 “Frequency of water Resource Management and drought plans” and “39D Drought plans: supplementary”. “Either the Environment Agency /Natural Resources Wales or Government Ministers grant legal permission to take further drought measures; in the form of drought orders or drought permits providing that the applicant demonstrates that there has been an exceptional shortage of rain. The further drought measures that can be taken are as follows: water companies can apply to abstract more water; water companies can apply to reduce other abstractions; water companies can apply to restrict certain types of water use; the Environment Agency /Natural Resources Wales can apply to restrict or ban abstraction to protect the environment” (OECD, 2015).

New Zealand (Waikato Region)

In addition to the Waikato Regional Council Water Shortage Risk Mitigation Plan (Council, 2000), the Water Module of the Waikato Regional Plan (Waikato Regional Council, 2010) specifies what water shortage conditions are (Policy 17), and lays out by user in order of priority the “Levels of Priority to Apply During Water Shortages” (Policy 18).

South Australia

“The Natural Resource Management Act 2004 establishes eight regional boards across South Australia. Each is responsible for developing a Natural Resource Management Plan for its region. Where a water resource is prescribed, the Boards are required to prepare a water allocation plan, which deals with the allocation of the available resource” (Government of South Australia, 2009). The Water Allocation Plans are legal document that set out the rules for managing the take and use of prescribed water resources to ensure resource sustainability, including the environment. However, the legislation does not require specific stipulations regarding how WAPs deal with water stress/shortage/drought. In situations of water stress, the NRM Act provides a number of options to restrict or reduce water use. These include reissuing allocations with a reduced volume (applies in unbundled water regimes, i.e. River Murray Prescribed Watercourse, and Southern Basins and Musgrave Prescribed Wells Area) which can be done by the Minister at his discretion; notice of restriction pursuant to section 132 of the NRM Act; reductions to water allocations pursuant to section 155; or water conservation measures pursuant to section 169.



7.8 HOW IS PRIORITY AMONG WATER USERS (INCLUDING IN-STREAM NEEDS IF APPLICABLE) ASSIGNED? ARE THERE ADDITIONAL CONFLICT RESOLUTION SYSTEMS IN PLACE? IF SO, WHAT ARE THEY?

Canada

British Columbia

Precedence of rights

WSA S. 22 "(1) The rights exercisable under an authorization that authorizes the diversion of water from a stream have precedence in relation to the rights of other authorization holders who divert water from

(a) the stream,

(b) a tributary of the stream, or

(c) an aquifer the decision maker considers is reasonably likely to be hydraulically connected to that stream according to the dates set out in the authorizations as the dates from which the rights take precedence.

(2) The rights exercisable under authorizations described in subsection (1) that have precedence from the same date have precedence in accordance with the ranking under subsection (7) of the water use purposes in respect of which the authorizations are issued.

(3) The rights exercisable under authorizations described in subsection (1) have equal precedence if the rights have precedence from the same date and are for the same water use purpose.

(4) The rights exercisable under an authorization that authorizes the diversion of water from an aquifer have precedence in relation to the rights of other authorization holders who divert water from the aquifer, or another aquifer the decision maker considers is reasonably likely to be hydraulically connected to that aquifer, according to the date set out in the authorization as the date from which the rights take precedence.

(5) The rights exercisable under authorizations described in subsection (4) that have precedence from the same date have precedence in accordance with the ranking under subsection (7) of the water use purposes in respect of which the authorizations are issued.



(6) The rights exercisable under authorizations described in subsection (4) have equal precedence if the rights have precedence from the same date and are for the same water use purpose.

(7) For the purposes of subsections (2) and (5), water use purposes are ranked, from highest to lowest as follows:

(a) domestic; (b) waterworks; (c) irrigation; (d) mineralized water; (e) mining; (f) industrial; (g) oil and gas; (h) power; (i) storage; (j) conservation; (k) land improvement.

(8) Despite subsections (1) to (6), a person to whom section 6 (4) [use of water — excluded groundwater users] applies is deemed to have rights that have precedence under those subsections, as if the deemed rights were granted under an authorization that

(a) sets out as the date of precedence the date of first use of the water, and (b) authorizes the use of the greater of

(i) 2 000 litres of water per day for each private dwelling on a parcel, or

(ii) the amount of water the engineer is satisfied the person has been using for domestic purposes."

Additionally, Under S. 38 in the WSA, the Comptroller of Water Rights, or water manager, can appoint a water bailiff to act on behalf of the province to manage conflicts in a stream before or during a drought. These people are given the authority to enter on any land and to regulate and control the diversion and use of water by all users (authorization holders as well as users that are not authorization holders) and control all diversion works on here streams or aquifers.

Manitoba

Water Rights Act S. 9 "The order of priority of the purposes for which water may be used or diverted, or works constructed, established or maintained, in accordance with this Act is as follows: 1. domestic purposes; 2. municipal purposes; 3. agricultural purposes; 4. industrial purposes; 5. irrigation purposes; 6. other purposes." 9.1(2) "The minister may refuse to issue a license if, in the opinion of the minister, the action authorized by the licence would negatively affect an aquatic ecosystem." Water Rights Act 14(4) outlines arbitration when a license is canceled or when rights are restricted.



New Brunswick

Priority is not assigned in the Clean Water Act or supporting regulation; conflict resolution in the Clean Water Act includes:

S.39 "A person whose registration, licence, permit or approval has been suspended or cancelled or whose application for a registration, licence, permit or approval or for the transfer, renewal or reinstatement of a registration, licence, permit or approval has been refused may appeal the suspension, cancellation or refusal in accordance with the regulations."

Ontario

Priority of water uses are outlined in two policies: the MECP Water Management Policy, Guidelines and Provincial Water Quality Objectives (1994) and in the Ontario Low Water Response Plan. The MECP Water Management Policy, Guidelines and Provincial Water Quality Objectives (1994) contains guidance for setting out a priority of water uses when evaluating the relative priority of uses in an area where there is insufficient water to meet established and new uses.

When evaluating the relative priority of uses in an area where there is insufficient water to meet established and new uses, the taking of water for private domestic and farm purposes is considered the most important use, generally followed by municipal water supply. The taking of water for industrial, commercial and irrigation purposes is regulated by the availability of the supply, the efficiency of use and established uses in an area. The use of water for pollution control, flood control, fire protection, recreation, wildlife preservation and the protection of habitats are also important considerations (pg 13).

There are no known examples of the ministry applying this policy.

The Ontario Low Water Response Plan also outlines a priority of water uses when low water conditions occur, differentiating between Essential, Important, and Non-Essential uses. Essential uses of water deal with human and animal life and health. Important uses are water uses that are important for social and economic well-being of a particular area, e.g. activities such as key agricultural crops. Non-essential uses are those that can be interrupted for the short term without significant impact. Prioritization of water uses is established annually, and the priority is short-term, applied only during low water conditions.



There are mechanisms under the Ontario Water Resources Act (OWRA) and Clean Water Act to establish public/municipal water supply areas as the priority water use in the designated areas. Under section 33.(1)(c) of the OWRA, Director has authority to define an area that includes a source of public water supply, wherein no act shall be done and no water shall be taken that may unduly diminish the amount of water available in such area as a public water supply. However, this provision has not been applied in the province to date. The Clean Water Act, 2006 established a locally-driven, science-based, multi-stakeholder process for safeguarding drinking water sources. It focuses on protecting water before it enters the municipal drinking water system. Under the legislation, local source protection committees across the province are tasked with creating source protection plans for their areas that identify threats and risks to the drinking water sources. Policies are then developed to protect drinking water sources that could potentially affect other water users.

Prince Edward Island

Section 8 of the PEI Water Act ("Water Act," 2017) "authorizes the Minister to direct that an approval not be issued for a water withdrawal for commercial, industrial or recreational purposes if it would interfere with the availability of water for domestic purposes or for [environmental] water flow needs of a watercourse." AND Article 34(2) "Water for fire suppression or domestic purposes not to be affected by regulations (2) Regulations referred to subsection (1) shall not apply to restrict water withdrawals for fire suppression purposes or from wells for domestic purposes that would otherwise be permitted under this Act or the regulations." No formal conflict resolution measures are in place.

Quebec

Priority is not assigned. Quebec Water Policy (Ministère de l'Environnement du Québec, 2002) states: "...the government intends to create the necessary instruments so that they may give precedence, in the event of conflict, to the fundamental right of individuals to access this resource for their basic needs."

Yukon

Waters Act s.6 "(1) Subject to subsection (2), no person shall use, or permit the use of, waters in a water management area except (a) in accordance with the conditions of a licence; or (b) as authorized by regulations made under paragraph 31(1)(m). (2) Subsection (1) does not apply in respect of the use of waters (a) by a domestic user; (b) by an in-stream user; or (c) for the purpose of (i) extinguishing a fire, or (ii) on an emergency basis, controlling or preventing a



flood. (3) Where any person diverts waters for a purpose set out in paragraph (2)(c), the person shall, when the need for the diversion has ceased, discontinue the diversion and, in so far as possible, restore the original channel conditions”.

Under to chapter 14 of the Umbrella Final Agreement, First Nations have a right to request that the Board review a licensee’s compliance with their license if they believe that there is an adverse effect resulting. This occurred when a First Nation believed that a licensee’s source of rip-rap was potentially harmful to salmon spawning and rearing habitat. Also, under the Waters Act anyone can make application to the board for an amendment to any license to address adverse effects from licensee’s use of water. This has happened, for example, when a resident applied to amend the permitted flows from a hydro facility because of flooding to their property (Salvin, 2018).

Waters Act s.12 “(1) Subject to this section, the Board may issue type A licences and type B licences, in accordance with the criteria set out in the regulations made under paragraph 31(1)(c), for a term not exceeding twenty-five years, permitting the applicant for the licence, on payment of the fees prescribed by regulations made under paragraph 31(1)(k) (a) at the times and in the manner prescribed by any applicable regulations made under paragraph 31(1)(l), or (b) in the absence of such regulations, at the times and in the manner set out in the licence, to use waters or deposit waste, or both, in connection with the operation of the appurtenant undertaking and in accordance with the conditions specified in the licence. (2) The Board shall not issue a licence in respect of a use of waters referred to in subsection 6(2)”.

The Act ("Waters Act," 2003) specifies only the following related to dispute resolution: s.26 “Appeal to the Supreme Court 26(1) An appeal lies from a decision or order of the Board to the Supreme Court on a question of law or a question of jurisdiction, on leave being obtained from that Court on application made within forty-five days after the making of that decision or order or within such further time as that Court, or a judge of it, under special circumstances allows. (2) No appeal lies after leave has been obtained under subsection (1) unless the notice of appeal is filed in the Supreme Court within sixty days after the making of the order granting leave to appeal.”



US – Great Lake States

Illinois

Priority among water users not apparent in Water Use Act ("Water Use Act of 1983," 1983) statute or regulations or Drought Plan; instead priority aquifers and watersheds are identified for conservation/protection. Conflict resolution is guided by reasonable use doctrine in the Water Use Act.

Indiana

The priority of domestic water use is established in Indiana Code 14-25-1-3, which states that: "the owner of land contiguous to or encompassing a public water course shall at all times have the right to the use of water therefrom in the quantity necessary to satisfy his needs for domestic purposes, which shall include, but not be limited to, water for household drinking purposes and drinking water for livestock, poultry and domestic animals. The use of water for domestic purposes shall have priority and be superior to any and all water uses."

Rule 312 IAC 6.3-4-1, ("Water Withdrawal Contracts from State Reservoirs," 2008), establishes the following water withdrawal priorities from State financed reservoirs under the provisions of IC 14-25-2:

- A) First Priority is for the use of water for domestic purposes as described in IC 14-25-1-3.
- B) Second priority is for the use of water for health and safety.
- C) Third priority is for the use of water for power production that meets the contingency planning provisions of the drought alerts described in 312 IAC 6.3-5-2.
- D) Fourth priority is for the use of water for industry and agriculture (not described in A, B, or C) that meets the contingency planning provisions of the drought alerts described in 312 IAC 6.3-5-2.
- E) Fifth priority is for the use of water for a purposed described in clause (C) or (D) that does not meet the contingency planning provisions of the drought alerts described in 312 IAC 6.3-5-2.
- F) Sixth priority is for the use of water for any other purpose.

- IC 14-25-1-8. Mediation of disputes:



“Sec. 8. Whenever a dispute arises between the users of surface water in a watershed area, any party to the dispute may request that the commission mediate the dispute using the mediation provisions under IC 4-21.5-3.5.”

- IC 14-25-3-10 withdrawal permits; judicial review (Groundwater)

“Sec. 10. A refusal to grant a permit is subject to court review under IC 4-21.5-5.”

New York

Environmental Conservation Law: § 15-0105. Declaration of policy.

“4. With respect to the use of the waters of the state and the water courses thereof, due consideration shall be given to the relative importance of different uses.”

Private riparian rights are subordinate to the public trust doctrine (see Adirondack League Club Inc. v. Sierra Club, 684 N.Y.S.2d 168, 172 (N.Y. 1998)).

Michigan

Guiding principle #7 of the Michigan water withdrawal assessment: “Water use by type of user or by purpose of use is not prioritized (Michigan Groundwater Conservation Advisory Council 2007).” In the event of a conflict, public water supply uses would likely be prioritized over other types of water use (Milne, 2018).

