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Bruce W. Kitchen

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TRENT-SEVERN WATERWAY CONFLICTS

by

Bruce W. Kitchen[2]

ABSTRACT: Whenever a large number of different activities are based upon a single resource, conflicts are inevitable. The Trent-Severn system of dams controlling the water levels and flows in a large recreational area is just such a situation. Whitewater canoeing requires flow to be taken from reservoir headwater lakes while cottaging on these lakes is enhanced when the water level remains high. Lock operation with adequate advertised draught through the navigation route, as planned and designed for, requires that evaporation losses from canal route lakes be replaced with water from the reservoir lakes, also detrimental to the reservoir cottager. Fish spawning requires certain flows of water at certain times in certain locations just at a time in some years when flow must be reduced to ensure filling the lakes for summer. Power production, flood control, agriculture, water quality and municipal water supply are among the further concerns of Trent-Severn Waterway in controlling flows.

The primary raison d'etre of the Trent-Severn Waterway is to provide through navigation for boats from the Bay of Quinte on Lake Ontario to Georgian Bay on Lake Huron. Many other uses of the works are also accommodated, however, including sport fishing, whitewater canoeing, waterfront development, hydro power, and agriculture. As you are aware, many of these uses manage to be complementary at times, but will inevitably conflict at other times. A case in point occurs where whitewater canoeing is becoming organized and popular downstream of our Horseshoe Lake Dam. This is immediately upstream from a hydro-electric power station headpond. The conflict arises if and when the events (generally planned for weekends) coincide

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[2]Water Control Engineer, Trent-Severn Waterway

with a time when less than full power plant flow is available. At these times it is advantageous to the power producer to run his headpond down gradually over the week and back-off on the weekend to refill. If the Trent-Severn Waterway, in support of the canoers, increases the flow on the weekend while the plant is at low flow, then decreases the following week while the plant wants to run high flows, the two uses become very incompatible indeed. Headpond variations would then be increased, water may be spilled and its power lost, earlier commitments would be infringed upon, and headpond residents become more upset than normal about the fluctuations. This is representative of the newer types of conflict we encounter.

Older conflicts stem back to the beginning of the cottaging era of the late 1950's and early 1960's. Haliburton County contains many very desirable cottage locations on lakes which form the headwaters of the Trent-section of the Trent-Severn Waterway. A crew of Trent-Severn employees places stoplogs in the Parks Canada dams as the snow melts in spring, to fill these lakes for summer use. When cottagers begin arriving in May the lakes are often brimming full, promising a long happy summer of water recreation. As summer begins, however, and evaporation exceeds rainfall, the shortages along the downstream canal system are made up with stored water released from lakes in Haliburton. As late July approaches those lakes may have receded one to five feet from full levels and are dropping steadily. Cottagers then feel that "their water" is being "wasted" to lock through some "fly-by-night boater" along the Waterway. At about that juncture it is easy for them to forget that if there were no boating on the Waterway, the dams on their Haliburton Lakes would not have been built, much less maintained and operated. Reduced lakes and larger swamps would exist, instead of some of the prime vacation spots that are now available, if the canal operation had not required summertime water to replace evaporation losses.

Parks Canada, which administers the Trent-Severn Waterway, encourages recreation of many forms: cottaging, whitewater canoeing, sport fishing and through navigation. Power production, water quality requirements, the maintenance of nature habitats, municipal and agricultural uses are also not to be forgotten or denied. Flood mitigation is also a major concern at those times of the year when heavy precipitation or snowmelt cause high flows and levels. The water management of this complex system of lakes and rivers as well as the constraints implied by interest groups and legal agreements make for a very challenging and rewarding operation.

