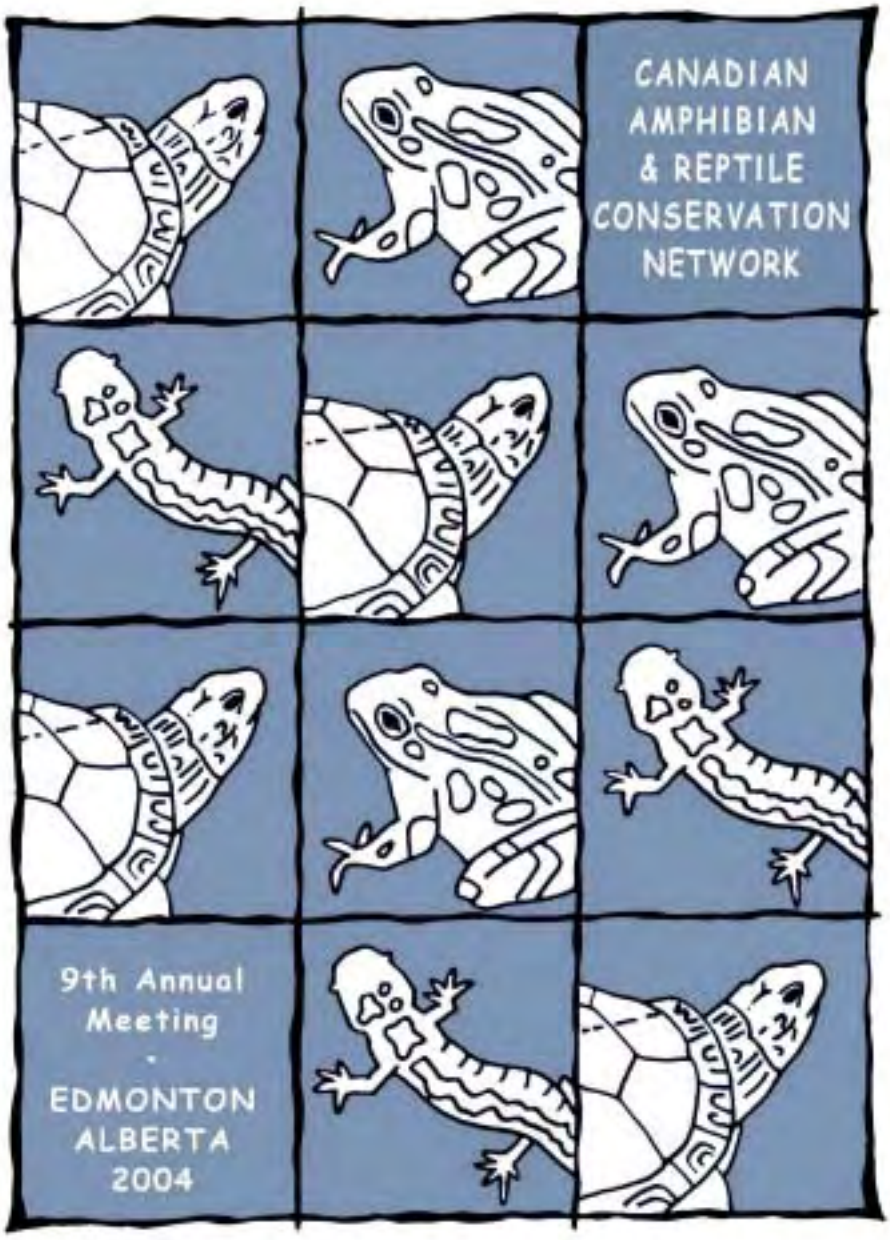
9th Annual Meeting of the

Canadian Amphibian and Reptile Conservation Network / Réseau Canadien de Conservation des Amphibiens et des Reptiles



24-27 September 2004
Edmonton • Alberta • Canada

ISSN 1916-3797

Board of Directors of the

Canadian Amphibian and Reptile Conservation Network / Réseau Canadien de Conservation des Amphibiens et des Reptiles

Welcome to CARCNET/RÉCCAR 2004!

Welcome to Edmonton…

Edmonton is the capital city of Alberta and has nearly one million citizens. Its future was clinched in 1947 when the Leduc oil discovery transformed it into the "Oil Capital of Canada". The oil and gas industry remains the city's economic cornerstone. Today, Edmonton is also home to the provincial government offices and staff.