Natural Resources and Environmental Protection Act (1994) Part 317 specifically outlines aquifer protection and dispute resolution. In MCL 324.31702 procedures are outlined for the process of submitting a complaint for a groundwater dispute. Actions such as informal meetings between parties and the duties of the director of the Michigan Department of Agriculture and Rural Development (MDARD) in the dispute are outlined. MDARD has jurisdiction over complaints involving agricultural high capacity wells. MDEQ has jurisdiction over other industrial high capacity wells (except for dewatering wells, which are exempt). Appeal processes and compensations requirement and conditions are specified. The Directors of MDARD and DEQ have the authority to declare a groundwater dispute if the high capacity well owner and the impacted small capacity well owner(s) are unable to settle the dispute. The Directors can order the high capacity wells to cease or reduce their pumping.



Part 327 provides for water user groups of all the water users and local governments in a depleted WMA to manage the water uses in the WMA. If a WMA has not been formed, the MDEQ can convene the water users in a depleted WMA and give them 30 days to propose a solution(s). If they don't propose a solution(s) the MDEQ can propose a solution(s), which the water users are not required to follow.

Minnesota

M.S. 103G.261 Water allocation priorities.

(a) The commissioner shall adopt rules for allocation of waters based on the following priorities for the consumptive appropriation and use of water:

(1) first priority, domestic water supply, excluding industrial and commercial uses of municipal water supply, and use for power production that meets the contingency planning provisions of section 103G.285, subdivision 6;

(2) second priority, a use of water that involves consumption of less than 10,000 gallons (37,854.12 litres) of water per day;

(3) third priority, agricultural irrigation, and processing of agricultural products involving consumption in excess of 10,000 gallons (37,854.12 litres) per day;

(4) fourth priority, power production in excess of the use provided for in the contingency plan developed under section 103G.285, subdivision 6;

(5) fifth priority, uses, other than agricultural irrigation, processing of agricultural products, and power production, involving consumption in excess of 10,000 gallons (37,854.12 litres) per day; and

(6) sixth priority, nonessential uses.

(b) For the purposes of this section, "consumption" means water withdrawn from a supply that is lost for immediate further use in the area.

(c) Appropriation and use of surface water from streams during periods of flood flows and high water levels must be encouraged subject to consideration of the purposes for use, quantities to be used, and the number of persons appropriating water.



(d) Appropriation and use of surface water from lakes of less than 500 acres in surface area must be discouraged.

(e) The treatment and reuse of water for non-consumptive uses shall be encouraged.

(f) Diversions of water from the state for use in other states or regions of the United States or Canada must be discouraged.

Minnesota Rules 6115.0740: Water Use Conflicts defines conflict and defines procedures for “whenever the total withdrawals and uses of ground or surface waters would exceed the available supply based on established resource protection limits, including protection elevations and protected flows for surface water and safe yields for groundwater, resulting in a conflict among proposed users and existing legal user (Subp2.).” Mechanisms include modifying the appropriation of the proposed and existing user and if this is not possible on the basis of existing priorities of use that either (a) if users are of the same priority class that a plan is developed to provide for proportionate distribution or (b) if the unresolved conflict involves users from a different priority class that the highest priority are satisfied first.

Minnesota Rules 6115.0730: Well interference problems involving appropriation. Procedures are described in this rule if the commissioner determines that there is a probable interference from a lower priority user with public water supply well(s) or private domestic well(s) which may result in reducing the water levels beyond the reach of those wells.

DNR decisions can be legally challenged: the applicant, the mayor of the municipality, the watershed district or the soil and water conservation district can demand a hearing. (Minnesota Rule, 6115.0250, subp. 3)

Appeal process also outline for orders issued by the South Dakota-Minnesota Boundary Waters Commission in district or circuit court as a dispute mechanism - 103B.451 (Subd. 5)

New York

In the New York State Comprehensive Emergency Management Plan's Drought Management Coordination Annex (2016): “The DMTF has determined that ensuring public health is the highest priority for drought preparedness.”

Ohio

Priority not noted. Litigation is the primary mechanism to resolve disputes over water use (Kroncelik, 2016). The Revised Code 1521 ("Conservation of Natural Resources," 2006) requires the Chief of the Division of Water to hold meetings or public hearings, whichever is considered



appropriate by the Chief, to assist in the resolution of conflicts between groundwater users. The meetings or hearings must be called upon written request from boards of health of city or general health districts or certain other authorities having the duties of a board of health, boards of county commissioners, boards of township trustees, legislative authorities of municipal corporations, or boards of directors of conservancy districts.

Pennsylvania

Priority only declared in a state of drought emergency - 4 Pa. Code Chapters 119-120 outlines non-essential water use restrictions and water rationing.

Litigation acts as an additional conflict resolution system according to the Citizens Advisory Council to the DEP (Citizens Advisory Council, 2000); however, no resolution for competing uses noted.

Wisconsin

Priority is only outlined in the Drought Incident Annex (Wisconsin Department of Military Affairs, 2015):

“The following prioritized, non-inclusive list of water uses is for guidance purposes only:

- (1) Human quality of life
- (2) Firefighting
- (3) Livestock watering
- (4) Crop irrigation
- (5) Industrial and commercial process uses
- (6) Hydroelectric production
- (7) Recreational uses (water-parks, golf course irrigation, etc.)
- (8) Landscape watering, car washing, etc.”

Alternative dispute resolution and enforcement is outline in the Great Lakes Compact (281.343(7)) - hearings before a court with jurisdictional review and civil action are outlined. Equitable relief and civil penalties are possible remedies.



US – Non-Great Lake States

California

“In deciding whether to approve applications and impose certain conditions in permits, the State Water Board is required to consider water quality control plans, including the protection of the beneficial uses of water, the public interest, reasonableness, and the public trust (protection of resources held in trust for all citizens, such as commerce, navigation, fisheries, and recreational and ecological values). Before issuing a water right, the State Water Board must find that “unappropriated” (unclaimed) water is available to supply the applicant, considering the water flows needed to remain in the stream (in-stream flows) for the protection of other beneficial uses, including municipal supply, agricultural supply, and fish and wildlife habitat. The water right permit specifies how much and during which season water can be diverted, and other conditions, such as special terms to protect in-stream flows. Specifically addressing priority, Sawyer (Sawyers, 2005) states:

Riparian rights are generally senior to pre-1914 and post-1914 appropriative water rights..., and are not lost by non-use. However, recent California court decisions suggest that unexercised riparian rights can be subordinated to longstanding downstream appropriative rights in order to avoid unfair disruption of water allocation schemes upon which water users have come to rely. As a result, an unexercised riparian right may be junior to other rights; in a case where a stream is fully appropriated, a junior right may be tantamount to no right at all, and the holder of an unexercised riparian right might find himself or herself with little or no recourse as against his or her neighbors. In addition, the right of a riparian to object to conflicting uses can be lost by prescription (see below). Riparian right holders generally do not have priorities with respect to other riparians. Instead, each has a "correlative right" to the use of a reasonable share of the total riparian water available in the watercourse, to the extent the riparian can place that water to beneficial use on the riparian's land. As a result, quantification of the riparian right is almost impossible unless there has been a stream-wide adjudication.

The right to use water is obtained through actual use of water within the limits described in the permit” (California Environmental Protection Agency, 2018a) “In recent years, temporary transfers of water from one water user to another have been used increasingly as a way of meeting statewide water demands, particularly in drought years. Temporary transfers of post



1914 water rights are initiated by petition to the State Board. If the Board finds the proposed transfer will not injure any other legal user of water and will not unreasonably affect fish, wildlife or other in-stream users, then the transfer is approved” (California Environmental Protection Agency, 2018b). “California’s judicial system also plays an important role in water governance, with the courts serving as arbiters of disputes over particular water management and use issues that often affect or reflect broader policies. State courts, rather than the legislature, established the initial contours of California’s hybrid system of water rights, and courts continue to define and redefine those contours (such as the meaning of ‘reasonable use’)” (Hanak *et al.*, 2011). Finally, the California Water Commission plays a role in water conflict. The Commission “consists of nine members appointed by the Governor and confirmed by the State Senate. Seven members are chosen for their general expertise related to the control, storage, and beneficial use of water and two are chosen for their knowledge of the environment. The Commission provides a public forum for discussing water issues, advises the Department of Water Resources (DWR), and takes appropriate statutory actions to further the development of policies that support integrated and sustainable water resource management and a healthy environment. Statutory duties include advising the Director of DWR, approving rules and regulations, and monitoring and reporting on the construction and operation of the State Water Project (California Water Commission, 2018).

Florida

Priority among water users is address in Florida Statute 373.246 Declaration of water shortage or emergency in ("2012 Florida Statutes, Permitting Consumptive Uses of Water," 2012) Chapter 373 on Water Resources states “If an emergency condition exists due to a water shortage within any area of the district, and if the department, or the executive director of the district with the concurrence of the governing board, finds that the exercise of powers under subsection (1) is not sufficient to protect the public health, safety, or welfare; the health of animals, fish, or aquatic life; a public water supply; or recreational, commercial, industrial, agricultural, or other reasonable uses, it or he or she may, pursuant to the provisions of s. 373.119, issue emergency orders reciting the existence of such an emergency and requiring that such action, including, but not limited to, apportioning, rotating, limiting, or prohibiting the use of the water resources of the district, be taken as the department or the executive director deems necessary to meet the emergency.” In-stream flows are not determined at a state level: Florida Statute ("2015 Florida Statutes," 2015) 373.0421 “Establishment and implementation of minimum flows and levels” states that requires each water management district to develop and set MFLs to protect Florida’s waterbodies, including springs, rivers, and aquifers. Conflict



resolution protocol for competing water use applications are found in Chapter 373.223 of the Florida Statutes. Conflict resolution regarding water use applications is addressed in Chapter 120 of the Florida Statutes. Legal challenges for pending water use applications are infrequent; however, follow Chapter 120 protocol. Mechanisms mentioned include litigation, unanimous vote, mediation, and hearings. ("2012 Florida Statutes, Permitting Consumptive Uses of Water," 2012)

Montana

Priority is based upon the time that water was first appropriated for pre-1973 rights and on the time of receipt of a complete application for post-1973 permit rights (AMEC, 2008). "Montana has closed some of its basins to certain types of new water appropriations due to concerns as to water availability, over-appropriation, and to protect existing water rights. Montana's in-stream flow program began in 1969 when the state enacted legislation allowing the Department of Fish, Wildlife and Parks the right to appropriate water on 12 trout streams. This was extended in 1973 to allow any state or federal agency to request minimum flows on any stream and further extended in 1989 and 1995 to allow the Department (and ultimately individuals and private groups) to lease water rights for in-stream uses. The Department may also acquire in-stream rights by transfer from existing users" (AMEC, 2008). "The 1979 Legislature created the Montana Water Court to expedite and facilitate the statewide adjudication of over 219,000 state law-based water rights (generally rights with a pre-July 1973 priority date) and Indian and Federal reserved water rights claims. The Water Court has exclusive jurisdiction over the adjudication of water rights claims" (Montana Judicial Branch, 2018).

North Carolina

"In those parts of North Carolina where water supplies are perceived to be sufficient to meet in-stream and consumptive needs, there are no restrictions on water use. However, the North Carolina Environmental Management Commission may designate "capacity use areas" where water use requires coordination and limited regulation to protect the rights of residents, property owners or the public interest. In these capacity use areas, applications for water use permits may be subject to an environmental assessment and applications that jeopardize water quality, aquatic habitat, or endangered species may be denied." (AMEC, 2008) Regarding public hearings, North Carolina statute 143-215.22L on regulation of surface water transfers states "(j)... At least one hearing shall be held in the affected area of the source river basin, and at least one hearing shall be held in the affected area of the receiving river basin. In determining



whether more than one public hearing should be held within either the source or receiving river basins, the Commission shall consider the differing or conflicting interests that may exist within the river basins, including the interests of both upstream and downstream parties potentially affected by the proposed transfer. The public hearings shall be conducted by one or more hearing officers appointed by the Chair of the Commission. The hearing officers may be members of the Commission or employees of the Department. The Commission shall give at least 30 days' written notice of the public hearing as provided in subsection (c) of this section. The Commission shall accept written comment on the draft determination for a minimum of 30 days following the last public hearing. The Commission shall prepare a record of all comments and written responses to questions posed in writing. The record shall include complete copies of scientific or technical comments related to the potential impact of the interbasin transfer. The applicant who petitions the Commission for a certificate under this section shall pay the costs associated with the notice and public hearing on the draft determination."

International

England/Wales

Permit/order options by area including prioritization into Tier 1 and Tier 2. England's Drought Plan (Environment Agency Government of the United Kingdom, 2017) is less specific: "the Environment Agency and water companies can apply to government for a drought order to stop any unlicensed or licensed abstraction with no low flow control conditions that is having a severe impact or is threatening to impact on the environment or public water supply. The Defra Secretary of State will make a decision to grant such orders for reasons based on the predicted impacts and the prioritisation of water for people, industry and the environment". Conflict resolution mechanisms exist for monitored withdrawals including agriculture, domestic, industrial, energy production, environment and national security. "Enforcement action (specifically the imposition of a sanction) can normally be appealed either through the criminal court process or as a result of specific appeal provisions. Our notices set out the rights of appeal which apply in the specific circumstances of each sanction or provision" (OECD, 2015).