RESUME: A chaque fois qu'un grand nombre d'activités différentes sont basées sur une ressource à une seule variable, les conflits sont inévitables. Le système de barrages de Trent-Severn qui contrôle les niveaux d'eau et les débits d'une vaste zone récréative en est justement l'exemple. Le canotage en eau rapide requiert des débits substantiels prélevés sur les lacs-réservoirs de tête du cours d'eau alors que la villégiature sur ces mêmes lacs est plus agréable lorsque les niveaux d'eau sont maintenus élevés. L'opération des écluses avec des tirants d'eau adéquats tout le long de la voie navigable requiert que les pertes d'eau du canal dues à l'évaporation soient compensées par l'eau des lacs-réservoirs en amont, ce qui se fait au détriment du villégiateur du réservoir. Le frai des poissons exige certains débits d'eau à des périodes et à des endroits précis; certaines années cela coincide avec le moment où les débits devraient être réduits pour assurer le remplissage des lacs pour l'été. La production d'énergie, l'agriculture, la qualité de l'eau et l'approvisionnement municipal en eau sont d'autres préoccupations de l'agence de la Voie navigable Trent-Severn dans le contrôle des débits.

La raison d'être de la Voie navigable Trent-Severn est d'assurer la navigation entre la Baie de Quinte sur le lac Ontario et la Baie Georgienne sur le lac Huron. Cependant, bien d'autres utilisations sont facilitées à l'aide des ouvrages existants y compris la pêche sportive, le canotage en eau rapide, le développement des berges, la production d'énergie et l'agriculture. Plusieurs de ces usages sont, à certaines périodes, complémentaires mais en d'autres moments, conflictuels. Un cas récent se produit alors que le canotage devient mieux organisé et plus populaire en aval du barrage du lac Horseshoe. L'endroit est immédiatement en amont de la tête d'eau d'une usine hydro-électrique. Le conflit se produit lorsque les compétitions (généralement tenues pendant les fins de semaine) coincident avec un débit d'eau disponible inférieur à la pleine capacité de l'usine. A ce moment-là il est avantageux pour la production d'énergie d'écouler graduellement son réservoir de tête pendant la semaine et de le reconstituer pendant la fin de semaine. Si la Voie navigable de Trent-Severn, pour favoriser le canotage, augmente le débit pendant la fin de semaine alors que l'usine fonctionne à faible débit puis diminue le débit pendant la semaine alors que l'usine voudrait turbiner de forts débits, les deux usages deviennent vraiment incompatibles. Les variations de la tête d'eau de l'usine sont alors augmentées, de l'eau peut être gaspillée et de l'énergie perdue; des engagements antérieurs sont enfreints et les résidents riverains de la tête d'eau deviennent plus dérangés que normalement par les

fluctuations de niveau. Voilà un cas représentatif des nouveaux types de conflits rencontrés.

Les conflits plus anciens remontent au début de la période de la villégiature, à la fin des années 1950, début de 1960. Dans le comté d'Haliburton, on trouve de nombreux endroits de villégiature fort attrayants en bordure des lacs qui forment les réserves de tête de la section Trent de la Voie navigable Trent-Severn. Chaque printemps à la fonte des neiges, une équipe d'employés de Trent-Severn installe des poutrelles aux barrages de Parcs Canada dans le but de remplir les lacs pour les usages d'été. Quand les villégiateurs commencent à arriver en mai, les lacs sont déjà remplis à pleine capacité; promesse d'un long été de joyeuses activités aquatiques. Au début de l'été toutefois, alors que l'évaporation dépasse la précipitation on compense les pertes dans les canaux en aval par des lachées d'eau emmagasinée dans les lacs d'Haliburton. Vers la fin de juillet, ces lacs peuvent avoir baissé d'un à cinq pieds de leur niveau maximum et continue de baisser régulièrement. Les villégiateurs croient alors que "leur eau" est en train d'être "gaspillée" dans les écluses par de quelconques usagers clandestins de la Voie navigable. A ce moment critique, il est facile pour eux d'oublier que s'il n'y avait pas de bateaux sur la Voie navigable, il n'y aurait pas non plus de barrages sur les lacs d'Haliburton. Au lieu des endroits de vacances exceptionnels actuellement disponibles, on trouverait des lacs réduits et de vastes marécages si l'opération du canal n'exigeait pas des réserves d'eau pour remplacer les pertes dues à l'évaporation en été.