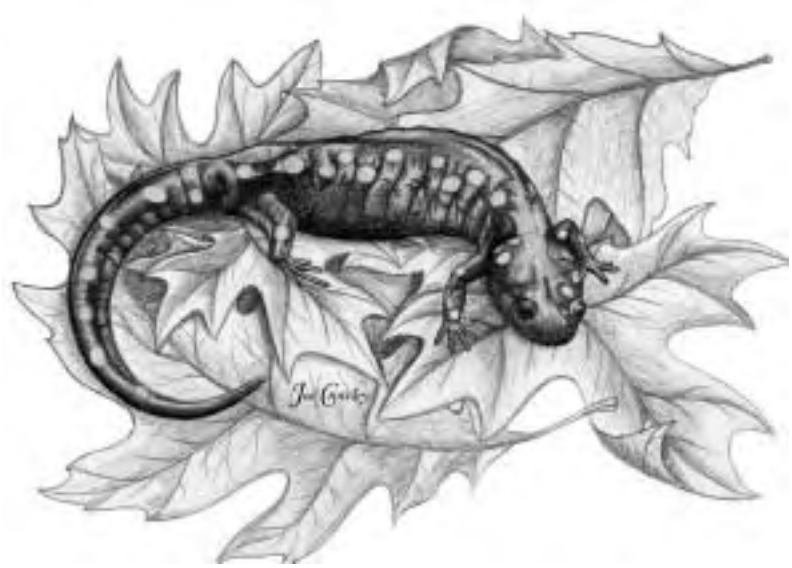
Edmonton is well known for its scenic and extensive river valley, which is over 7,400 hectares, making it the largest urban park in North America. Edmonton is also renowned for the numerous art and music festivals each year and is known as Canada's Festival City.

Perhaps Edmonton is most famous for its claim of having the world's largest shopping and entertainment centre, West Edmonton Mall. In area, the mall covers over 48 hectares and is on two levels with more than 800 stores and services, including the world's largest indoor wave pool, over 100 restaurants, amusement park and NHL sized ice rink!

The North Saskatchewan River, which originates in the Rockies near Saskatchewan River Crossing, flows through Edmonton, and north and east to Hudson Bay. Its existence led to the founding of Fort Edmonton, a fur-trading site, by The Hudson's Bay Company in 1795. The fort has been reconstructed in Edmonton's river valley in Fort Edmonton Park, which is reputed to be Canada's largest living history museum.

Edmonton is usually warm and sunny in summer (with up to 17 hours of daylight in mid-summer), and tends to be several degrees warmer than Calgary and places in or closer to the Rocky Mountains, especially in the evening. Winters in Edmonton are cold and rarely experience the moderating Chinook winds that occur in southwestern Alberta.

Alberta is home to 5 national parks and over sixty provincial parks, which are located in Alberta's six natural regions: boreal forest, Canadian Shield, foothills, mountains, grassland and parkland. These same natural regions are home to 10 species of amphibian and 8 species of reptile, which have adapted to Alberta's moderate and dry climate.



Welcome to CARCNET/RÉCCAR 2004!

Thank you to the people who worked hard to put together this great event:

Primary Organising Committee:

- Bev Horn (University of Manitoba)
- Brian Eaton (Alberta Research Council)
- Bruce Pauli (Canadian Wildlife Service)
- Cindy Paszkowski (University of Alberta)
- Ed Hofman (Alberta Fish and Wildlife)
- Kerrie Serben (Vizon SciTec Inc.)
- Kris Kendell (Alberta Conservation Association)
- Larry Halverson (Parks Canada)
- Lisa Priestley (Beaverhill Bird Observatory)

Silent Auction Donors (current to the time of printing):

- Alberta Conservation Association
- Alberta Research Council (Sustainable Ecosystems)
- Brill Academic Publishers
- Golder Associates Ltd.
- Hole's Greenhouses and Gardens Ltd.
- Indigo Books
- Lone Pine Publishing
- Parks Canada
- Reel Girls Media
- The City of Edmonton Community Services
- The Wildbird General Store
- University of Alberta

Sponsors:

- Alberta Conservation Association
- Alberta Fish and Wildlife Division
- Beaverhill Bird Observatory
- Edmonton Reptile and Amphibian Society
- North American Waterfowl Management Plan

Other thanks:

- Chris Fisher and Tony Russell for the interesting articles about amphibians and reptiles in Alberta
- Christine Bishop for putting together the Herpetile Quiz
- Don McAlpine for producing the award plaques
- Ed Hofman and Lisa Priestley for hosting the field trips
- Edmonton Reptile and Amphibian Society for the live animal display
- Joe Crowley for the use of his beautiful drawings

Welcome to CARCNET/RÉCCAR 2004!