New Zealand (Waikato Region)

Policy 18 on "Levels of Priority to Apply During Water Shortages" in the Waikato Regional Plan (Waikato Regional Council, 2010) states "a) The level of priority to apply during water shortage conditions in surface water (SW) bodies, in descending level of importance is as follows: i) Priority SW-A activities: takes which have a zero net take, or for firefighting ii) Priority SW-B activities: stock watering supplies, takes for animal welfare and sanitation (including shed wash



down and milk cooling), takes for perishable food processing, takes associated with electricity generation, all permitted and s14(3)(b) RMA takes, and takes for domestic or municipal supply. iii) Priority SW-C activities all other takes allocated within the primary allocable flow as defined in Table 3-5. iv) Priority SW-D activities: all other takes allocated water above the primary allocable flow as defined in Table 3-5 and temporary takes of short duration. v) Priority SW-E activities: takes for water harvesting. b) The level of priority to apply during water shortage conditions in groundwater (GW) aquifers, in descending level of importance, is as follows: i) Priority GW-A activities: will include groundwater takes allocated as discretionary activities. ii) Priority GW-B activities: will include groundwater takes allocated as non-complying activities.” Table 3-5 specifies the percentage of Q5 flow which can be allocated and the portion required for minimum flow. The Environment Court is a specialist court operating under the RMA and has the same powers as the District Court. The three main functions of the court are (1) appeals (including recommendations for water conservation orders), (2) hearing and deciding significant applications, and (3) enforcement including confirming, amending or canceling decisions on applications for resource consents and designations (New Zealand Ministry for the Environment, 2015).

South Australia

Water Allocation Plans, which are required under the Natural Resource Management Act ("Natural Resources Management Act," 2004) at least every three years, are prepared by the regions of South Australia. One approved by the Department of Environment, Water and Natural Resources users can be allocated water by applying for a “licence, which sets out their allocation and the conditions under which they can take water. Those wanting to carry out activities on a water body may need to apply for a permit” (Department of Environment, 2018). In South Australia, the Department for Environment and Water charges penalties for the unauthorized take and use of water or overuse. The penalties are published yearly in the South Australian Government Gazette (Water, 2018). The Environment, Resources and Development Court of South Australia has jurisdiction over a wide range of legislation including the Natural Resources Management Act ("Natural Resources Management Act," 2004). The ERD is a specialist court which deals with disputes, and the enforcement of laws relating to land development and management, “the natural and built environment and natural resources” (Courts Administration Authority of South Australia, 2018).



Once a water resource is prescribed, a process commences whereby existing users of water are given first preference at accessing the available water resource. This is provided for under section 164N of the NRM Act. Preference is given to existing users over new users. Once existing users are provided for, any excess water can then be made available to new water users or existing users wanting more water (anyone) by purchasing it from the Minister through some form of sale, e.g. auction, tender, or direct purchase (Popleton, 2018). Water license trading is the primary mechanism being used within Australian jurisdictions to deal with conflict and re-allocate scarce resources. If someone needs water, they can buy temporary or permanent rights to take more water from someone who has excess water allocation available and/or is financially better off selling their water than using it. Trading is enabled under the NRM Act; area-specific trading rules are prescribed in Water Allocation Plans (Popleton, 2018). Water trading on the River Murray in particular, has allowed water users to source water in times of scarcity.

**7.9 IS THERE A DROUGHT PLAN? IF SO WHAT ARE THE MAIN ACTION ITEMS OF THE PLAN?
(E.G., MONITORING, COMMUNICATION/COORDINATION PLANNING, LOCAL ASSISTANCE, CONSERVATION)?**

Canada

British Columbia

Yes - British Columbia Drought Response Plan (Ministry of Environment, 2016); action items are outlined for provincial level committees and ministries as well as regional and local drought teams.

Deputy Ministers Committee on Drought - Resolve higher level issues and recommendations, strategic regulatory, policy, and financial guidance and approval, elevate issues to political or inter-jurisdictional level.

Assistant Deputy Ministers Committee on Drought - consider and address corporate objectives, approve recommendations, oversee working groups and communicate issues to Deputy Ministers Committee.

Ministry of Forests, Lands, Natural Resource Operations and Rural Development - oversight responsibility for planning and response, orders of Minister, Comptroller, Engineer and Lieutenant Governor Council (WSA s. 22, 86,87,88,93)



Ministry of Environment & Climate Change Strategy- legislation and policy development, oversee and coordinate science for monitoring and assessing impact.

Emergency Management BC - provide advice and historical context, support local government, support emergency response coordination, fire-fighting risk assessment and requirements.

Ministry of Health - provide policy development and guidance related to drinking water.

Natural Resources Board - oversee effective provision of integrated natural resources and services; provide strategic oversight to management efforts.

FLNR Executive - oversee FLNR responsibilities, coordinate with other ministries.

Engineer, Water Manager or Comptroller of Water Rights - make statutory decisions on priority of water rights, CEFT orders, may restrict lower priority licenses, authority to regulate non-licensed water users.

Inter-Agency Drought Working Group - ensure delivery of drought plan and projects, identify trends, issues and gaps, ensure roles and responsibilities are defined, communicate with stakeholders, document and enable shared learning.

Provincial Technical Drought Working Group - ensure effective delivery of plan, coordinate cross-agency response, determine watershed basin level drought levels, determine when to take regulatory action.

AGRI Drought Working Team - assess role of AGRIO staff, inform WSA s88 about needs of agriculture, assess impact on farming, livestock feed, range land, provide info on drought programs to producers.

Regional Drought Teams - provide advice on region and watershed response levels, issue advisories. support pre-drought preparedness.

Regional level response plans generally cover: area the plan covers; members of drought management team; roles and responsibilities of team Members; details surrounding a Stream Watch List; how drought will be assessed and the corresponding response; a data management plan; a communication plan; and any training that will need to occur.



Local authority roles include: gathering available drought information for the community; identifying information gaps; identifying vulnerable aquatic ecosystems; targeting water management needs; implementing water conservation strategies; managing community water supplies; communicating with the public; and participating as part of Regional Drought Teams in the coordination of drought response.

Manitoba

Manitoba's Drought Management Strategy (Province of Manitoba, n.d.): monitoring, data communication and sharing; reporting on water availability and drought conditions; drought forecasting; infrastructure planning and design, use and operation of water retention structures, drought proofing programs, groundwater management; drought tolerant crops, restoration of wetlands, transboundary drought management, drought insurance/assistance fund, demand management (water efficiency and reduced consumption), innovative water technology, limiting water licensing/permits, education and awareness, support for human health.

New Brunswick

No noted drought management plan; however, the Department of Environment and Local Government (2017) outlines actions to prepare a response to drought conditions.

Ontario

The Ontario Low Water Response plan (led by Ministry of Natural Resources and Forestry) outlines a program to monitor and report on low water conditions across the province, on a watershed basis. The plan outlines criteria for measuring and quantifying low water conditions, recommended actions that should be taken at different levels of low water, and the process for locally-based response (through Water Response Teams) to low water conditions (Ministry of Agriculture Food and Rural Affairs, 2018).

Broad authority exists in the current PTTW framework to tailor individual permits to given conditions and to alter or revoke a permit if conditions change (e.g., respond to drought). For example, establishing permit conditions related to drought is under the director's discretion. Likewise, a general framework for when and how to alter/revoke permits in response to drought are discussed in the Water Management: Policies, Guidelines, Provincial Water Quality Objectives (Ontario Ministry of the Environment and Energy, 1994) and the Ontario Low Water Response program.



Broad authority also exists in the current PTTW framework to consider water availability and manage water takings at a regional scale (e.g., to potentially delineate drought-prone areas and develop/implement a strategy to manage existing and new takings within such areas). The "high use watershed policies" under the Water Taking and Transfer Regulation under the OWRA is an example of setting priorities of water use in stressed areas i.e., permits for new and expanded water takings for specific uses, including water bottling, are prohibited. Following a provincial assessment of average annual water flows and summer low flows, some tertiary watersheds were designated in regulation as "high use watersheds". Specific policies prohibiting highly consumptive water uses are outlined in the Water Taking and Transfer Regulation (s.5).

A factor that the PTTW signing Director must consider when considering a PTTW Application includes water availability (e.g., impacts of water taking on water balance and sustainable yield; low water conditions; as well as considering historic low water conditions as an indicator of water availability within an area/watershed); the Director may subsequently establish conditions in the permits to respond to low water conditions.

- On April 21, 2017, Ontario implemented interim rules that apply to all renewals of existing water takings from groundwater for water bottling. These include reductions in water taking linked to OLWR declarations.
- Relevance of OLWR to groundwater takings is limited given that current low water indicators relate primarily to surface water (i.e., stream flow, precipitation).

Prince Edward Island

N/A

Quebec

N/A

Yukon

The Act ("Waters Act," 2003) does not have any formal mechanisms for addressing drought management in the context of water allocation.



US – Great Lake States

Illinois

Yes - State of Illinois Drought Preparedness and Response Plan (State of Illinois, 2011) (formally the 1983 drought contingency plan); identifies the interagency Drought Response Task Force (DRTF), which is responsible for determining what areas are of concern and what actions to take. During a drought, the DRTF provides technical assistance to communities. The communities send out press releases and voluntary conservation techniques. In a more severe drought, the Governor, through the Illinois Emergency Management Act, may respond to a drought emergency and implement mandatory conservation measures. Additionally, many individual communities within the state have their own drought response plans that set their own restrictions and actions (Ohio River Valley Water Sanitation Commission, 2015).

Indiana

Yes – Indiana's Water Shortage Plan (Indiana Department of Natural Resources, 2015); actions for different uses (i.e., domestic and miscellaneous uses, essential service uses, public water supply system use, industrial and commercial use, industrial use, irrigation use, livestock and poultry water, institutional use) through phases of Water Shortage Watch, Warning, and Emergency; water conservation measures also suggested for individuals, water and wastewater utilities, local and state governments; plan includes triggers to identify the start of a water shortage and appropriate responses, including water-use priorities and conservation tools (e.g., voluntary restrictions or conservation methods).

New York

Yes - New York State Drought Plan (New York State Department of Environmental Conservation, 1988) outlines state and local response actions under normal conditions drought alert/watch, drought warning, drought emergency, and drought disaster.

The Drought Plan describes the actions to be taken during each drought stage by water purveyors, towns and villages, water authorities, and other agencies with water supply responsibilities.

Drought Watch - Public water suppliers begin to conserve water and urge customers to reduce water use.



Drought Warning - Voluntary water conservation is intensified. Public water suppliers and industries update and implement local drought contingency plans. Local agencies make plans in case of emergency declaration.

Drought Emergency - The Governor may declare emergency. The Disaster Preparedness Commission coordinates response. Mandatory local/county water restrictions may be imposed. Communities may need to tap alternative water sources to avoid depleting water supplies, protect public health and provide for essential uses.

Drought Disaster - Disaster plans are implemented. Water use is further restricted. The Governor may declare disaster and request federal disaster assistance. Emergency legislation may be enacted. The state provides equipment and technical assistance to communities.

Michigan

Yes - Drought Response Plan (Office of Water Resources, 1988) - actions are short and long term in nature:

Short term: form Drought Response Management Task Force, meet with Office of Water Resources to summarize status of drought conditions, water resources, and water use conflicts, Attorney General will identify specific water rights to regulate water withdrawals, oppose new or increased diversions out of the Great Lakes Basin, develop briefing materials for state legislators outlining strategy, enable joint management by relevant agencies, contact dam agencies and remind them to maintain minimum flow releases, request cooperation of NPDES permit holders to reduce pollutant loads, provide technical assistance to local governments, carry out fire protection, summarize water law for regional and district offices, monitor streamflow conditions, monitor water quality conditions, respond to water use complaints, notify that non-riparian water withdrawals from public access sites are prohibited, identify areas where reduced flows and water levels are causing water quality problems, take measures to protect recreational uses and public health, authorize where appropriate use of partially treated wastewater for irrigation, document drought related expenses for federal reimbursement. Long-term - adopt watershed management program with water use reporting, protection of minimum in-stream flows, water use regulation, encouragement of water conservation and demand management.



Minnesota

Yes - Minnesota Statewide Drought Plan (Department of Natural Resources, 2009); outlines state, federal, water user and supplier's actions during phases of non-drought, drought watch, drought warning, restrictive, and emergency.

Non-drought:

State & Federal Actions: water quality monitoring, state and regional studies and coordination, assist users in developing conservation measures, conservation education.

Water Users and Suppliers: water supply plans, conservation rate structures and ordinances, mutual aid agreements, interconnections, conservation education, minimize water supply system losses and improve efficiency.

Watch:

State & Federal Actions: inform Drought Task Force and suppliers of conditions, intensify monitoring activities, public awareness, coordination.

Water Users and Suppliers: monitor and report conflicts and problems, provide conservation information, request voluntary conservation measures.

Warning:

State & Federal Actions: Convene Drought Task Force, increase public awareness, notify water suppliers of conditions, monitor.

Water Users and Suppliers: implement water use restrictions and conservation measures, implement low-flow management plan for dams.

Restrictive:

State & Federal Actions: notify water suppliers of extreme conditions, monitor river flows, continue drought awareness efforts.

Water Users and Suppliers: follow allocation restrictions, minimize non-essential water uses.

Emergency:

State & Federal Actions: advise governor on need for emergency declaration, implement Emergency Operations Plan, consider releasing water from Mississippi River Headwater Reservoirs.



Water Users and Suppliers: mandatory water reduction, limit water use based on priorities, implement emergency declaration measures, provide bottled water, hauled water, and sanitation supplies to users if needed.

Ohio

Yes - State of Ohio Emergency Operations Plan Drought Incident Response Annex (Ohio Emergency Management Annex, 2009); outlines actions for pre-drought monitoring and assessment, increased monitoring, conservation actions, and emergency response for federal, state and local support agencies.