Parcs Canada, l'organisme responsable de la Voie navigable Trent-Severn encourage plusieurs activités récréatives: la villégiature, le canotage, la pêche sportive et la navigation de plaisance. Bien sûr, on n'oublie pas non plus la production d'énergie, les exigences de qualité de l'eau, le maintien des habitats naturels, les usages municipaux et les besoins agricoles. A certaines périodes de l'année, quand les gros orages ou la fonte des neiges causent des débits et niveaux élevés, la lutte aux inondations devient la préoccupation première. La gestion des eaux de ce système complexe de lacs et de rivières ainsi que les contraintes imposées par les groupes de citoyens et par les ententes légales constituent une opération enrichissante en même temps qu'un véritable défi.

INTRODUCTION

The Trent-Severn Waterway is a 386 kilometer navigation route which crosses south-central Ontario from Trenton on Lake Ontario to Port Severn on Lake Huron. Natural rivers and lakes have been connected by man-made canal cuts, locks and controlled water levels to form a navigable route through two neighbouring watersheds (see Plate 1).

The Trent Watershed

The easterly watershed is the Trent River Basin. It is an area of 11,400 square kilometers. About one-third of this basin lies on the Canadian shield. The other two-thirds lie in the rolling farmlands of southern Ontario.

In the northern shield area, some forty reservoir lakes are dammed to collect spring run off water. These lakes are on the tributaries called Gull, Burnt, Nogies, Mississauga, Eels and Jack, which drain south into the Kawartha Lakes (see Plate 2). A greater amount of precipitation over the year and a higher run off rate makes this an excellent water source area for replacement of losses in the Kawartha Lakes downstream.

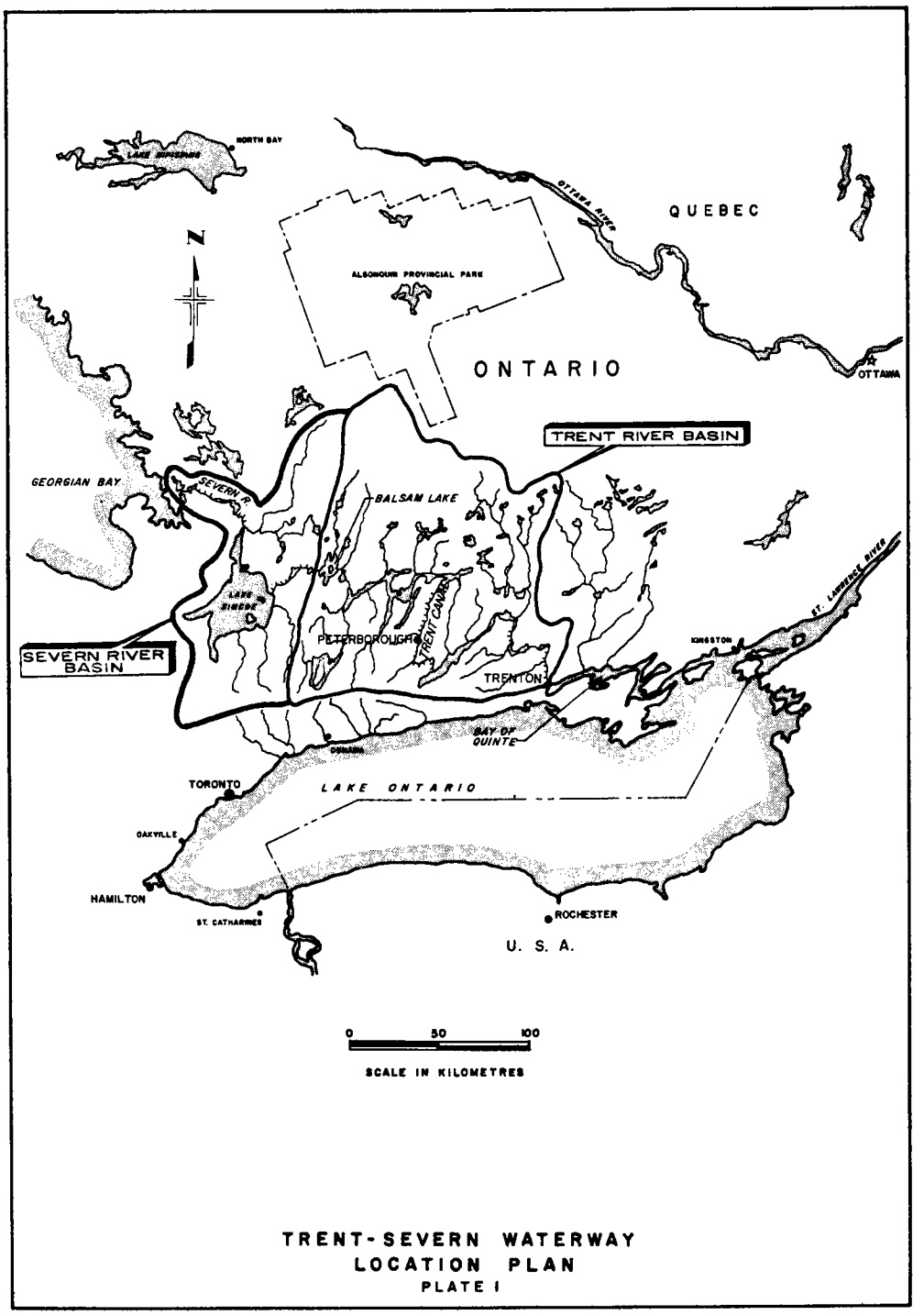
Discharges from the tributary lakes to the Kawarthas are controlled by dams having from one to four sluiceways fitted with square timber stoplogs. The greater size of the Kawartha Lakes, and the greater volumes of water feeding into these lakes, mean that Kawartha Lake dams are considerably larger than others found in the watershed. The Buckhorn Dam, for example, has four 15 meter radial sluice gates, while the Young's Point Dam at the outlet of Stony Lake has one vertical-lift sluice gate and 12 stoplog sluiceways.