Finding Alberta's Grassland Toads

Great Plains Toad (Photo by Chris Fisher)

The phone rang early one morning in late May. On the other end was Sandi Robertson. Now any call from Sandi, an articulate, attractive, Kangaroo Rat biologist, is one to be treasured. But this one offered an added bonus--she had just found her first Great Plains Toad.

Alberta does not have a particular rich amphibian fauna in comparison to other Canadian provinces--much less tropical regions. Nor are many of the frogs, toads, and salamanders all that easy to locate. In fact, many friends and colleagues that are interested in the natural history of Alberta have seen fewer than half of our 10 species of amphibians. Most Albertans would do well by naming 2 or 3. I have long been interested in seeing and photographing amphibians and in order to do so, I have been recruiting the assistance of biologists who may encounter them in the field.

Great Plains Toads and Plains Spadefoot Toads are Alberta's herpetological Holy Grail. They are found only in scattered localities within the southeastern Grassland ecoregion of the province. This corner of Alberta is very rural, sparsely populated, and characterized by native pastures, deeply cut by large river valleys. This region is also very dry, which is why both these anurans spend upwards of 90% of their adult lives buried in a self-made crypt. Is it therefore near pointless to initiate a search for either toad if there has been little rain. Added to this temporal challenge is one of access. When rains hit the prairies, the back roads turn to gumbo.

Plains Spadefoot Toad (Photo by Chris Fisher)

It is burdened with this knowledge that I eagerly jumped into my truck to begin the 6-hour commute to where Sandi had discovered her Great Plains Toad. Fortunately, her study site has good access along sandy roads, so as evening fell it wasn't long until the calls of both Great Plains and Spadefoot Toads were heard. Both species are well known for their loud voices, and the experience of walking more than 2 km to reach a breeding chorus, left no doubt to the purpose of the volume. With so few breeding wetlands and so little time to take advantage of the temporary puddles, males have to call long distance to ensure that they maximize their breeding opportunities.

Since that late May experience I have yet to find another Great Plains Toad, but have had a number of encounters with Spadefoots. In meeting either amphibian, good fortune and the right circumstances have to fall into play. While they spend little of their adult lives above ground, the time spent is dominated by intense reproductive activities. To be lucky enough to experience it, you need good planning, willing scouts, and an eagerness to jump when the phone rings.

Through his work as a writer and television host, Chris Fisher (www.chrisfisher.ca) strives to share nature with others. He has a particular interest in amphibians and proudly boasts of being pee'd on by every species of toad in Canada.

Welcome to CARCNET/RÉCCAR 2004!

Who Goes There? Amphibians and Reptiles in the Vicinity of Edmonton

For amphibians and reptiles, Alberta, as part of the northern portion of western North America, represents a recent expanding front of occupancy. With the retreat of the last great ice sheets less than 10,000 years ago, most of Alberta (save for the glacial refugium of Cypress Hills) became newly occupiable by amphibians and reptiles, and those species with biological characteristics compatible with existence in the Continental climatic regime of the prairie provinces expanded their ranges northward. As the glaciers continued to recede; geographic and climatic factors combined and resulted in the establishment of four major vegetational zones that we recognize today in Alberta--the prairies to the south, the aspen parkland in a south central band, and in a pair of isolated fragments in the north west, the boreal forest occupying most of the northern two-thirds of the province, and the mountain region to the west. Each of these regions provides particular challenges for the herpetofauna of Alberta, and diversity generally diminishes as more northerly latitudes are approached, or as elevation increases in the mountain region.