Pennsylvania

Drought emergencies are managed in conformance with Pennsylvania Emergency Management Agency (PEMA)'s drought emergency regulations, found at 4 Pa. Code Chapters 118-120. Three stage processes (drought watch, warning and emergency) organize actions including reductions of major water use in a commonwealth drought emergency area (Ch 118), prohibition of non-essential water uses in a commonwealth drought emergency area (Ch 119), local water rationing plans (Ch 120).

Wisconsin

Yes - Wisconsin Emergency Response Plan (Wisconsin Department of Military Affairs, 2015) includes a Drought Incident Annex that outlines recognition, response, and mitigation action items in times of abnormally dry, moderate drought, severe/extreme drought, exceptional drought for local, state, and federal support and coordinating agencies.

US – Non-Great Lake States

California

Yes, the California Drought Contingency Plan (California Natural Resources Agency & Resources, 2010) includes monitoring, communication/coordination planning, local assistance, conservation. California's water system faces a number of “difficult challenges including: uncertain water supplies, drought, water quality, habitat loss, flooding and climate change” (Government of California, 2018). In 2015 the California Governor signed “emergency legislation - AB 91 and AB 92 - that fast-tracks more than \$1 billion in funding for drought relief and critical water infrastructure projects” (Brown, 2009). Further, the Sustainable Groundwater Management Program has developed a Groundwater Sustainability Plan Emergency Regulations Guide (Resources, 2016).



Florida

Yes, the goals of the Florida Drought Action Plan (Florida Department of Environmental Protection *et al.*, 2007) are to monitor (Collect and analyze drought-related information in a timely and systematic manner); assess (assess impacts of the drought on water users and the environment); coordinate (coordinate the drought response plans of relevant agencies and organizations); communicate (communicate accurate information to decision makers and other interested parties); act (take coordinated actions to reduce the adverse effects of the drought and assess the effectiveness of mitigation actions being taken), and prepare (develop actions to reduce Florida's vulnerabilities to the next drought).

Montana

Yes, the Montana Drought Response Plan (Montana Drought Advisory Committee, 1995) was predated by a plan in 1977 and focuses on mitigation. An updated Draft Outline for State Drought Management Plan (Montana Department of Natural Resources & Conservation, 2016), for which the public comment period is over, has not been finalized but can be viewed. Main actions of the 1995 Plan are monitoring, reporting, assessment, response (including triggering mechanisms, drought alert and severe drought), and an outline of state, federal, and local response actions.

North Carolina

Yes, the North Carolina Drought Assessment and Response Plan (State of North Carolina, 2005). Main action items are monitoring, assessment, impact identification, reporting, and response; the Plan divides some of the action items among task forces, e.g., agriculture, health, water sources.

International

England/Wales

Yes, the Drought response: Our Framework for England (Environment Agency Government of the United Kingdom, 2017), published by the Environment Agency and defined drought stages from normal to severe. Action items include (response to) environmental incidents, drought permits and orders to increase water supply, drought orders to protect the environment, spray irrigation restrictions, drought monitoring, data and information gathering and reporting, and communication. "The Environment Agency's, "Enforcement and Prosecution Policy," sets out a framework for agency inspection of abstractions and impoundments to ensure compliance with



licence conditions. The frequency of inspection depends upon the criticality of the impact of the authorized activity on the environment. Meter inspections are an integral part of licence enforcement" (Canadian Council of Ministers of the Environment, 2016a; Environment Agency Government of the United Kingdom, 2013b). Under Section 28 of the Water Act ("Water Act," 2014) drought plans must be revised every five years. Dŵr Cymru Welsh Water (Dŵr Cymru Welsh Water, 2015) also has published a drought plan with a comprehensive table of action items in relation to various drought conditions.

New Zealand (Waikato Region)

Yes. The Waikato Regional Council Water Shortage Risk Mitigation Plan (Council, 2000) deals with drought as a significant cause of water shortage. The major action items are reducing adverse effects, response and recovery, and monitor and review. See also Waikato Regional Plan Policy 17 and 18 and Standard 3.3.4.27. In addition to those water shortage measures required under the Regional Plan, section 329 RMA provides for formal Water Shortage Directions to be applied.

South Australia

Because South Australia is and has been experiencing unprecedented dry weather patterns, low water flows and drought appear to be managed continuously. South Australia's 194-page Water for Good Plan comprehensively lays out the actions the State will do to ensure their "water supplies are secure, safe, reliable – and able to sustain continued growth – for at least the next 40 years" (Government of South Australia, 2009). The plan affords for the creation of a Drought Response Plan, among other options, in both short term emergencies and long term permanent change. Related and notable is the Climate Change Adaptation Framework for South Australia "Prospering in a Changing Climate" (Department of Environment Water and Natural Resources, 2012) which lays out strategic direction and policy responses to climate change at the state level.

The two most recent water allocation plans have built in mechanisms to manage allocations in dry times. The Water Allocation Plan for the Southern Basins and Musgrave Prescribed Wells Areas reallocates water annually, or at shorter periods if necessary, based on the level of storage in aquifers. See:

<http://www.naturalresources.sa.gov.au/eyrepeninsula/land-and-water/water-allocation-plan-new>



The Water Allocation Plan for the River Murray Prescribed Watercourse contains an allocation framework in Chapter 5. For fact sheets regarding allocating in dry times and a copy of the plan see:

<http://www.naturalresources.sa.gov.au/samurraydarlingbasin/water/water-allocation-plans/river-murray-wap> (Poppleton, 2018).

7.10 WHERE INFORMATION IS AVAILABLE, WHAT IS THE ROLE OF STAKEHOLDERS IN WATER ALLOCATION DECISIONS?

Canada

British Columbia

There is currently no formal role for stakeholders in water allocation decisions.

A decision maker can accept comment about an application, but in the end the decision maker must not be fettered. See sections 12, 13, 14 WSA.

Section 115 of the act allows the minister to establish advisory boards to advise on matters under the WSA, this could include water allocation.

Section 126 WSA provides for the conferring of decisions of the Comptroller, Water Manager, Officer or Engineer on another person/entity – this could be an allocation decision.

Water Objectives could also be developed with stakeholders and a decision maker is required to consider these in a decision. These are currently being developed and are part of the Cumulative Effects Framework.

Water Sustainability Plans were introduced in the Water Sustainability Act as a replacement to Water Management Plans and act as a provincial tool to use to address impacts of land-based activities on water resources and other water issues on a regional/local basis. In the content of plan terms of reference, WSA 68 (1)(f), 73(1) (c) outlines requirements including the requirement that “a description of the public and stakeholder communications and consultations undertaken in the planning process.” To date, a Water Sustainability Plan has not been undertaken by the province.



Manitoba

Public hearings for licensing processes; Water Rights Act s.6 “(4) Upon expiry of the 15 days provided in subsection (3) in respect of any application, and before the minister determines whether or not to grant the application, a public hearing shall be held before the Municipal Board at which any person may make representations, either himself or through counsel, for or against the application.” Public and non-government consultation a key component in development of Water Strategy.

New Brunswick

Regulation 90-80 (1990) s.16 “(1) At any time after an application has been submitted under this Regulation, the Minister may require the person submitting the application or the person on whose behalf the application is submitted to do any of or any combination of the following: (a) publish notice of the application in The Royal Gazette and in such newspaper as the Minister may require, including in the notice such details of the application as the Minister may require; (b) serve a copy of the notice of application upon such persons as the Minister may require; (c) attend at any public meeting arranged by the Minister; or (d) make submissions with respect to the application. 16(2) If publication or service of a notice of application is required under subsection (1), any person may file with the Minister a written objection to the issuance of the permit sought at any time within thirty days after the publication or service.”

Ontario

When an application for a PTTW requires posting in accordance with the Environmental Bill of Rights (EBR) Act and supporting regulations, a Proposal Notice is posted for a minimum of 30 days on the Environmental Registry to allow public commenting.

A proposal for a Permit to Take Water is required to be posted on the Environmental Registry for public comment. Proposals for water takings of less than a year and water takings for the irrigation of agricultural crops are not considered Class 1 proposals and are not posted for comment, unless it is a permit that includes a transfer of water between Great Lakes watersheds for one or more years.



Some Permit to Take Water applications are not required to be posted to the Environmental Registry because of regulatory exemptions and/or exceptions. The following types of proposals are not required to be posted for public review and comment:

- agricultural irrigation, except if the permit includes a transfer of water between Great Lakes watersheds for one or more years;
- water taking that is associated with implementation of a project approved under the Environmental Assessment Act (e.g., municipal water supply);
- emergency use; or,
- water taking of duration less than one year.

Proposals to renew existing permitted takings for bottled water have additional proponent-led consultation requirements to be completed prior to submitting a PTTW application (Ministry of the Environment and Climate Change, 2017): the preparation, and submission to the MECP for review and comment, a consultation plan outlining the applicant's proposed consultation activities; consultation with municipalities, agencies, indigenous communities/organizations and other interested parties; written notification about the proposed water bottling activity must be provided to the consulted parties; and the submission of a record of consultation with the PTTW application. Bottled water renewal applications under consideration by the Director will be posted on the Environmental Registry for a minimum 90-day public commenting period, rather than the standard minimum 30-day period for other PTTW applications. If a PTTW for water bottling is issued, the permit holder must also develop and maintain a publicly-available website that includes (among other items) a copy of the permit, all technical reports submitted in support of the application, and data on daily water takings.

General information about Permits to Take Water is publicly available through the ministry's open data catalogue website. The website includes a map of all active permits, including the purpose of water taking, and approved maximum rates/volumes of taking. This also provides an excel spreadsheet with more detailed information on active and inactive PTTWs (e.g., expired, cancelled and replaced).

The public can view permitted water taking locations using an interactive map found on the Ontario government website. The ministry also shares its data with community-based organizations to help support water management, such as the preparation of Source Protection Plans and implementation of the Ontario Low Water Response Plan.



The Water Taking and Transfer Regulation requires the Director to notify municipalities and Conservation Authorities of a proposed water taking in their jurisdiction. The Director may also require proponents to notify and consult with others, as necessary.

Prince Edward Island

On Prince Edward Island, the “governance approach to developing plans is bottom-up, with participation and collaboration with stakeholders at the local order of government to develop plans” (Canadian Council of Ministers of the Environment, 2016a). PEI Water Act 2017 ("Water Act," 2017) Article 35(2)(i) specified that, in Municipal Water Supply Areas, any water supply plan shall specify requirements for “consultation with stakeholders, residents of the area to which the plan may apply and other persons who may potentially be affected by the provisions of the plan, with respect to the development of the plan”.

Quebec

Not addressed in the Watercourses Act ("Watercourses Act, R.S.Q. 2003, c.R-13," 2003); Under the Environment Quality Act Quebec Water Policy ("Environment Quality Act, R.S.Q. 2005, c.Q-2. (Consolidated 2007)," 2005) some major projects effecting watercourses (e.g., dredging or digging of lakes and watercourses and some of dams) may be subject to an environmental assessment and review procedure; The Quebec Water Policy (Ministère de l'Environnement du Québec, 2002) c.3 states “The first orientation of the Québec Water Policy stipulates that water governance must be reformed Interventions on the part of water-management stakeholders in Québec will have to incorporate social, economic, environmental and health concerns.” “In Québec, integrated water resource management is the responsibility of 40 watershed organizations and in the case of the St. Lawrence River, 12 regional consultation groups. These bodies have been mandated to produce, promote and monitor sustainable water resource development plans for their zones. The plans are approved by the Ministry of Sustainable Development, Environment, Wildlife and Parks. Integrated management of the St. Lawrence River involves a St. Lawrence forum, an annual meeting of stakeholders who have an interest in the river ecosystem.”(Canadian Council of Ministers of the Environment, 2016a).

Yukon

Anyone, including stakeholders, can intervene to the Board on any application before it, to provide evidence regarding potential effects from the proposed use. The Board must consider all evidence provided, and provide reasons for decision that explain how they considered the interventions (Salvin, 2018). Yukon Environmental and Socio-economic Assessment Act ("Yukon



Environmental and Socio-Economic Assessment Act," 2003): "Water licences 86 A body established by territorial law and having jurisdiction in relation to rights in respect of waters may not, under territorial law, (a) grant or renew rights in respect of waters contrary to a decision document issued by a federal agency or a decision document that is to be implemented by a territorial agency, municipal government or first nation under subsection 83(2) or 84(2) or (3); or (b) set terms of such rights that conflict with such a decision document, to the extent that the decision document is required to be implemented by a federal agency or a territorial agency, municipal government or first nation." Yukon Waters Act ("Waters Act," 2003) s.19: "Public hearings 19(1) The Board may, where satisfied that it would be in the public interest, hold a public hearing in connection with any matter relating to objects, including, without limiting the generality of the foregoing, (a) the issuance or renewal of, or an amendment to, a type B licence; (b) an amendment to a type A licence pursuant to which neither the use, flow, nor quality of waters nor the term of the licence would be altered; and (c) the cancellation of a type B licence pursuant to subparagraph 16(1)(c)(i). (2) Subject to subsection (3), a public hearing shall be held by the Board where the Board is considering (a) the issuance or renewal of a type A licence; (b) an amendment to a type A licence pursuant to which the use, flow, or quality of waters, or the term of the licence, would be altered; (c) the cancellation of a type A licence pursuant to paragraph 16(1)(c); (d) the cancellation of a type B licence pursuant to subparagraph 16(1)(c)(ii) or (iii); or (e) an application pursuant to section 29 for permission to enter on, use, occupy, take, and acquire any lands or any interest therein."