The Severn Watershed

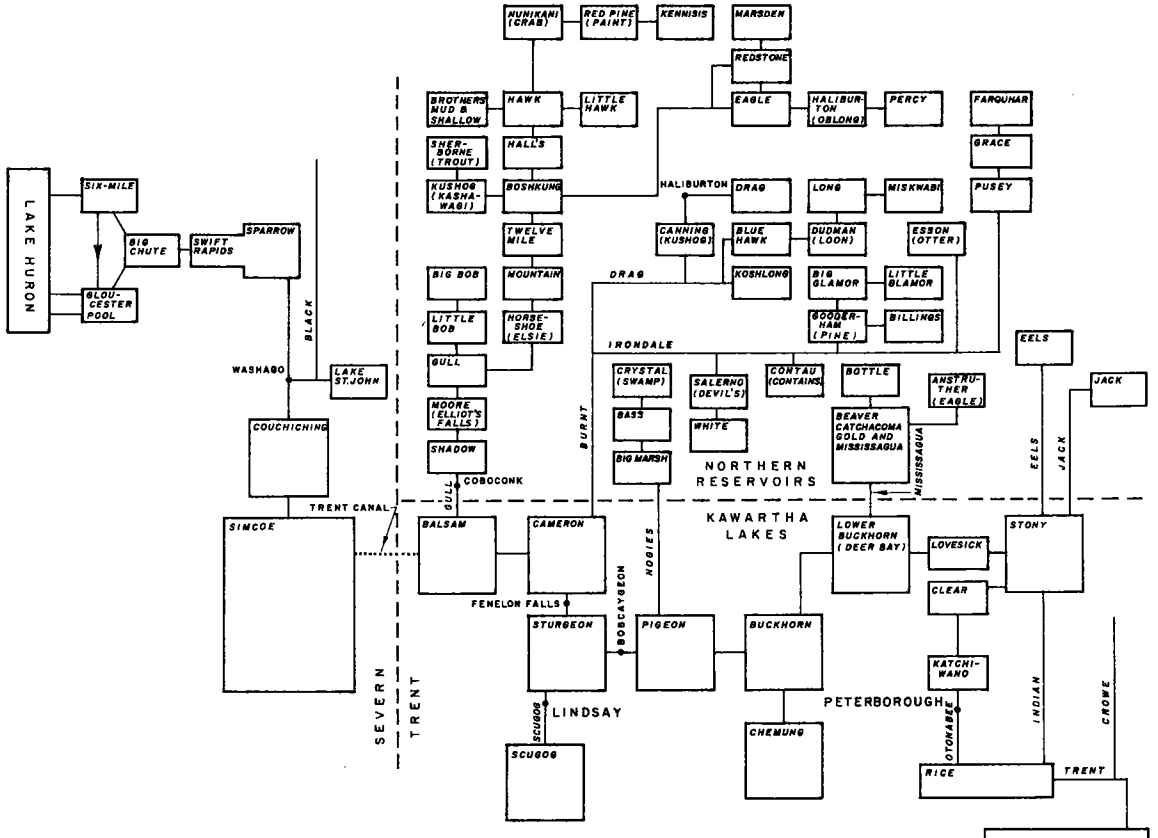
The Severn Watershed lies immediately west of the Trent Basin (see Plate 1) and drains into Georgian Bay. This 6,160 square kilometer drainage area has three major components:

