

Headwaters Edition — It all begins in the Canadian Rockies

## 30-year water quality study shows integrity of aquatic ecosystems in mountain parks recovering

***Improved water quality exiting the parks is directly related to better water quality management practices within the parks***

A long-term water monitoring program, conducted by Parks Canada and Environment Canada, now reveals significant improvements in overall water quality for key headwater aquatic systems in Alberta. The positive trend in water quality over the past 30 years is directly related to improved water-quality management practices within the **Banff and Jasper National Parks**.

Water quality has been monitored monthly in the mountain parks since 1973, between and within the three watersheds of the Bow, North Saskatchewan and Athabasca rivers. Improvements in concentrations of nutrients and bacteria were recorded at downstream sites, and were particularly evident in the lower Bow River.

This assessment examined over 60 water quality parameters, paying particular attention to nutrient issues. Nutrients are essential for aquatic life, but an excessive nutrient build-up (especially phosphorus and nitrogen resulting from human activities) can lead to algal blooms and adverse impacts on aquatic life. This is known as eutrophication. For example, certain algal species can produce toxins that can compromise the health of exposed mammals, fish and shellfish. Eutrophication can also adversely affect water supply, livestock watering, irrigation, navigation, angling and water sports. Interestingly, other contaminants such as metals

were not found to be a major issue in the park reaches of the Bow, Athabasca and North Saskatchewan rivers, as the level of their presence in the samplings can be attributed to natural sources.

Although the lowering of nutrient concentrations is substantial so far, nutrient enrichment remains the main concern for aquatic ecosystems within these national parks. Municipal wastewater discharges represent one of the largest sources of pollutant releases by volume to Canadian waters. Treatment plants can remove significant amounts of contaminants from wastewater, containing grit, debris, suspended solids, pathogens, oxygen-depleting wastes, nutrients, and roughly 200 different metals, persistent organic compounds and other chemicals. A “tertiary treatment” capacity allows for an advanced wastewater treatment approach, using additional filtering or chemical/biological processes to remove specific compounds or materials that remain after initial treatment.

The continuous, long-term nature and coverage of this ongoing water quality program will, in the near term, measure how well the new municipal treatment upgrades are working. On a broader scale, the program will ensure that the Bow, North Saskatchewan and Athabasca watersheds remain healthy and capable of supporting the biodiversity of their aquatic ecosystems.

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Aquatic Ecosystems Scientist  
Environment Canada

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### Definition:

#### “reach” verb

1. to stretch out or put forth; extend; reached out an arm
2. to succeed in getting in contact with or communicating with people

#### “reach” noun

1. the stretch of water visible between bends in a river or channel
2. range of scope or influence

**Check out our website for more information and upcoming events!**

[www.rdrwa.ca](http://www.rdrwa.ca)



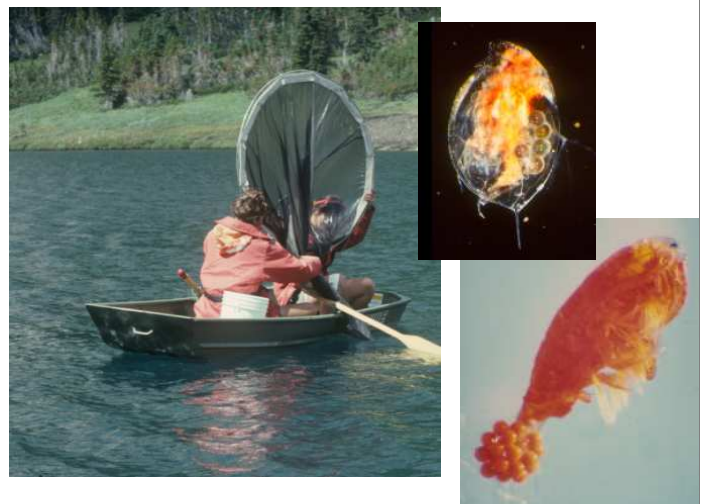
## Restoring the Biological Communities of Headwater Lakes

The headwaters of the Red Deer River and adjacent drainages include numerous small, mostly fishless, high elevation lakes and ponds. In the mid 1900s, park staff stocked many of these lakes with non-native trout to provide recreational opportunities for backcountry travellers. We infer from early records that the introduced trout had a major impact on the planktonic communities of the stocked lakes. The large crustaceans *Hesperodiaptomus arcticus* and *Daphnia middendorffiana* frequently were eliminated, after which small zooplankton species and algae flourished.

We began a study of several of the stocked alpine lakes in 1991. Our interests lay in discovering if the lakes still contained fish some 30 years after the last stocking, if the invertebrate communities remained damaged, and if we could restore the biological communities of damaged lakes to their original condition. We found that where fish had persisted for less than 13 years, usually where short-lived Rainbow or Cutthroat Trout were stocked, the zooplankton communities often naturally recovered to their pristine conditions. Where long-lived Brook Trout were stocked, and fish were present for two decades or more, the zooplankton communities frequently remained damaged even after the Brook Trout died out. The large copepod *Hesperodiaptomus* was particularly susceptible to elimination from these lakes. In a small number of lakes Brook Trout successfully reproduced and the invertebrate communities remained severely damaged with both *Hesperodiaptomus* and *Daphnia* being absent.