US – Great Lake States

Illinois

Illinois Lake Michigan Water Allocation Program (Illinois Department of Natural Resources, 2017) manages Illinois' diversion of water from Lake Michigan in response to a 1967 Supreme Court Decree (amended 1980). The allocation process of this program explicitly involves an active public participation process.

The Regional Water Supply Planning Program under Executive Order 2006-01 administers and provides technical assistance to the regional committee to identify local supply and demand to determine water supply shortfall and conflicts. The regional committee is formed from the various water supply sector stakeholders to develop a plan to address these conflicts and shortfalls.



Indiana

See Great Lakes-St. Lawrence River Basin Water Resources Compact. See also, Chapter 2. Maumee River Basin Commission (2015) "C 14-34 1-3(9) Assure that appropriate procedures are provided for the public participation in the development, revision, and enforcement of regulations, standards, reclamation plans, or programs established by the state."

New York

Water Resource Planning Council may involve public stakeholders Environmental Conservation Law - ENV § 15-2909. Water Resource Management strategy; hearings "Upon receipt of the statewide water Resource Management strategy from the department of environmental conservation, the council shall promptly publish once a week for three consecutive weeks in newspapers of general circulation notice of public hearings thereon. Public hearings shall be conducted in each of the substate areas represented in the statewide strategy and shall be in accordance with regulations adopted by the department, subject to modification by the council. Such regulations shall, at a minimum, require a hearing on the record with sworn witnesses and shall afford interested parties a reasonable opportunity to sponsor witnesses and to question witnesses sponsored by others, including department staff, consistent with the need to conclude the hearings expeditiously so that a state water Resource Management strategy can be adopted in a timely manner. The hearings shall not be considered part of an adjudicatory proceeding, as defined in subdivision three of section one hundred two of the state administrative procedure act, or as part of a rulemaking proceeding held under subdivision one of section two hundred two of such act."

See also, Great Lakes-St. Lawrence River Basin Water Resources Compact (§ 21-1001 Article 6 "Public Participation" Section 6.1. Meetings, Public Hearings and Records.

Michigan

Authorizations by the WWAT and SSRs are not subject to public notice. Part 327 permit applications are subject to public notice with a public comment period of at least 45 days. The local units of government can form ad hoc subcommittees of local residents to advise the water use groups.

Under Subsection 17(5) of the Safe Drinking Water Act (MCL 325.1017) specific to bottled water producers must also consult with interested community members before withdrawal approval can be made.



Stakeholder engagement in the form of advisory collaboration is also practiced in Michigan. For example, the Southwest Michigan Water Resources Council, an external stakeholder group, met between 2011 and 2014. The Water Use Advisory Council (WUAC) is a statewide external stakeholder group that began meeting in 2012 and is still meeting. The WUAC's members include agricultural irrigators, golf courses, utilities, industry, local governments, state and federal agencies, environmental groups, tribes, conservation groups, the aggregate industry, university researchers, among others.

Minnesota

Permit applications are typically sent to the municipality, county, watershed district and soil and water conservation district for comment. Individual members of the public are not specifically contacted for comment on most permit applications but they can work through their local government if they have concerns. Some major/unique applications have been posted for public review.

South Dakota-Minnesota Boundary Waters Commission 103B.451 (2) has the power and authority over public hearings on issues pertaining to boundary waters:

“Sub 4. Hearings. (a) Hearings must be held at a time and place designated by the commission in counties affected by the subject matter.

(b) At least two weeks' published notice of the hearings must be given by publication of the notice in a legal newspaper in each county bordering on the boundary waters that may be affected by the subject matter of the hearing.”

Ohio

In ORC 1501.34 Determinations for application approval and in ORC 1501.32 Permit for diverting more than 100,000 gallons (378,541.18 litres) a day from Ohio River watershed, the director may hold public hearings upon any application for a permit. In ORC 1522 (Great Lakes Compact) Articles 6 outlines public participation requirements as a necessity for promoting the management of the water resources of the basin.

Pennsylvania

DRBC and SRBC regulations require public hearings for groundwater and surface water withdrawal, diversion, and consumptive use projects. Additionally, public hearings are noted in the DRBC Compact as a part of comprehensive water resource planning (Section 13.1), for



approval for the development of groundwater protected areas (Section 10.2) and for emergency declaration of water supply shortages (section 10.4). The SRBC provides specific public notice guidelines (Susquehanna River Basin Commission, 2018).

For areas outside of basin commissions:

- there is a 30-day comment period from the date of publication in the Pennsylvania Bulletin during the review process, the application is forwarded to many other review agencies for their approval. I.e. relevant regional Bureau of Water Supply and Community Health, Bureau of Water Quality Management, River Basin Commission, etc.
- Act 14, P.L. 834, enacted February 17, 1984, requires that each applicant give written notice to the municipality(ies) and the county(ies) in which the permitted activity is located. The written notice shall be received by the municipality(ies) and the county(ies) at least 30 days prior to the issue or denial of the permit by the DEP.

Wisconsin

Under the Great Lakes — St. Lawrence River Basin Water Resources Compact stakeholder involvement in water management and regulation regionally includes:

Wisconsin S. 281.343 concerning water resources inventory, registration and reporting”

(4h)(c) “1. To ensure adequate public participation, the regional body shall adopt procedures for the review of proposals that are subject to regional review in accordance with subs. (4) to (4z).

2. The regional body shall provide notice to the public of a proposal undergoing regional review. Such notice shall indicate that the public has an opportunity to comment in writing to the regional body on whether the proposal meets the standard of review and decision.

3. The regional body shall hold a public meeting in the state or province of the originating party in order to receive public comment on the issue of whether the proposal under consideration meets the standard of review and decision.

4. The regional body shall consider the comments received before issuing a declaration of finding.

5. The regional body shall forward the comments it receives to the originating party.”

(6) Public participation.



(a) Meetings, public hearings, and records.

1. The parties recognize the importance and necessity of public participation in promoting management of the water resources of the basin. Consequently, all meetings of the council shall be open to the public, except with respect to issues of personnel. 2. The minutes of the council shall be a public record open to inspection at its offices during regular business hours.

(b) Public participation. It is the intent of the council to conduct public participation processes concurrently and jointly with processes undertaken by the parties and through regional review. To ensure adequate public participation, each party or the council shall ensure procedures for the review of proposals subject to the standard of review and decision consistent with the following requirements: 1. Provide public notification of receipt of all applications and a reasonable opportunity for the public to submit comments before applications are acted upon. 2. Assure public accessibility to all documents relevant to an application, including public comment received. 3. Provide guidance on standards for determining whether to conduct a public meeting or hearing for an application, time and place of such a meeting or hearing, and procedures for conducting of the same. 4. Provide the record of decision for public inspection including comments, objections, responses, and approvals, approvals with conditions, and disapprovals.”

Wisconsin S. 281.346 (9)(b) concerning public participation:

“(b) Public notice.

1. The department shall, by rule, create procedures for circulating to interested and potentially interested members of the public notices of each complete application that the department receives under sub. (4). The department shall include, in the rule, at least the following procedures:

a. Publication of the notice as a class 1 notice under ch. 985.

b. Mailing of the notice to any person, group, local governmental unit, or state agency upon request.

2. The department shall establish the form and content of a public notice by rule. The department shall include in every public notice concerning an application under sub. (4) at least the following information:



- a. The name and address of each applicant.
- b. A brief description of the proposal for which the application is made under sub. (4), including the amount of the proposed interbasin transfer.
- c. A brief description of the procedures for the formulation of final determinations on applications, including the 30-day comment period required under par. (c).
- d. Information indicating where the complete application may be viewed on the department's Internet Web site....

(c) Public comment. The department shall receive public comments on a proposal for which it receives an application to which par. (b) 1. applies or on a proposed general permit under sub. (4s) (a) for a 30-day period beginning when the department gives notice under par. (b) 1. The department shall retain all written comments submitted during the comment period and shall consider the comments in making its decisions on the application.

(d) Public hearing.

1. The department shall provide an opportunity for any interested person or group of persons, any affected local governmental unit, or any state agency to request a public hearing with respect to a proposal for which the department receives an application under sub. (4). A request for a public hearing shall be filed with the department within 30 days after the department gives notice under par. (b). The party filing a request for a public hearing shall indicate the interest of the party and the reasons why a hearing is warranted. The department shall hold a public hearing on a proposal for which the department receives an application under sub. (4) if the department determines that there is a significant public interest in holding a hearing.

2. The department shall promulgate, by rule, procedures for the conduct of public hearings held under this paragraph. A hearing held under this paragraph is not a contested case hearing under ch. 227.

3. The department shall circulate public notice of any hearing held under this paragraph in the manner provided under par. (b) 1. (e) Public access to information. Any record or other information provided to or obtained by the department regarding a proposal for which an application under sub. (4) is received is a public record as provided in subch. II of ch. 19. The department shall make available to and provide facilities for the public to inspect and copy any records or other information provided to or obtained by the



department regarding a proposal for which an application for a new or increased interbasin transfer under sub. (4) is received, except that any record or other information provided to the department may be treated as confidential upon a showing to the secretary that the record or information is entitled to protection as a trade secret, as defined in s. 134.90 (1) (c), or upon a determination by the department that domestic security concerns warrant confidential treatment. Nothing in this subsection prevents the use of any confidential records or information obtained by the department in the administration of this section in compiling or publishing general analyses or summaries, if the analyses or summaries do not identify a specific owner or operator.”

US – Non-Great Lake States

California

Information not readily available.

Florida

Stakeholders are involved in the process of setting minimum flow/levels. The Florida Department of Environmental Protection and five Water Management Districts along are responsible for the technical aspects of setting minimum flow/levels including multi-disciplinary expertise and evaluating flows (Locke *et al.*, 2008). Minimum flow/level implementation rules require opportunity for “participation by the public and local governments. Public workshops are held at least 90 days prior to plan acceptance or amendment by the Water Management District board” (Ecofish Research Ltd. *et al.*, 2017).

Florida Statutes 373.036 ("Natural Resources; Conservation, Reclamation and Use," 2017) Florida water plan; district water management plans state that “Each governing board shall develop a district water management plan for water resources within its region, which plan addresses water supply, water quality, flood protection and floodplain management, and natural systems. The district water management plan shall be based on at least a 20-year planning period, shall be developed and revised in cooperation with other agencies, regional water supply authorities, units of government, and interested parties, and shall be updated at least once every 5 years. The governing board shall hold a public hearing at least 30 days in advance of completing the development or revision of the district water management plan.”



Florida Statutes 373.036 ("Natural Resources; Conservation, Reclamation and Use," 2017) Florida water plan states "A priority ranking for each listed project for which state funding through the water resources development work program is requested, which must be made available to the public for comment at least 30 days before submission of the consolidated annual report."

Montana

Montana Title 85 Water Use Chapter 1 Water Resources ("Water Use," 2017) states "State water plan. (1) The department shall gather from any source reliable information relating to Montana's water resources and prepare from the information a continuing comprehensive inventory of the water resources of the state. In preparing this inventory, the department may...(d) hold public hearings in affected areas at which all interested parties must be given an opportunity to appear. (5) Before adopting the state water plan or any section of the plan, the department shall hold public hearings in the state or in an area of the state encompassed by a section of the plan if adoption of a section is proposed."

North Carolina

"For most water uses, water users must register with the state. There is no formal public notification process for a registration although information on registrations is available on the department's website" (AMEC, 2008). North Carolina statute 143-214.24 on the Riparian Buffer Protection Program: Coordination with River Basin Associations states "(a) Prior to drafting temporary or permanent rules that require the preservation of riparian buffers in a river basin, the Department shall consult with major stakeholders who may have an interest in the proposed rules, including the board of directors or representatives designated by the board of directors of any river basin association in the affected river basin that meets all of the following criteria: [Please see statute for the full list of stakeholder specifications]".

International

England/Wales

In times of severe drought, environmental agencies will work extensively with abstractor and stakeholders. National Drought Group (NDG), is an external stakeholder group that is activated at the prolonged dry weather or drought stage (Environment Agency Government of the United Kingdom, 2017). In Wales, the Drought Plan gives extensive detail on stakeholder engagement (Dŵr Cymru Welsh Water, 2015). "Consultation is an integral part of the CAMS process. The process offers many opportunities for interested organizations and individuals to comment on



and/or participate in the development of a CAMS. Some elements of the consultation involve a “stakeholder group” comprised of about 8-10 key stakeholders identified in the initial stages of the process, while others involve all interested parties. Consultation is an important part of the CAMS resource assessment (not in the resource assessment calculation), the sustainability appraisal (stakeholder group) and in the presentation of the proposed strategy to the public. With the production of the formal consultation document, the public has three months to respond to the Agency” (Canadian Council of Ministers of the Environment, 2016a; Environment Agency Government of the United Kingdom, 2013b).

New Zealand (Waikato Region)

Stakeholder involvement is codified in the Water Module of the Waikato Regional Plan (Waikato Regional Council, 2010) s.3.3.4.3 on Water User Groups/Voluntary Agreements “The Waikato Regional Council will, in order to assist and support the community to understand water management and allocation as an essential element of restoring and protecting water bodies: a) promote water user groups, or voluntary agreements between water users, to schedule takes and manage allocations. b) initiate and support water user groups to assist with allocations during times of restrictions or when the catchment is fully or over allocated. c) provide, where available, accurate technical information on which user groups can make decisions. The Waikato Regional Council will further investigate how water user groups can be used to: a) assist with management of water allocated to abstractors; b) provide opportunities for shared investment in, and optimal use of water transport and storage infrastructure; c) make best use of available water.”