Edmonton today stands more or less at the boundary between the south central band of the aspen parkland, and the boreal forest. Both of these vegetational zones contain many bodies of standing water, including large and small lakes, sloughs, and marshes. As such, their herpetofaunal complement is strongly biased towards amphibian representation, and those reptiles that, among other things, exploit amphibians as a dietary resource. Six of the ten species of amphibians known to occur in Alberta are, or once were, found in the vicinity of Edmonton (*Ambystoma tigrinum, Bufo boreas, B. hemiophrys, Pseudacris maculata, Rana sylvatica,* and *R. pipiens*). However, only two of the Province's eight recorded species of reptile occur in the vicinity of Edmonton (*Thamnophis sirtalis* and *T. radix*) (Russell and Bauer 2000).

Wood Frog (Photo by Dan Farr)

For amphibians and reptiles, a key-limiting factor related to occupancy of such regions is the length of winter and the severity of temperature depression. One of the main reasons for the bias in persistence of amphibian versus reptile species in the regions around Edmonton and further north, is that their preferred body temperatures are generally lower, and the range of temperatures over which most physiological maintenance functions can be continued is greater. Reptiles are generally larger and have a lower surface area to volume ratio than amphibians and thus take longer to warm up to their preferred body temperature. Day length and available insolation combine to exclude all but the most cold tolerant of Alberta's reptiles from these more northerly regions (Russell and Bauer 2000).

Despite these limitations, the reptiles that occur this far north can be extremely abundant (as can the amphibians), although human exploitation of the land over the last century and a half has surely had an impact on this. This abundance was responsible for the first recorded mention of reptiles in Alberta, by Aemilius Simpson 178 years ago in 1826 (Bauer and Russell 2001). Simpson was in the employ of the Hudson's Bay Company, which until 1870 controlled the present area of central and southern Alberta. On Monday, September 4th, 1826, Simpson (1826) made the following observation at a point located on the North Saskatchewan river 10 km north of Myrnam, approximately 117 km ENE of Edmonton:

> "Thick fog in the morning, followed by very warm weather during the day. Thermometer at noon 75° [F]… Along the north banks I observed boulders or masses of limestone embedded in clay. During the heat of the day we passed great numbers of a small striped black and green snake swimming from the south to the north bank of the river and strewed along the sandy beach on the north shore, as if enjoying the powerful influence of the sun, and it appeared that those crossing were leaving the cold of the northern aspect to gain the more pleasing heat of the southern exposure."

Welcome to CARCNET/RÉCCAR 2004!

This is almost certainly an observation referring to *Thamnophis sirtalis*, the red-sided garter snake and a true northern specialist. These notes predate the earliest subsequent observations of Alberta reptiles by more than 75 years. The aggregations Simpson observed may have represented a late summer gathering of gravid females comparable to that recorded for this species in the interlake region of Manitoba (Gregory 1975). Alternatively, they may have been a mixed sex grouping exhibiting an autumn pre-denning aggregation. Finally, the observation may merely reflect high local natural densities in areas of high quality habitat, as have been reported for both *T. radix* and *T. sirtalis* (Rossman *et al*. 1996).

Red-sided Garter Snake (Photo by Lisa Priestley)

Such observations made by pioneers long before Alberta was a province, and continued investigations up to the present day, reveal that although the herpetofauna of Alberta is not highly diverse, the range-marginality of almost all of Alberta's species renders them of particular interest in terms of the evolutionary and environmental challenges that they face.

References:

Bauer, AM and AP Russell. 2001. The first record of reptiles in Alberta: Aemilius Simpson's journal of 1826. *Herpetological Review* 32:174-176.

Gregory, PT 1975. Aggregations of gravid snakes in Manitoba. *Copeia* 1975:185-186.

Rossman, DA, NB Ford and RA Seigel. 1996. The Garter Snakes, Evolution and Ecology. University of Oklahoma Press, Norman. xx + 332 pp.

Russell, AP and AM Bauer. 2000. The Amphibians and Reptiles of Alberta. A Field Guide and Primer of Boreal Herpetology. 2nd Ed. University of Calgary Press, Calgary. xii + 279 pp.

Simpson, A. 1926. Journal of a Voyage Across the Continent of North America in 1826. Hudson's Bay Company Archives (Provincial Archives of Manitoba). B.223/a/3. Microfilm No. 1M148.

Anthony P. Russell is a professor in the Department of Biological Sciences at the University of Calgary. His (and Bauer's) field guide to Alberta herpetofauna was my favourite bed-time book all through grad school.