1. The Lake Simcoe-Couchiching Basin;

2. The Black River watershed which feeds into the Severn River downstream of Lake Couchiching outlet;



TRENT-SEVERN WATERWAY
LOCATION PLAN
PLATE I



TRENT-SEVERN WATERWAY
SCHEMATIC DIAGRAM
PLATE 2

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3. The lakes and channels of the Severn River below the confluence, including Sparrow Lake, Six Mile Lake and Gloucester Pool.

Most of the drainage area for the Lake Simcoe-Couchiching basin is in rolling farmland and the deeper soils of Southern Ontario. As a result, water run off is slow. As well, the evaporation losses from both the land and lake surface are high. Thus, only 25% of the precipitation falling on this watershed eventually appears as a run off flow.

The Black River watershed which is located in the thin soils and exposed bedrock of the precambrian shield, produces rapid run off of precipitation while evaporation losses are lower. Consequently, even though the Black River watershed is less than half as large as the Simcoe-Couchiching basin, its long term average flow is comparable (21.7 cubic meters per second (m3/s) compared to 26.7 m3/s from Lake Simcoe-Couchiching).

The Black River watershed is virtually unregulated, so it has relatively high peak flows during the spring period. The maximum recorded daily flow at the Black River gauging station for the period 1915 to 1979, for example, was in excess of 225 m3/s. By contrast, the lowest summer minimum daily flow was only 0.5 m3/s! Such drastic variations of flow passing along the natural watercourses of the Black and the Severn Rivers which are constrained by several narrow reaches, can cause severe fluctuations in the river and smaller lakes levels.

Flood damages are therefore a fairly common and hazardous occurrence along the Severn where the shoreline residents are in desirable recreational locations. Most of the recreational conflicts occur on the Trent watershed so the Severn will not be discussed further here.

Conflicting Desires

This paper will explain some facets of annual water control operations on the Trent Watershed of the Trent-Severn Waterway and some of the conflicts that arise between competing recreational and other uses.

The basic conflict revolves around a desirable flow past a river location versus a desirable level at a lake location, when the future effects of precipitation and evaporation are largely unknown. For some interest groups the discharge rate of the water is what matters as their sport or activity may require

flowing water. Other groups have an interest in the remaining amount of water stored in the controllable lakes. Generally they want the levels to remain moderately high throughout the recreational part of the year without going overfilled to cause damage, or low enough to present boating obstacles or expose water intakes. At times, the prevailing weather conditions make these two desires compatible, but often adverse conditions result in conflicts and enforced sharing becomes a necessity.