South Australia

Water Allocation Plans, which outline the allocation of water by region within the state, and that are required in accordance with the Natural Resource Management Act ("Natural Resources Management Act," 2004) s.76 is developed with the community, industry and key stakeholders for each water resource identified as being significant, or ‘prescribed’, under the Natural Resource Management Act 2004 (Department of Environment, 2018).

The NRM Act prescribes public engagement at specific points in the plan development process (concept statement, draft plan). In addition, most NRM Boards are voluntarily forming local advisory groups to further engage water users and other catchment stakeholders.



7.11 WHAT PROVINCE/STATE/REGION-LEVEL LEGISLATION (IF ANY) FRAMES THE ROLE OF INDIGENOUS NATIONS IN ALLOCATION DECISIONS?

Canada

British Columbia

There are no explicit provisions that address a role specifically for First Nations. However, the Water Sustainability Act outlines treatment of treaty First Nation water reservations and Nisga'a Nation water reservation. They can lead a planning process (Water Sustainability Plan – s. 69(2)), an advisory board could be put in place under s.115 and they can be delegated decision making under s.126.

Inclusion of First Nations in regional drought planning and Ministry of Indigenous Relations and Reconciliation included in Drought Response Plan (2016).

Provincial duty to consult is guided by the following provincially established guidelines and procedural manuals to assist government officials and proponents to meet consultation obligations:

- Building Relationships with First Nations: Respecting Rights and Doing Good Business
- Guide to Involving Proponents When Consulting First Nations
- Proponent: First Nations Engagement Communication Log
- Updated Procedures for Meeting Legal Obligations When Consulting First Nations
- Proponents Guide to First Nation Consultation in the Environmental Assessment Process

Manitoba

Commitment to define and recognize Aboriginal rights to water and act cooperatively in 2003 Water Strategy (still ongoing); partnership with Aboriginal organizations a guiding principle of Drought Management Strategy; broad recognition of evolving rights and responsibilities under Aboriginal self-government Manitoba Policy on First Nation Government (1996), and the Memorandum of Understanding between the Assembly of Manitoba Chiefs-Manitoba Keewatinowi Ojibwanak and the Minister of Natural Resources regarding the Manitoba Network of Protected Areas (1998), emphasize that Aboriginal people need to be acknowledged and included in land and resource use planning, significant resource allocation, environmental licensing and regulatory mechanisms, including effects assessment tools and documents.



New Brunswick

Government of New Brunswick Duty to Consult Policy (Aboriginal Affairs Secretariat & Province of New Brunswick, 2011) acknowledges the province's obligation to ensure "people are adequately consulted about matters that may affect an Aboriginal right or treaty right that has been recognized and affirmed by Section 35(1) of the Constitution Act, 1982."

A Water Strategy for New Brunswick 2018-2028 outlines the goal of maintaining "an on-going dialogue with First Nations in order to better understand and incorporate the Aboriginal perspective as it relates to water;" however, there is no formal legislation specific to Indigenous consideration in allocation decisions.

Ontario

Broadly:

Duty to Consult: The Crown has a duty to consult with Indigenous peoples where it contemplates decisions or actions that may adversely impact asserted or established aboriginal or treaty rights. Ontario is committed to meeting its duty to consult with First Nation communities (Ontario Ministry of the Environment and Climate Change, 2017b).

Determination for which Indigenous Communities are notified: MECP bases its notification on the potential for negative impacts to the natural environment, the location of the water taking within traditional territories or harvesting areas, and past concerns/interests Indigenous communities have raised with past water takings (Ontario Ministry of the Environment and Climate Change, 2017b).

Notification Timing: As early as possible in the application review process, before or during the consultation and scientific evaluation stage of the application review process.

Director's Authority: The Director may require the applicant to notify or consult with other persons who have an interest in the proposed water taking. Ministry staff in coordination with their Indigenous affairs Advisor shall ensure that the proper communities are being notified, and that the notification is adequate.

Water Bottling:



Recent action related to water bottling affecting First Nations, stakeholder, and public engagement on PTTW decisions:

- On April 21, 2017 the Ministry posted new stricter requirements for renewals of existing bottled water permits to take groundwater. The new rules strengthen Ontario's permit to take water program by increasing public transparency and scientific requirements, including:
 - Reducing the duration of permit renewal applications from 10 years to a maximum of five years.
 - Mandatory reductions on water taking during drought.
 - Increasing Indigenous and public notification, consultation and reporting, including any bottled water renewals will be posted on the Environmental Registry for a minimum 90-day public commenting period.
 - As part of its review of bottled water renewal applications, the ministry notifies and consults with Indigenous communities. Furthermore, the ministry may also become involved in proponent led consultation activities in certain circumstances. Proponent initiated consultation was intended to provide the respective communities with additional time to provide comments and discuss concerns related to the water taking activity.
 - For PTTW proponents that require renewals of bottled water PTTW applications, the Ministry can delegate certain procedural aspects of the Duty to Consult and Accommodate. However, where the Crown's Duty to Consult and Accommodate is triggered, it is ultimately the ministry's responsibility for fulfilling the Crown's consultation obligations.
 - The ministry plays an oversight role for the consultation it delegates to proponents and in some situations may become involved in consultation activities. In its oversight role, the ministry will review the steps taken by proponents and the information they obtain to ensure adequate consultation has taken place.

Great Lakes Protection Act:

Ontario's Great Lakes Protection Act ("Great Lakes Protection Act," 2015) specifies the following in relation to Indigenous peoples:

Part II 4(3) Before a meeting of the Council is held, the Minister shall, as he or she considers advisable, extend written invitations to individuals to attend and participate in the meeting, including... (c)representatives of the interests of First Nations and Métis communities that have a historic relationship with the Great Lakes-St. Lawrence River Basin.



Additional references to the consideration for and inclusion of Indigenous peoples are included in this Act under Parts III, V, and VII.

Regional:

Indigenous inclusion was found at a regional level. For example, the policies in the Lake Simcoe Plan, though not mandatory, are based on the principle of shared responsibility and collaboration amongst the Province, First Nations and Métis communities, municipalities, the Lake Simcoe Region, Conservation Authority, agricultural, commercial, and industrial sectors and small businesses, environmental groups, and the general public (Government of Ontario, 2009).

Prince Edward Island

No provincial legislation, just deference to case precedent, treaty and Constitutional law: "The Government of Prince Edward Island recognizes it has a duty to consult in a meaningful way with the Mi'kmaq of PEI and is committed to making decisions in a manner that is consistent with the recognition and affirmation of existing Aboriginal and Treaty rights in Section 35 of the Constitution Act, 1982; and, within the legal parameters established by the Supreme Court of Canada concerning the duty to consult."

Quebec

Agreement Concerning a New Relationship Between the Government of Québec and the Cree of Québec, entered into with the Cree nation ("Agreement Concerning a New Relationship Between the Government of Québec and the Cree of Québec," 2002); Partnership Agreement on Economic and Community Development in Nunavik, entered into with the Inuit nation ("Partnership Agreement on Economic and Community Development in Nunavik," 2002). "Watershed organizations in Québec must reserve a seat for an Aboriginal person living within the watershed. Before being finalized, Master Plans for Water in Québec (akin to watershed management plans) must be submitted to Aboriginal communities for comment and consultation" (Canadian Council of Ministers of the Environment, 2016a).

Yukon

Waters Act "Expropriation s.29 ..(11) Where an interest in land referred to in subsection (10) is to be affected as described in subsection (1) without the agreement of the Yukon First Nation or Gwich'in Tribal Council, as the case may be, (a) a public hearing in respect of the location and extent of the land to be affected shall be held in accordance with the following procedure: (i)



notice of the time and place for the public hearing shall be given to the Yukon First Nation or Gwich'in Tribal Council and the public, (ii) at the time and place fixed for the public hearing, an opportunity shall be provided for the Yukon First Nation or Gwich'in Tribal Council and the public to be heard, (iii) costs incurred by any party in relation to the hearing are in the discretion of the person or body holding the hearing and may be awarded on or before the final disposition of the issue, and (iv) a report on the hearing shall be prepared and submitted to the Minister; and (b) notice of intention to obtain the approval of the Commissioner in Executive Council shall be given to the Yukon First Nation or Gwich'in Tribal Council on completion of the public hearing and submission of a report thereon to the Minister." It is important to note that Territory-level legislation is not required due to the constitutionally protected Umbrella Final Agreement and Self-Government Agreements, which would supersede any territorial legislation. The Waters Act, as you note, requires the Board to notify any potentially affected First Nation of any application made. This is separate from the expropriation clauses, which to my knowledge have never been required or used (Salvin, 2018).

US – Great Lake States

Illinois

Water Act does not make any specifications regarding Indigenous peoples in Water Allocation

Indiana

Indiana Code 14-25 ("Water Resource Management Act," 1983) does not make any specifications regarding Indigenous peoples in water allocation. Indiana's tragic history included removals of Indigenous peoples in the 1800s, many of whom have settled in other states.

New York

Great Lakes-St. Lawrence River Basin Water Resources Compact (§ 21-1001, Article 5. "Tribal Consultation")

Michigan

Noted in Great Lakes Compact; Tribal organizations included in advisory councils: e.g., the 12 federally recognized Native American Tribes are consulted on Great Lakes Water Diversion Applications. Public Act 189 of 2008: 324.32803 establishes a formal position for Indian Tribe representation on a water conservation advisory council.



Tribes are represented on the Water Use Advisory Council. Tribal consultation meetings are held for high profile permit reviews or any other decisions at the Tribes' request (Milne, 2018).

Minnesota

Minnesota has adopted the correlative rights doctrine which awards equitable rights in groundwater to all overlying landowners (including for Native tribes) TARLOCK, supra note 35, § 4:15

Inclusion of tribal governments on advisory committee for the South Dakota-Minnesota Boundary Waters Commission - 103B.451.

Permits cannot be required of tribal members conducting projects on tribal land.

Ohio

Ohio Revised Codes 1521 and 1501 do not make any specifications regarding Indigenous peoples in water allocation. There are no federally recognized Indian tribes in Ohio today. However, ORC 1522 (Great Lakes Compact) Article 5 outlines Tribal consultation requirements

Pennsylvania

Most tribes that once were native to Pennsylvania ended up on Indian reservations in Oklahoma. Therefore, the main water allocation legislation (i.e., Water Rights Act, Limited Power and Water Supply Act, Water Resources Planning Act, Emergency Management Services Code 35, PA Safe Drinking Water Act) acknowledge Indigenous peoples.

Wisconsin

There are eleven federally recognized tribal governments in Wisconsin. Wisconsin S. 281.343 outlines consultation responsibilities of the state with tribes for the Great Lakes — St. Lawrence River Basin Water Resources Compact:

(2)(i) Advisory committees. The council may constitute and empower advisory committees, which may be comprised of representatives of the public and of federal, state, tribal, county, and local governments, water resources agencies, water-using industries and sectors, water-interest groups, and academic experts in related fields.

(5)(a) "In addition to all other opportunities to comment pursuant to sub. (6) (b), appropriate consultations shall occur with federally recognized tribes in the originating party for all proposals subject to council or regional review pursuant to this compact. Such consultations



shall be organized in the manner suitable to the individual proposal and the laws and policies of the originating party.

(b) All federally recognized tribes within the basin shall receive reasonable notice indicating that they have an opportunity to comment in writing to the council or the regional body, or both, and other relevant organizations on whether the proposal meets the requirements of the standard of review and decision when a proposal is subject to regional review or council approval. Any notice from the council shall inform the tribes of any meeting or hearing that is to be held under sub. (6) (b) and invite them to attend. The parties and the council shall consider the comments received under this subsection before approving, approving with modifications, or disapproving any proposal subject to council or regional review.

(c) In addition to the specific consultation mechanisms described above, the council shall seek to establish mutually agreed upon mechanisms or processes to facilitate dialogue with, and input from, federally recognized tribes on matters to be dealt with by the council; and the council shall seek to establish mechanisms and processes with federally recognized tribes designed to facilitate ongoing scientific and technical interaction and data exchange regarding matters falling within the scope of this compact. This may include participation of tribal representatives on advisory committees established under this compact or such other processes that are mutually agreed upon with federally recognized tribes individually or through duly authorized intertribal agencies or bodies.”

(9)(a) “Tribal consultation is specifically required for Great Lake proposals affecting tribes or bands “The department shall consult with a federally recognized American Indian tribe or band in this state concerning a proposal that may affect the tribe or band and that is subject to regional review or Great Lakes council approval under sub. (4) or (5).”

Wisconsin S. 281.346 (9)(a) concerning Tribal consultation:

“a) Tribal consultation. The department shall consult with a federally recognized American Indian tribe or band in this state concerning a proposal that may affect the tribe or band and that is subject to regional review or Great Lakes council approval under sub. (4) or (5).”