Field Trips

Tyrrell Museum & Reptile World

Hosted by Ed Hofman, Alberta Fish and Wildlife Division

This all-day field trip to Drumheller, Alberta, will provide the participant with two uniquely different and exciting experiences. First, we will visit the Royal Tyrrell Museum of Palaeontology to view numerous galleries and exhibits describing the vast diversity of life on the earth during prehistoric times. This journey through geological time begins several billion years ago, and ends in relatively recent times with the fossil record of only a few thousand years ago. Of particular interest will be the numerous dinosaur exhibits, and skeletal and fossil displays. Opened in 1985, the Museum's mandate is to "collect, conserve, research, display and interpret palaeontological history with special reference to Alberta's fossil heritage". From there we will proceed to Reptile World to view our "living" history of 85 species of reptiles and amphibians. Reptile World has the largest display of reptiles in Western Canada, attracting visitors from all over the world. Of particular interest will be the live displays of indigenous Canadian species such as the Prairie Rattlesnake and Western Hog-nosed Snake, as well as more "exotic" species such as the Gila Monster, American Alligator, Poison Dart Frogs and several species of pythons. This Tour will be of interest to anyone, regardless of experience or expertise.

Welcome to Slytherin!
The Red-sided Garter Snake Hibernaculum

Hosted by Lisa Priestley, Beaverhill Bird Observatory

Join Lisa Priestley of the Beaverhill Bird Observatory for a field trip to a Red-sided Garter Snake hibernaculum. This journey will take us about 40 minutes east of Edmonton to the Glory Hills, appropriately named for the high concentrations of Red-sided Garter Snakes. We will be viewing one of the largest known garter snake dens in Alberta (over 9000 snakes based on captures). It is located in a gravel pit area and is being protected by the landowner. Each spring, over 1000 people visit the site to watch the snakes as they move out from the den to breed and then disperse. From 1998-2001, Lisa coordinated a relocation study of the garter snakes through the Alberta Conservation Association. We will be visiting the den that the snakes were taken from, and the den that the snakes were relocated to. A presentation on the largely volunteer-based study will talk about the methods used for this relocation study. Please bring good walking shoes, a sweater or jacket, and pants. Cameras and video recorders are welcome. A snack and drink will be provided. This trip is weather dependent, so if it is raining or too cold, then we will be travelling to the Provincial Museum of Alberta, one of Canada's most popular museums. Exhibits at the Provincial Museum include: the Syncrude Gallery of Aboriginal Culture, Natural History Galleries (Bug Room, Treasures of the Earth, Bird Gallery, Dinosaurs), and the new Wild Alberta Display. Wild Alberta is a new museum experience leading visitors on a journey of discovery across, over, and even under, Alberta's diverse landscapes.

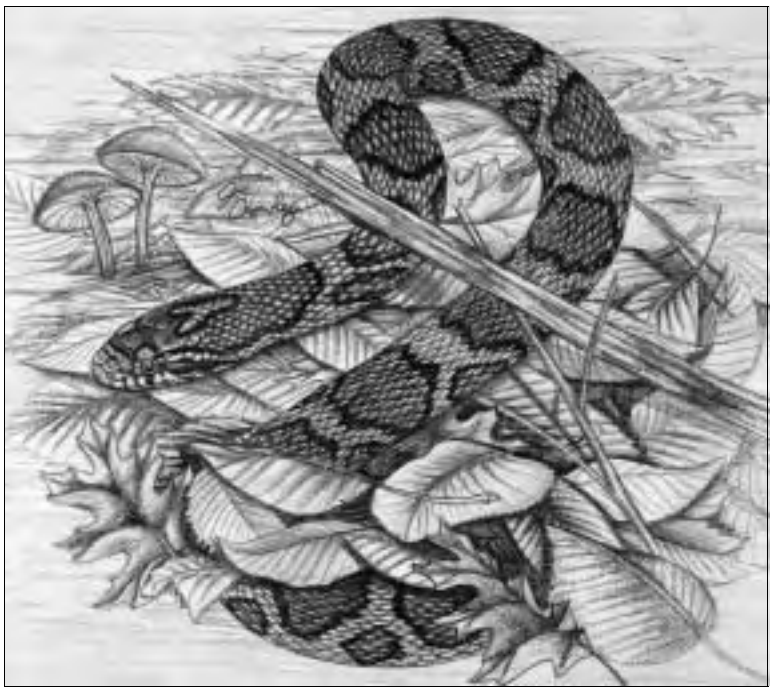
Conference Schedule

Friday, 24 September 2004

4:00 pm – 7:00 pm CARCNET/RÉCCAR Board of Directors Annual General Meeting (Terrace 2 Room)