Reservoir Cottagers vs. Navigation, Power, Water Quality

In the late 1950's and early 1960's some provincial government lands surrounding Trent-Severn Waterway reservoir lakes in Haliburton and Peterborough Counties were sold off to private people for cottage lots. These areas tended to be on the shorelines of the more northerly lakes and beyond the already settled larger lakes at the downstream end of tributary rivers such as the Gull. The cottaging enjoyment and the economic boost to the area were very beneficial results of this action. It also led to confrontation over the competing uses for the stored water, especially in dry years.

In the spring the snowmelt water and rain in this area is trapped and held on the reservoir lakes. This process refills them to 85-100% of their defined normal maximum levels by early summer. Re-installation of the squared timber stoplogs in the dams facilitates this action. An attempt is made to come to the same level year after year in spite of tremendous variations of rate, timing and quantity of the run off. In some 70 years of operation the spring inflow volume has varied between a low of 54,000 ha-m (hectare-metre) in 1958 and a high of 209,000 ha-m in 1929. Experience has shown that a low starting level can very often lead to low levels all summer while a higher level tends to result in higher levels all summer regardless of how wet or dry the summer. This satisfies the largest number of users, as well as the canal system needs.

The cottagers have begun to feel that due to their numbers the manner of operating the reservoir lakes should be altered from its original purpose (namely replacement of evaporation losses over the summer along the canal route) to make higher water levels available to cottagers later in the summer. Since the amount of water available at any one time is finite, and additional reservoir sites are small, prohibitively expensive and disruptive to make available, then the only way for more water to remain in Haliburton Lakes is to: a) hold more in spring and b) run less over the summer. Both of these changes

have a price attached to their implementation.

When the first alternative, of holding more water on these lakes in the spring is practised the inconvenience and damages due to flooding increase, because of a reduced available buffer of unfilled storage volume in case of sudden, heavy rain or rapid melting of snow.

The Haliburton County Water Levels Committee comprised of concerned lake association representatives and individuals have contacted the Trent-Severn Waterway on this question and have indicated that the increased risk was worth it and they would accept occasional greater flooding caused by attempts to hold more water for summer. The problem with this of course is that some individual shoreline residents would not have agreed to this and therefore feel that damages, etc. incurred by them due to this policy are unjustified. In effect they are in conflict with other residents of their own lake in this regard.

Over the course of several years operation with this policy about 30% of the lakes have requested some lower target level. Each request is handled by the committee and approved by it before Trent-Severn Waterway is asked to change.

The second alternative, that of reducing the summer flow, has a cost that is more remote to the reservoirs. Our first responsibility, that of maintaining through navigation of the canal route, requires no greater lowering of the large Kawartha Lakes than is presently practised, therefore to cut the flow to the Kawarthas requires equivalent cutting of the flow coming from them. Here many activities can potentially be affected. Hydro-electric power production at some 15 generating stations is reduced by a measurable number of dollars and cents. Quality of the water may begin to decline due to more sluggish flow where the various municipalities along the Otonabee and Trent Rivers must draw their drinking water. A third concern is operation of the canal system during localized drought conditions. On occasion the steady flow being released from the Kawarthas can be entirely consumed by evaporation and leakage before reaching Trenton. Lockages which normally require only about 5% of the total river flow needed for quality, etc. can (at the Trenton end of the system, when added to the water unavoidably leaking through the accompanying dam) amount to more than the remaining flow of the river so that the level of the last reach or two declines day by day. The available vessel draught can soon be less than advertised on the navigation charts and therefore become hazardous, unless more flow is allowed to move down from the Kawarthas and ultimately from the

Haliburton Lakes.

In recent years the Trent-Severn Waterway has gone to the extra trouble to act in both these directions. It observes the operational limits of structures and gauges as well as the limits of our collective experience and judgment. Other agencies such as Ontario Hydro have undoubtedly noted and absorbed their losses in accordance with provincial priorities regarding recreation versus hydro-electric power production. What quality concerns have yet to be related to river flows and complaints have been few.