US – Non-Great Lake States

California

“Although SGMA does not allow a tribe to be a [Groundwater Sustainability Agency], it does allow tribes to participate in GSA’s by MOU’s and similar arrangements. Such participation is optional on the part of a tribe” (California Department of Water Resources, 2017b). Sustainable Groundwater Management Legislation (“Sustainable Groundwater Management Act,” 2015) s.10720.3 states “(c) The federal government or any federally recognized Indian tribe, appreciating the shared interest in assuring the sustainability of groundwater resources, may voluntarily agree to participate in the preparation or administration of a groundwater sustainability plan or groundwater management plan under this part through a joint powers authority or other agreement with local agencies in the basin. A participating tribe shall be eligible to participate fully in planning, financing, and management under this part, including eligibility for grants and technical assistance, if any exercise of regulatory authority, enforcement, or imposition and collection of fees is pursuant to the tribe’s independent authority and not pursuant to authority granted to a groundwater sustainability agency under this part. (d) In an adjudication of rights to the use of groundwater, and in the management of a groundwater basin or sub-basin by a groundwater sustainability agency or by the board, federally reserved water rights to groundwater shall be respected in full. In case of conflict between federal and state law in that adjudication or management, federal law shall prevail. The voluntary or involuntary participation of a holder of rights in that adjudication or management shall not subject that holder to state law regarding other proceedings or matters not authorized by federal law. This subdivision is declaratory of existing law.” See also 10723.2, 10723.4, 10727.8, 10723.8(a).

Florida

Through the Seminole Indian Land Claims Settlement Act of 1987: EL. 100—228, 101 Stat. 1556, Florida has the second oldest water rights compact in the US. The 1987 Water Rights Compact defines the rights and obligations of the Tribe and the State pertaining to water, allowing them to govern their water resources. To do so, the Seminole Tribe has created a tribal constitution, tribal council and Seminole Tribe of Florida Inc (Walker & Baker, 2012). In 1987 the Seminole Tribe entered into a water settlement agreement with the State of Florida and the federal government (Fla. Stat. §285.165), this has led the state to include the Seminole Tribe water needs in long-term plans. As a result of this Compact, the Seminole Tribe is actively engaged in water use decision-making. For example, the Tribe has entered into 14 landowner agreements



that allow them to resolve water disputes with other landowners. For example, with the South Florida Water Management District and other private land owners an agreement was made to establish water quality and quantity standards for water control structures upstream from tribal lands (Walker & Baker, 2012). Additionally, in the context of the Everglades system, the Seminole Tribe is a partner in restoration projects with 50% cost sharing.

For the Northern Everglades and Estuaries Protection Program (Chapter 373.4594), tribal engagement beyond the Seminole Tribe is also considered for water quality for projects (including those focused on aquifer recharge) on Tribal lands: “Projects that make use of private lands, or lands held in trust for Indian tribes, to reduce nutrient loadings or concentrations within a basin by one or more of the following methods: restoring the natural hydrology of the basin, restoring wildlife habitat or impacted wetlands, reducing peak flows after storm events, increasing aquifer recharge, or protecting range and timberland from conversion to development, are eligible for grants available under this section from the coordinating agencies. For projects of otherwise equal priority, special funding priority will be given to those projects that make best use of the methods outlined above that involve public-private partnerships or that obtain federal match money. Preference ranking above the special funding priority will be given to projects located in a rural area of critical economic concern designated by the Governor. Grant applications may be submitted by any person or tribal entity, and eligible projects may include, but are not limited to, the purchase of conservation and flowage easements, hydrologic restoration of wetlands, creating treatment wetlands, development of a management plan for natural resources, and financial support to implement a management plan.” Also specified in Chapter 373.4594 is explicit recognition for the rights of the Seminole Tribe of Florida (10) “Nothing in this section is intended to diminish or alter the governmental authority and powers of the Seminole Tribe of Florida, or diminish or alter the rights of that tribe, including, but not limited to, rights under the water rights compact among the Seminole Tribe of Florida, the state, and the South Florida Water Management District.”

Montana

“Montana’s Reserved Water Rights Compact Commission (RWRCC) was established by the Montana Legislature in 1979 as part of the state-wide general stream adjudication process for the purpose of negotiating and quantifying federal and tribal reserved water rights... Montana is one of a handful of states that has relied upon the use of negotiated settlements instead of the courts to resolve claims for federal and tribal water rights throughout the state” (Montana Department of Natural Resources & Conservation, 2015). “Only the federal government has



authority to enter into treaties with foreign nations and American Indians. The treaty-making power is one basis for the reserved water rights of Indian tribes in Montana” (Montana Watercourse at the Montana Water Center, 2014). The Reserved Water Rights Compact Commission negotiates settlements with federal agencies and Indian tribes that claim federal reserved water rights within the State of Montana (Montana Department of Natural Resources & Conservation, 2018c).

North Carolina

N/A

International

England/Wales

N/A

New Zealand (Waikato Region)

“Policies which, subject to achieving the overarching purpose of the Vision and Strategy, establish allocable and environmental flows from surface water and sustainable yields from groundwater based on a range of factors including matauranga Maori. The policies should also provide for the input of iwi [Maori] in determining any allocable and environmental flows, and allocation priorities, with respect to the Waikato River Catchment, as well as state how ground and surface water will be allocated” (Waikato Regional Council, 2010). The Waikato Regional Council has explicit policy (8.5.2) on the approach to joint management with Indigenous peoples in the Waikato River catchment “Waikato Regional Council, in partnership with Waikato-Tainui, Ngāti Tūwharetoa, Te Arawa River Iwi, Maniapoto and Raukawa, will: provide for Joint Management Agreements and Integrated River Plans to be developed and agreed; establish monitoring programmes, which shall incorporate mātauranga Māori, to determine and monitor the health status of the Waikato River; work with the Waikato River Authority to ensure targets are established for improving the health and wellbeing of the Waikato River; and develop and implement a programme of action to achieve those targets, including recommendations for changes to regional and district plans. See also the Waikato River Co-Management Framework.



South Australia

The South Australia Natural Resource Management Act ("Natural Resources Management Act," 2004) s.207(1) on and the River Murray Act ("River Murray Act," 2003) s.34(1) both state on the subject of Native Title "Nothing done under this Act will be taken to affect native title in any land or water." The Native Title Act ("Native Title (South Australia) Act," 1994) includes water in the definition of Native title: "the communal, group or individual rights and interests of Aboriginal peoples in relation to land or waters where— (a) the rights and interests are possessed under the traditional laws acknowledged, and the traditional customs observed, by the Aboriginal peoples; and (b) the Aboriginal peoples, by those laws and customs, have a connection with the land or waters; and (c) the rights and interests are recognised by the common law; and (d) the rights and interests have not been extinguished or have revived." In this same Act, the Crown asserts its ownership of natural resources and the rights to "use, control and regulate the flow of water" (39(2)), as well as fishing access rights and public access to waterways. Allocation with respect to Indigenous peoples is not specified in these Acts.

Australia's federal water policy – National Water Initiative (2004) – seeks to incorporate Indigenous rights, interests and values in water management. The NWI requires states to take into account Indigenous title interests, to assess and include Indigenous customary, social and spiritual objectives in water plans, and to engage with Indigenous communities in their development.

<http://155.187.2.69/water/australia/nwi/index.html>

Significant progress has been made in South Australia with engaging Indigenous communities, particularly in relation to the development of Water Resource Plans which are part of the requirements under the Murray Darling Basin Plan. This progress has been administrative and organizational rather than legislative.



7.12 WHAT, IF ANY, ARE THE APPROACHES IMPLEMENTED TO MANAGE GROUNDWATER USED BY WATER BOTTLERS?

Canada

British Columbia

Fresh water bottling is defined as an Industrial purpose - i.e., the “use of water designated by regulation as a use for an industrial purpose, but does not include the use of water for any other water use purpose (Section 2, WSA)”.

“The diversion and use of water for the bottling, for commercial distribution, of fresh water, including the bottling of carbonated water and water fortified with vitamins, but not including mineralized water or fermented or other processed beverages” (Government of British Columbia, 2016b).

Bottled Water as an industrial purpose is subject to licensing fees and extraction fee at a rate of \$2.25 per million litres and extraction for ground and surface water users are treated the same.

Manitoba

Water bottling considered “other purpose” ranking below all others for water use licensing; Water Stewardship tracks allocations for bottled water allocations (Rutherford, 2004).

New Brunswick

New Brunswick does not have any regulations that specifically target bottled water operations; however, bottled water is classified as “commercial use” and is subject only to environmental impact assessment and regulation when exceeding 50,000 litres per day (Rutherford, 2004).

Ontario

High Use Watershed provisions under O. Reg. 387/04 Water Taking and Transfer prohibit high consumptive water takings within watersheds designated as a high use watershed as shown on the Average Annual Flow Map or on the Summer Low Flow Map. High consumptive uses include beverage manufacturing, including the manufacturing or production of bottled water or water in other containers. On April 21, 2017, the Ministry also posted new requirements for renewals of existing bottled water permits to take groundwater. The new rules increase public transparency and scientific requirements in the PTTW for water bottlers, including:



- Reducing the duration of permit renewal applications from 10 years to a maximum of five years.
- Mandatory reductions on water taking during drought.
- Increasing Indigenous and public notification, consultation and reporting, including any bottled water renewals will be posted on the Environmental Registry for a minimum 90-day public commenting period.

Details of these rules are outline in the Procedural and Technical Guidance Document for Bottled Water: Permit to Take Water Applications and Hydrogeological Study Requirements (2016).

Moratorium on Water Bottling: The Taking Ground Water to Produce Bottled Water Regulation establishes a moratorium prohibiting the issuance of permits to take water that would authorize new takings of groundwater by water bottling facilities or permits that would increase the amount of groundwater existing water bottling facilities are authorized to take under their respective permits. The regulation further prohibits the PTTW Director from issuing permits for pumping tests, where the objective of the pumping test is to provide data on the feasibility of the water source for a future new or expanding water bottling operation. The prohibition does not apply to persons who already have a permit for water bottling that was issued before the moratorium takes effect; however, the regulation prohibits the PTTW Director from increasing the amounts a bottling facility is authorized to take under its permit while the moratorium is in effect. The regulation does not apply to:

- renewals of existing permits to take water for the same volume from the same location and for the same purpose, or;
- water bottling facilities that obtain their water from a municipal drinking water system.

The moratorium is in effect until January 1, 2019. While the moratorium is in place, Ontario plans to conduct a broader review of the permit to take water program. This includes collecting data and undertaking research on water resources in the province, and reviewing Ontario's water quantity management programs and policies as they apply to water bottlers taking groundwater, as well as all water takers across the province. Ontario will engage Indigenous partners, communities and industry on any potential changes to water quantity management practices. Any proposed changes that result from this broader review will also be posted for public comment.



Technical and Procedural Guidance for Bottled Water Applications: On April 21, 2017 the Ministry posted new stricter requirements for renewals of existing bottled water permits to take groundwater. The new rules strengthen Ontario's permit to take water program by increasing public transparency and scientific requirements, including:

- Reducing the duration of permit renewal applications from 10 years to a maximum of five years.
- Mandatory reductions on water taking during drought.
- Increasing Indigenous and public notification, consultation and reporting, including any bottled water renewals will be posted on the Environmental Registry for a minimum 90-day public commenting period.

For any new application for renewal, the water bottler would be required to submit additional research (e.g. groundwater quantity) to justify any water taking. This would also include a new cumulative effects study, which will include projections due to climate change, population growth, increasing consumption and growth.

Bottled Water Charges: Ontario Regulation 176/17 "Charges for Taking Ground Water to Produce Bottled Water" establishes, effective August 1, 2017, a new additional \$500 per million litre fee for facilities that take groundwater for the purpose of producing bottled water and are required to have a permit to take water under the Ontario Water Resources Act. The new fee applies in addition to the existing fee of \$3.71 per million litres under Ontario Regulation 450/07 "Charges for Industrial and Commercial Water Use".

- The fee under Ontario Regulation 450/07 applies to "phase one" commercial and industrial water users, which are facilities that incorporate water into a product, including water bottlers and other beverage manufacturers.
- The purpose of the fee imposed under Ontario Regulation 450/07 is to recover a portion of the costs of the province's broader water quantity management programs.

The new fee will help recover the Ontario government's costs of regulating and managing groundwater takings by water bottlers, including:

- Regulating water bottling facilities under the Act, including promoting outreach with, and compliance by, facilities with permits to take water for water bottling.
- Undertaking scientific research and analysis to advance knowledge of the impacts of water takings for water bottling on groundwater resources in watersheds from which a water bottling facility takes water.



- Reviewing the regulatory framework that governs ground water takings by water bottling facilities.

The regulation requires that the Minister review the new fee at least every five years and report on provincial costs. This will help ensure that there is a regular assessment of provincial costs incurred to effectively manage groundwater takings for water bottling and that the amount of the charge is appropriate to recover these costs. The fee does not apply to water bottling facilities that obtain their water from municipal drinking water systems.

Prince Edward Island

PEI Water Act ("Water Act," 2017) Article 41(1) Prohibits water removals including the export or sale of bottled water. "No person shall withdraw, store, use or transport water from a well, watercourse or wetland for the purpose of removal from the province."

Quebec

Beginning October 21 1999, the Water Resources Preservation Act ("Water Resources Preservation Act," 1999), the bulk water exports of surface and groundwater became prohibited: s.2 "This Act applies to surface water and groundwater. 2. From 21 October 1999, no water taken in Québec may be transferred outside Québec. Such prohibition does not apply, however, to water taken (1) to produce electric power; (2) to be marketed as water intended for human consumption, insofar as the water is packaged in Québec in containers of 20 litres capacity or less;" Quebec charges \$70 for every million litres of water taken for water bottling (Jones, 2017). Quebec is a signatory to the Great Lakes—St. Lawrence River Basin Sustainable Water Resources Agreement which prevents significant water withdrawals from the basin common to these jurisdictions (Amyot-Bilodeau *et al.*, 2008).

Yukon

Waters Act ("Waters Act," 2003) does not address water bottling, water export, or bulk sale of water. Some municipal/city zoning may affect groundwater use by water bottlers (Council of Canadians, 2011).