7:00 pm – 10:00 pm Registration/Mixer (Edmonds Room)

- Finger food and non-alcoholic beverages provided
- Cash Bar



Conference Schedule

Saturday, 25 September 2004

8:00 am – 8:30 am	Information/Registration (Ballroom B)
8:30 am – 9:00 am	Introductory Remarks/Welcome to Edmonton
9:00 am – 10:00 am	Keynote Speaker – Dr. Dianne Draper
10:00 am – 10:45 pm	Poster Session/Coffee Break (45 min)
10:45 am – 11:00 am	Thermal ecology of wood turtles (*Glyptemys insculpta*) in southern Quebec, preliminary results of a two years study *Yohann Dubois*
11:00 am – 11:15 am	The benefits of better condition: Reproductive output in a vivaparous snake, *Thamnophis sirtalis* *Patrick Gregory*
11:15 am – 11:30 am	Inter and intra-population variation in snapping turtle development rate *Sarah Holt*
11:30 am – 11:45 am	Characterizing the thermal ecology of the sharptail snake, *Contia tenuis* in British Columbia *L.A. Isaac*
11:45 am – 12:00 pm	Northern prairie skinks in Manitoba: Where are they? *Jacey Scott*, David Walker, Richard Bayduck, and James Duncan*
12:00 pm – 1:30 pm	Lunch (90 min)
1:30 pm – 1:45 pm	Recovery efforts are underway for northern leopard frogs (*Rana pipiens*) in British Columbia and Alberta *Doug Adama* and Kris Kendell*
1:45 pm – 2:00 pm	Efforts to re-establish northern leopard frogs on the Flathead Indian Reservation *Janene Lichtenberg*, J. Kirwin Werner, and Art Soukkala*
2:00 pm – 2:15 pm	Removal of introduced American bullfrogs (*Rana catesbeiana*): An alarming threat to amphibian species at risk in the south Okanagan *Sara Ashpole*, David Cunnington, and Brian Purvis*
2:15 pm – 2:30 pm	Effectiveness of Canada's reserve system for conserving amphibian and reptile diversity *Stephen Hecnar and Darlene Hecnar*
2:30 pm – 2:45 pm	Population declines of freshwater turtles in Point Pelee National Park *Constance Browne* and Stephen Hecnar*

Conference Schedule

Saturday, 25 September 2004 - continued

2:45 pm – 3:00 pm	Conservation of amphibians and reptiles at risk on federal land in the south Okanagan *David Cunnington*, Ron Hall, Stephen Hureau, Betty Reballato, and Mike Sarell*
3:00 pm – 3:45 pm	Poster Session/Coffee Break (45 min)
3:45 pm – 4:00 pm	Effects of forest harvesting and food limitation on body condition of juvenile northwestern salamanders (*Ambystoma gracile*) *A.J. Hilton* and John Richardson*
4:00 pm – 4:15 pm	The effects of variable buffer width on the abundance, distribution, and survivorship of amphibians in coastal Douglas-fir forests *Virgil Hawkes*
4:15 pm – 4:30 pm	Beaver ponds as habitat for a boreal anuran: The older the better *Cameron Stevens* and Cindy Paszkowski*
4:30 pm – 4:45 pm	Evidence of physical disturbance of anuran egg masses by introduced common carp (*Cyprinus carpio*) at Delta Marsh, Manitoba *Katarzyna Dyszy*, Dale Wrubleski, and John Spence*
4:45 pm – 5:00 pm	The influence of northern pike on wood frog tadpole populations in boreal Alberta *Kirsten Norris* and Cindy Paszkowski*
6:30 pm – 10:30 pm	Banquet (Ballroom B) - Special Guest Speaker – Cleve Wershler - Silver Salamander and Blue Racer Awards - Herpetile Quiz – Christine Bishop