We chose to experimentally restore two lakes to their pristine condition, one each with a failed and a self-maintaining Brook Trout population. In the first lake, we stocked 660,000 *Hesperodiaptomus* in an effort to reintroduce this large copepod. In the second, we removed Brook Trout with 4 years of intensive gillnetting, after which we stocked 240,000 *Hesperodiaptomus*. *Hesperodiaptomus* was successfully restored to both lakes. Interestingly, *Daphnia* recovered without our assistance, probably from hatching of *Daphnia* resting eggs deposited in lake sediments before Brook Trout were stocked. The return of the pristine zooplankton assemblages was followed, after a time lag of several years, by changes in the species composition of the algal community and massive reductions in the biomass of algae present. The restoration of the biological communities of small alpine lakes is feasible, but may require considerable effort if stocked fish populations must be removed.

by Brian R. Parker and David W. Schindler, Department of Biological Sciences, University of Alberta, Edmonton, Alberta, T6G 2E9



(Top) Pipit Lake, at headwater of the Red Deer River, Banff National Park

(Bottom right to left) Collecting *Hesperodiaptomus* for reintroduction into experimental lakes; *Hesperodiaptomus arcticus*; *Daphnia* sp.

Photo credit: Brian Parker and Alistair Hardie



## The Interrelationship of Forestry and Watershed Management

The General Meeting on the Interrelationship of Forestry and Watershed Management held in Sundre on October 20<sup>th</sup> was a terrific forum to learn more about watershed management and the huge efforts being put forward by the forest industry in relation to watershed management.

The sixty people who attended the meeting were given an excellent overview of forest hydrology by Dr. Uldis Silins from the University of Alberta. Dr. Silins talked about the forest water balance; evapotranspiration; disturbance effects on water yield, water regime and water quality; and hydrologic recovery. He provided a number of graphs and charts showing the science behind forest hydrology.

Staff from Sundre Forest Products Inc. presented information

on stream classification and protection, and stream crossing site plans and audits. Gary Lewis provided an overview of the Rocky Riparian Group (a local stewardship group) and highlighted some of their key activities. Michael Bender of Golder & Associates gave a presentation on peak flow modeling and validation. And last but by no means least, was a very engaging presentation by Bart McNally, Alberta Sustainable Resource Development on the threat of the Mountain Pine Beetle and its impact on watershed management. All of these presentations are posted on our website @ [www.rdrwa.ca](http://www.rdrwa.ca) for your information.

Special thanks go to Peter Denney and staff from Sundre Forest Products Inc., a division of West Fraser Mills Ltd. for organizing the conference and speakers. Great Job!

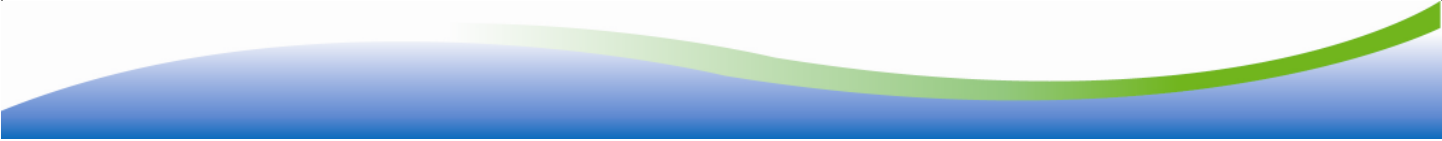
Hey kids...

See if you can find all the words in this

Sentence:

"A WATERSHED IS AN AREA OF LAND DEFINED BY A DIVIDE WITHIN WHICH WATER DRAINS INTO A RIVER, LAKE OR OTHER BODY OF WATER."

E E T R E V I R A O T N I O S E  
 B E N E F I T S E N B O A O I E  
 N L E R B O D Y O F W A T E R A  
 A R M O S D E H S R E T A W A I  
 S I N R D N R Y O A E R E H K D  
 I S O O D A I E M W S R O E R A  
 D R R T E E D A E O I O N L H W  
 E I I H E K F I R E N E A A E O  
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 E D N R D I F L N I R I C D P R  
 E A E D O H N R D E D E S E O E  
 D A A A I D E I F H D E T E E E  
 H C I H W N I H T I W B A A P A  
 E T E S W E B A B D T B Y N W R  
 R S A R E A O F L A N D O R R R  
 N R E E A Y D N O W W T R N H D



## View from the Board ...

It is the time of year when Christmas is quickly approaching and we are soon to start into a New Year.

The RDRWA is looking forward to 2007 with the commencement of many exciting but challenging projects, especially the State of the Watershed Report. We will be implementing the Education and Communication Strategy, work with our local stewardship groups and continue on many other initiatives including broadening our membership and support and providing information sessions. The Alliance is taking active roles in shaping both the province's Watershed Planning Framework and the Land Use Strategy and will be participating in Interbasin Water Coordinating Committee with AENV which will determine an apportionment operations plan for the entire South Saskatchewan River Basin.

RDRWA would like to thank our members and partners for their support in the past year, and the Alberta government for their contribution to our projects.

We wish everyone a very Merry Christmas and a Happy and prosperous New Year. May all your water run clean, clear and fresh in the New Year!

Earl Graham – Chair  
RDRWA Board of Directors

### *Holiday Greetings!*

**Thank you for your generous  
support of the Red Deer River  
Watershed Alliance.**

**We wish you a Merry  
Christmas and all the best in 2007!**

*Manager, Staff and Board of Directors  
Red Deer River Watershed Alliance*