US – Great Lake States

Illinois

N/A

Indiana

N/A

New York

2011 Water Resource Protection Act expanded regulation of water withdrawals to include bottled water.

Michigan

Section 17 (as amended) of the Safe Drinking Water Act specifically pertains to Bottled Drinking Water:

“(3) A person who proposes to engage in producing bottled drinking water from a new or increased large quantity withdrawal of more than 200,000 gallons [757,082.357 litres] of water per day from the waters of the state or that will result in an intra-basin transfer of more than 100,000 gallons (378,541.18 litres) per day average over any 90-day period shall submit an application to the department in a form required by the department containing an evaluation of environmental, hydrological, and hydrogeological conditions that exist and the predicted effects of the intended withdrawal that provides a reasonable basis for the determination under this section to be made.

(4) The department shall only approve an application under subsection (3) if the department determines both of the following:

(a) The proposed use will meet the applicable standard provided in section 32723 of the natural resources and environmental protection act, 1994 PA 451, MCL 324.32723.

(b) The person will undertake activities, if needed, to address hydrologic impacts commensurate with the nature and extent of the withdrawal. These activities may include those related to the stream flow regime, water quality, and aquifer protection

(5) Before proposing activities under subsection (4)(b), the person proposing to engage in producing bottled drinking water shall consult with local government officials and interested community members.”



Limited permitting fee - \$25 fee for state license and \$25 fee for license renewal per brand/type of bottled water; however, case law has resulted in settlement limiting how much water Nestle can pump in Mecosta County to an average of 218 gallons (825 litres) per minute, with restrictions on spring and summer withdrawals from the Sanctuary Springs field. - Michigan Citizens for Water Conservation v. Nestle Waters North America INC 2005. Additionally, Nestle adheres to the municipal rate of \$2.37USD/1000 gallons (3,785.41 litres) to extract groundwater in municipal water supply for the City of Ewart (Nestle Waters, N.D.)

Minnesota

N/A

Ohio

N/A

Pennsylvania

Pennsylvania only takes money from water withdrawals through permit and application fees; no withdrawal fees; Delaware River and Susquehanna River basin commissions do collect withdrawal fees from any company extracting within the basins (Credit Valley Conservation Authority & Grand River Conservation Authority, 2003).

Wisconsin

Projects with high water loss (>95%), which may include some water bottlers, are reviewed under NR. 820.32, Wisconsin Administrative Code ("Environmental Analysis and Review Procedures," 2015). The department shall prepare an environmental assessment under S. NR 150, Wisconsin Administrative Code and determine that no significant environmental impact to surface water or groundwater will occur because of construction or operation of the high capacity well.

US – Non-Great Lake States

California

None – “In most areas of California, overlying land owners may extract percolating ground water and put it to beneficial use without approval from the State Board or a court. California does not have a permit process for regulation of ground water use” (California Environmental Protection Agency, 2018b).



Florida

Water bottlers (not groundwater specifically) is addressed in Florida Statute 373.223 Conditions for a permit in ("2012 Florida Statutes, Permitting Consumptive Uses of Water," 2012) Chapter 373 on Water Resources states "(3) Except for the transport and use of water supplied by the Central and Southern Florida Flood Control Project, and anywhere in the state when the transport and use of water is supplied exclusively for bottled water as defined in s. 500.03(1)(d), any water use permit applications pending as of April 1, 1998, with the Northwest Florida Water Management District and self-suppliers of water for which the proposed water source and area of use or application are located on contiguous private properties, when evaluating whether a potential transport and use of ground or surface water across county boundaries is consistent with the public interest, pursuant to paragraph (1)(c), the governing board or department shall consider: (a) The proximity of the proposed water source to the area of use or application. (b) All impoundments, streams, groundwater sources, or watercourses that are geographically closer to the area of use or application than the proposed source and that are technically and economically feasible for the proposed transport and use. (c) All economically and technically feasible alternatives to the proposed source, including, but not limited to, desalination, conservation, reuse of non-portable reclaimed water and stormwater, and aquifer storage and recovery. (d) The potential environmental impacts that may result from the transport and use of water from the proposed source, and the potential environmental impacts that may result from use of the other water sources identified in paragraphs (b) and (c). (e) Whether existing and reasonably anticipated sources of water and conservation efforts are adequate to supply water for existing legal uses and reasonably anticipated future needs of the water supply planning region in which the proposed water source is located. (f) Consultations with local governments affected by the proposed transport and use. (g) The value of the existing capital investment in water-related infrastructure made by the applicant.

Montana

Application, processing, issuance, and follow-up of permits for water bottling are no different than permits for any other purposes (Ferch, 2018).

North Carolina

N/A



International

England/Wales

N/A

New Zealand (Waikato Region)

There are no fees or restrictions for water bottlers.

South Australia

In prescribed groundwater areas, the taking of water for the purposes of commercial bottled water requires a water licence, the same as any other commercial purpose (Poppleton, 2018).

7.13 DID ANY NOVEL PROCESSES OR POLICIES FOR WATER ALLOCATION EMERGE FROM THE REVIEW?

Canada

British Columbia

Water Allocation Plans as a tool for regional water managers or the comptroller to adjudicate water allocation decisions; Environmental Flow Needs Policy; Cumulative Effects Framework Policy, use of water bailiffs, drought management plans with both pre and post drought actions

Manitoba

N/A

New Brunswick

N/A

Prince Edward Island

Environmental base flows are relatively stringent - may become even more stringent in the future (Somers, 2017).

Quebec

N/A



Yukon

Peel Watershed First Nation Supreme Court Decision Dec 1, 2017; Yukon a signatory to the Mackenzie River Basin Transboundary Waters Master Agreement ("Mackenzie River Basin Transboundary Waters Master Agreement," 1997) and to the International Rivers Improvement Act ("International Rivers Improvement Act," 1985).

US – Great Lake States

Illinois

N/A

Indiana

Specified percentages as conservation reductions during drought (Indiana Department of Natural Resources, 2015).

New York

Required water conservation planning for permitting (Hudson Valley Regional Council, 2016). SRBC regulations for conservation and project review also novel on a regional level.

Michigan

Innovative and specific environmental flow policy (use of Water Withdrawal Assessment Tool) and bottled water policy particularly.

Minnesota

In times of deficiency, actions outline in 103G.291 Public Water Supply Plans: Appropriation during Deficiency include the required use of collaborative process to achieve demand reduction measures as a part of the water supply plan review process (Subd 3.c).

Groundwater management area planning is still a fairly new process. Develop 5-year plans of action. All three are still in the 5-year process.

Community Aquifer Management Planning is occurring in areas of southern Minnesota as a way to make sure local governments and water users are aware of and planning for current and future water needs. These are locally driven efforts that bring together community planners, elected officials and water users.



Ohio

Facility conservation plans for permitting (Rowland & Vendel, 2007).

Pennsylvania

The SRBC and DRBC both provide planning and regulation for groundwater protection areas at a site specific and permitting level considering cumulative effects and flow management and scientific assessment requirements, cost considerations, roles and responsibilities for multiple partners and a public review process (Delaware River Basin Commission, 1999; Susquehanna River Basin Commission, 2005). Additionally, the DRBC employs a comprehensive water conservation program that includes water charging, water conservation and water audit programming (Delaware River Basin Commission, 2016b). The Commissions' efforts for coordination, cooperation and public consultation at a regional level are also notable as there is the aim to promote the planning and management of the basin's water resources in the most efficient manner possible; to inform the public on the Commission's water management responsibilities; and to enhance the public's access to Commission information and in commenting on Commission activities (Credit Valley Conservation Authority & Grand River Conservation Authority, 2003).

Wisconsin

N/A

US – Non-Great Lake States

California

They have an Interagency Drought Task Force (Government of California, 2015).

In September 2012, California legislatively recognized the human right to water through Assembly Bill (AB) 685, making California the first state in the US to do so. Under Water Code as Section 106.3, the state statutorily recognizes that "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes". All relevant state agencies shall consider this state policy when revising, adopting, or establishing policies, regulations, and grant criteria when those policies, regulations, and criteria are pertinent to the uses of water. This policy does not expand any obligation of the state to provide water or to require the expenditure of additional resources to



develop water infrastructure. This policy does not apply to water supplies for new development. (California State Water Resources Control Board, 2018).

In order to balance levels of groundwater pumping and recharge, California passed the Sustainable Groundwater Management Act (SGMA). Signed into law by Governor Edmund G. Brown, Jr. in September of 2014, the law requires groundwater-dependent regions to halt overdraft and develop plans to bring basins into balanced levels of pumping and recharge through local planning efforts. SGMA tasked DWR to implement the law and provide ongoing support to local agencies around the state. Under SGMA, these basins should reach sustainability within 20 years of implementing their sustainability plans. For critically overdrafted basins, that will be 2040. For the remaining high and medium priority basins, 2042 is the deadline. SGMA empowers local agencies to form Groundwater Sustainability Agencies (GSAs) to manage basins sustainably and requires those GSAs to adopt Groundwater Sustainability Plans (GSPs) for crucial groundwater basins in California. GSPs are detailed road maps for how groundwater basins will reach long term sustainability.

Florida

Have a definition of significant harm that is reinforced in the regulations; have one government entity responsible for the setting, monitoring and implementing of environmental flows.

Montana

Existence of a Water Court to adjudicate water rights; many decades of drought planning.

North Carolina

N/A

International

England/Wales

Water entitlements may be traded leased and transfers with approval from overseeing agencies.

New Zealand (Waikato Region)

Have policies/rules related to the allocation and management of geothermal energy and geothermal water; comprehensive policy on water allocation priority in cases of shortage.



South Australia

WAPs, including the process of prescribing water resources deemed to be at risk, and the consideration of environmental water requirements in developing allocation policies.



8. APPENDIX C

Long-form Questions for In-Depth Jurisdictions



The following questions were used to gather in-depth information for Minnesota, Michigan, Florida, Montana and New Zealand (Waikato Region).

8.1 LEGAL FRAMEWORK

- *What is the legal structure and the scale at which authority is exercised?*
- *How are water users identified (purpose of use? volume?) and what are their water taking limits?*
- *Is there a fee structure for water users to acquire water rights and use water?*
- *Are the rights of/limits on water bottlers and fee structures pertaining to water use addressed in policy as a specific system consideration? If measures are taken to explicitly define the rights or limits on water bottlers, how are the measures challenged or upheld?*

8.2 INTEGRATED MANAGEMENT

- *How does your jurisdiction's water allocation system formally integrate concerns for groundwater and surface water into legislation?*
- *How does your jurisdiction's water allocation system formally integrate concerns for water quantity and quality into legislation?*
- *Are cumulative effects considered in your jurisdiction's approach to water allocation?*
- *What approach does the jurisdiction use (e.g., area-based assessment)?*
- *To what extent are cumulative effects data considered in water allocation decisions at the watershed/aquifer scale?*

8.3 IDENTIFYING WATER QUANTITY STRESS

- *How does your jurisdiction identify water quantity stress areas?*
- *How is water quantity stress defined in your jurisdiction?*
- *Can you provide examples of this approach to identify stress?*

8.4 ADAPTIVE MANAGEMENT

- *Does your jurisdiction use adaptive management strategies including tools and practices for implementing an adaptive management approach – e.g., institutional measures (e.g., municipal water rates), technical adjustments (e.g., low water sprinklers), and/or behavioral (e.g., water sharing)?*



- *How and to what extent is your jurisdiction incorporating adaptive strategies into water allocation?*
- *If relevant, how are these adaptive management strategies enforced?*
- *If there is a water rights system, can rights be amended for adaptive management? How?*

8.5 ECOSYSTEM PROTECTION

- *How does your jurisdiction allocate for environmental flows, habitat, and in-stream needs?*
- *Are there monitoring and enforcement legislation/regulation for environmental flows, habitat, and in-stream needs?*
- *How does your jurisdiction acquire (e.g., data and tools) ecological knowledge in decision-making?*
- *Does your jurisdiction have any innovative environmental protection procedures or policy?*

8.6 DROUGHT MANAGEMENT

- *What are the structure of plans and primary concerns related to drought in your jurisdiction?*
- *What formal conservation measures exist for the restriction of water allocation across different uses during times of water stress?*
- *Are these measures voluntary or mandatory?*
- *Are there conservation measures that are applied specifically during times of water shortage?*

8.7 CONFLICT RESOLUTION MECHANISMS

- *In your jurisdiction, is priority assigned to any specific water use?*
- *What dispute/conflict resolution mechanisms are legislated and implemented to deal with surface or groundwater allocation disputes (e.g., decentralization, public consultation, negotiation, mediation, arbitration, appeal processes and structures)?*
- *Are these mechanisms used? Please explain.*



8.8 COLLABORATIVE APPROACHES

- *What is your jurisdiction's communication policy with the public at different stages in the policy cycle regarding water allocation decisions?*
- *Are equality and transparency procedures formally incorporated into water allocation legislation in your jurisdiction? How?*
- *Are there examples of novel collaborative approaches being used by your jurisdiction to advise on water allocation decision making?*
- *In your jurisdiction, what are the formal requirements for Indigenous inclusion in decision-making?*
- *In your jurisdiction, are there formal requirements for the use of Indigenous Knowledge Systems in allocation decisions?*
- *Are there any agreements or actions of note regarding Indigenous decision making on water?*

8.9 IMPLEMENTATION

- *For any of the above topic areas have there been any particular challenges or successes related to the implementation of the legislation, policies, or plans that are worthy of note?*
- *Can you please recommend any additional documents related to implementation of the legislation, policies or plans mentioned above?*



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