Conference Schedule

Sunday, 26 September 2004

8:30 am – 9:00 am	Information/Registration (Ballroom B)
9:00 am – 10:00 am	Keynote Speaker – Dr. Michael W. Caldwell
10:00 am – 10:45 pm	Poster Session/Coffee Break (45 min)
10:45 am – 11:00 am	Pesticide exposure and reproductive effects in two species of native amphibians using agricultural habitat, south Okanagan, British Columbia *Sara Ashpole*, Christine Bishop, John Elliot, and Laurie Wilson*
11:00 am – 11:15 am	Is malathion insecticide toxic to amphibians? *Bruce Pauli*, N. Gallant, and M. Charbonneau*
11:15 am – 11:30 am	Effects of road salt (NaCl) on the development and growth of wood frogs, *Rana sylvatica* *Domenico Sanzo*, Stephen Hecnar, and Stephanie Baker*
11:30 am – 11:45 am	Factors affecting amphibian species richness in Pictou County, Nova Scotia *Krista Chaisson* and Ronald Russell*
11:45 am – 12:00 pm	Large-scale differences in disease susceptibility among populations of tiger salamanders in Saskatchewan and Manitoba *Danna Schock*, Trent Bollinger, and James Collins*
12:00 pm – 1:30 pm	Lunch (90 min)
1:30 pm – 1:45 pm	Monitoring Metal Uptake in Amphibians and Macroinvertebrates near an Abandoned Mine Site *Elke Wind* and Trudy Chatwin*
1:45 pm – 2:00 pm	Short-range translocation of the northern pacific rattlesnake (*Crotalus oreganus*): Preliminary observations and results *Jeff Brown*, Christine Bishop, and Brenda Baptiste*
2:00 pm – 2:15 pm	The unique overwintering method of the northern cricket frog, *Acris crepitans*, and its potential link to the species' decline *Jason T. Irwin*
2:15 pm – 2:30 pm	Habitat use by the western toad (*Bufo boreas*) in Alberta: Results from surveys and radio-tracking *Constance Browne*, Carol Browne, and Cindy Paszkowski*
2:30 pm – 2:45 pm	An update on Suncor's amphibian reclamation monitoring in northeastern Alberta *Nicole McDonald*, C. De La Mare, S. Attaway, and L. Paquin*

Conference Schedule

Sunday, 26 September 2004 - continued

2:45 pm – 3:00 pm	Assessing habitat selection of a small anuran without telemetry and the ecological sensitivity of *Pseudacris triseriata* *A. Whiting* and David M. Green*
3:00 pm – 3:15 pm	Spring movements by leopard frogs (*Rana pipiens*) in the Kemptville area, eastern Ontario, 2004 *Frederick Schueler*
3:15 pm – 4:00 pm	Poster Session/Coffee Break (45 min) - Group Photo Session (in the hotel atrium)
4:00 pm – 4:15 pm	Scholarship and Student Award Presentations
4:15 pm – 4:30 pm	Annual Open Business Meeting of CARCNET/RÉCCAR
4:30 pm – 4:45 pm	Closing Ceremony and Silent Auction Winners

Conference Schedule

Monday, 27 September 2004

Field Trip Tyrrell Museum/Reptile World

8:15 am	Depart Edmonton (Coast Terrace Inn)
8:15 am – 11:30 am	Travel (to Tyrrell Museum)
11:30 am – 12:15 pm	Lunch at the Tyrrell Museum (45 min)
12:15 pm – 3:30 pm	Tyrrell Museum
3:30 pm – 4:00 pm	Travel (to Reptile World)
4:00 pm – 5:30 pm	Reptile World
5:30 pm – 7:00 pm	Travel/Dinner (in Stettler or Crossfield)
7:00 pm – 9:00 pm	Travel (to Edmonton)
9:00 pm	Arrive in Edmonton (Coast Terrace Inn)

Field Trip Garter Snake Den

12:30 pm	Depart Edmonton (Coast Terrace Inn)
12:30 pm – 1:45 pm	Travel (to Old Snake Den)
1:45 pm – 2:15 pm	Old Snake Den
2:15 pm – 2:30 pm	Travel (Gravel Pit Den Site)
2:30 pm – 4:00 pm	Gravel Pit Den Site
4:00 pm – 5:00 pm	Travel (to Edmonton)
5:00 pm	Arrive in Edmonton (Coast Terrace Inn)