Cottaging vs. Fish Spawning

Increased leisure time, larger recreational investments and improved access to Reservoir Lakes have resulted in the desires among cottaging people to extend their season of use of the lakes into the autumn. This in some lakes has clashed with the needs of fall-spawning fish species, notably the lake trout.

In their natural state and under the operational methods of the timber trade as well as the early years of federal government operation the lakes would generally enter the fall months in a lowered state due to the relative wetness of the season preceding. Lake trout spawning would coincide with nearly the lowest natural level of the lakes. Though some spawn would be laid on shallow gravel bars, the slightly increased water levels of early winter would generally prevent significant losses of spawn due to exposure to freezing or drying.

Cottagers, however, want to enjoy the beautiful fall weather to the end of October if possible and this includes the use of outboard motorboats (which gradually have increased in power and draught), as well as the use of docks and access channels where adequate water depth is important. Consequently, at the natural fall level of the lakes many difficulties would plague the cottagers.

A group of property owners on these lakes began then to request that water levels on the lakes be held up until late in the fall. The confrontation had arrived! How critical was this early fall drawdown to the success of fall-spawning fish? What date was most critical, etc.? The involvement of Ministry of Natural Resources (MNR) was required, and a workable arrangement based on what is presently known has been worked out. In recent years the summer policy of drawing only the necessary flow from the reservoirs has been extended from about Labour Day (early

September) to Thanksgiving (mid-October), to aid the cottagers.

MNR has concurred with this approach on all but three lakes. Observed shallow spawning in these three waterbodies resulted in the Fish and Wildlife Section of MNR requesting that these lakes be lowered by October 1. On notice from MNR that spawning is occurring, we re-install one stoplog in each dam. This encourages water levels to rise a little rather than decline further after the spawn are laid. Though it involves the use of Trent-Severn Waterway structures the answer to this particular conflict affected canal operations very little in that the canal navigation season is nearing its end in the fall. Precipitation generally is exceeding evaporation so that a surplus of water usually is available.

Another critical time of year for fish occurs in spring, when spring-spawning fish begin to run upstream while snowmelt water is running off the watersheds. At several locations along the Trent-Severn Waterway, natural or enhanced spawning areas, generally on a rapid section of water downstream of a control dam, are known to be in use by pickerel and other spring spawners. In these locations the depth of water over the gravel shoals, depends mostly on the flow being discharged from the dam, not the level of any lake. Frequently the fish begin to spawn at the onset of the rush of water, then the eggs hatch and the fry leave by about the time the surplus of meltwater has been discharged. Reducing the flow at the dams occurs after the time of greatest vulnerability of the new spawn. There are years, however, when the freshest flow is minimal, or earlier or later than the peak fish spawning time. This can result in the Trent-Severn Waterway having to reduce the flow through the dam (to preserve water for summer) before all of the fish have hatched. The best interest of these fish and the fishermen who seek them is then in conflict with the best interests of boaters and cottagers who want the water preserved.

Whitewater Canoers vs. Cottagers, Power Production and Navigation

A few years ago a whitewater canoeing group who had for several years made some use of the flow coming from our Horseshoe Lake Dam contacted the Trent-Severn Waterway about improving the rapids for their sport. The group asked our cooperation in temporarily manipulating flows of water from the dam to produce optimum conditions for construction activities and some racing events. With non-polluting recreational pursuits considered highly beneficial by Parks Canada, the request was granted and endorsed subject to provisoes concerning

prior rights and obligations.

A major prior right is that held by the municipal hyrdo-electric power plant located with its own headpond about 2 km downstream. Built in about 1940 this plant has recently become much more valuable to its owners due to the increased cost of electricity, especially at peak demand times.

The initial prior right of course is navigation through the Trent-Severn Waterway. This requires that water be stored on Horseshoe Lake and the others upstream of it, during spring run off. This water needs to be released as and when required. It flows down to the Kawartha Lakes which form the canal route. This water helps preserve navigation depths during the summer. The major reconstruction of these northern dams, in the early 1900's as the timber trade was coming to an end, was for this very reason. Water lost to evaporation off the Kawarthas, plus minimum acceptable outflows to the Otonabee River (a lower limit of 17 m3/s has been established) can only be replaced with stored Haliburton water if the Kawarthas are not to decline.

A third group of prior users is the cottagers who reside along these lakes (e.g. Horseshoe Lake itself). A faster decline in their water levels due to higher flows being released for canoers is not well received by cottagers.

Late one spring the Trent-Severn Waterway reduced the overall flow from upstream lakes passing through Horseshoe Dam to a minimal amount due to the well-filled condition of the Kawarthas and the earliness of the season. This approach followed our policy of drawing only as much water as necessary, especially early in the season for the sake of cottagers. As it happened the canoe people had an event scheduled for the weekend following our reduction of the flow. The flow remaining was deemed insufficient for good competitive conditions so they requested that we increase it. This of course was completely at odds with the power commission whose major need for power is during the week. They could envision a large amount of water being run for the canoers in excess of power production capability and/or weekend needs only to be reduced during the following work week to less than they needed. This would force the commission to increase purchases of peak power from Ontario Hydro. The power lease agreement actually provides for the opposite operation of reducing Horseshoe flow during the weekend and increasing it during the week under certain conditions.

To resolve this impasse it was necessary for our crew to make temporary changes to the flow for the duration of the

canoeing events alone, during the weekend. For these extra hours at premium rates the whitewater people have agreed to reimburse Parks Canada.

At another site on the canal route a group of kayakers want to use flow from a dam at the head of a suitable rapid for a weekend competition once each year. This pre-arranged event often happens on a weekend when the flow of the river at the point, which is heavily dependent upon preceding conditions, has declined enough so that it can be completely utilized by the hydro-electric generating station accompanying the dam. The one or two-day gush of water by-passing the power plant for kayaking purposes could have been passed through the power plant to produce a measurable amount of renewable energy. In these instances a non-polluting entertainment activity conflicts measurably with a non-polluting energy source.

Shadow Lake vs. Upstream Cottagers

A similar style of conflict occurs lower on the Gull River. This particular stream passes through a lake whose level is not held up by a control dam, but depends upon the flow rate of the river going over natural bedrock restrictions at its outlet. For this relatively small lake which is well populated with cottagers the summer water levels are adversely effected if sustained rainfall occurs on the Kawarthas, but does not affect Haliburton Lakes noticeably. This can result in the Trent-Severn Waterway reducing flows through their lakes in order to conserve water for cottagers on upstream lakes when the water is not needed on the Kawarthas due to the rain. Shadow Lake then declines until the Kawarthas begin to drop. This results in our increasing the flow of the Gull River. At that time, Shadow Lake is restored to its normal level by the higher flow. In this instance we have the wishes of one group of cottagers (holding more water on upstream lakes) conflicting with those of another group (to run more water through their lake). We have of course an imposed lower limit to the Gull River flow during the recreational season. This standard of 12.7 m3/s is designed to prevent more drastic problems on Shadow Lake whether this much is required on the Kawarthas or not.

Remarks

It should not be thought from the foregoing that navigation supercedes all other desires for the Trent-Severn Waterway. The threat of flood damage or even considerable inconvenience to shoreline residents has often resulted in delayed openings or a later suspension of navigation through the locks, while a large

surplus of water was rapidly emptied from the system. Continued heavy rains have produced these situations as late as the beginning of August. The weather it seems can conflict with every activity and very often with water-based recreation.

Fulfillment of recreational desires is a major aim of Parks Canada and the Trent-Severn Waterway. The main areas of conflict discussed in this paper show the diversity of interests and use being made of this large handy resource. Acting as an operator and arbiter of the system and its conflicts is a challenging and rewarding role for Trent-Severn Waterway personnel.