Field Trip Garter Snake Den <u>Plan B</u> – Provincial Museum of Alberta*

12:30 pm	Depart Coast Terrace Inn
12:30 pm – 1:00 pm	Travel (to Provincial Museum)
1:00 pm – 4:00 pm	Provincial Museum
4:00 pm – 4:30 pm	Travel (to Coast Terrace Inn)
4:30 pm	Arrive at Coast Terrace Inn

* In event of inclement weather that would preclude snake activity

Abstracts for Keynote Speakers

Saturday Morning

DRAPER

CLIMATE CHANGE AND OUR ENVIRONMENT: AN OVERVIEW

Dr. Dianne Draper

Professor and Department Head of Geography, University of Calgary, 2500 University Drive NW, Calgary, Alberta, Canada, T2N 1N4, draper@ucalgary.ca

Climate change is one of the most significant challenges the world has ever faced. Since climate is the major factor influencing Earth's biodiversity, climate change is a key threat to continued effective functioning of the biosphere. In Canada, we already are seeing the effects of climate change on our environment, human health, and economy.

During the past century, several processes external to Earth's climate system are believed to have influenced trends in climate change; these processes include changes in solar intensity, changes in concentrations of stratospheric aerosols, increases in concentrations of both greenhouse gases and tropospheric aerosols, and thinning of the ozone layer. Each of these processes of change (called climate forcings) has a unique effect, in time and space, on Earth's climate system. In turn, climate changes may (indirectly) be the cause of changes in the seasonal timing of plant and animal activity, and may be implicated in the declines of sensitive species such as some amphibians. Although we still have a lot to learn about the various influences on climate and climate change, and about how herpetiles potentially may be affected by climate change, this paper provides an overview of Earth's natural climate system, recent causes and effects of climate change (particularly the predicted effects of enhanced greenhouse gases, the thinning of the ozone layer), and other atmospheric changes associated with El Niño and the Southern Oscillation and the Pacific Decadal Oscillation. Efforts are made throughout the paper to highlight the trends and potential effects of climate change in Canada.

Abstracts for Keynote Speakers

Saturday Evening

WERSHLER

WAITING FOR THE RAINS

Cleve Wershler, P.Biol.

Wildlife Biologist and Environmental Biologist, Sweetgrass Consultants Ltd., 15112 Deer Run Drive SE, Calgary, Alberta, Canada, T2J 5M8, sweetgrass@shaw.ca

A tour through Alberta's natural regions reveals a total of 19 species of amphibians and reptiles occurring in a diversity of environments including Canadian Shield, Boreal Forest, Foothills, Rocky Mountains, Parkland and Grassland. The richest herpetofauna is found in the Dry Mixedgrass Sub-region where 14 species, of 9 families, have been recorded. While this area has the mildest temperatures in the province, it also experiences the most frequent and severe periods of drought. Marked fluctuations from dust to deluge are the rule rather than the exception—phenomena often mirrored in ecosystem productivity. The various adaptations of wildlife species, including amphibians and reptiles, to these uncertain habitat conditions are not well documented. While most dramatic in the dry southeast, significant fluctuations in environmental conditions can also be observed in other regions of the province. The term "average" can be misleading and inappropriate when applied to weather data, habitat quality, and population dynamics. This ecosystem variability contradicts the philosophy of some conservation groups, wildlife biologists, and landowners whose goals encompass stabilization/improvement of wildlife populations and habitats. It is critical to understand and value natural ecosystem dynamics for future amphibian and reptile conservation strategies. This is complicated by habitat loss and fragamentation.

Abstracts for Keynote Speakers

Sunday Morning

CALDWELL

THE AGE OF MOSASAURS: WHEN GIANT LIZARDS RULED THE SEAS

Dr. Michael Caldwell

Associate Professor of the Department of Earth and Atmospheric Sciences and Department of Biological Sciences, Curator of Higher Vertebrates, University of Albert,a Laboratory for Vertebrate Palaeontology, Z 424 Biological Sciences Building, 11145 Saskatchewan Drive, University of Alberta, Edmonton, Alberta, Canada, T6G 2E9, mw.caldwell@ualberta.ca

To a casual observer, wandering along the southern beaches of ancient Europe, some 100 million years ago, the oceans would have looked just like they do today – reefs would have broken the surf, the water would have been clear and blue, the beaches pale and white, and the air warm and humid. However, just below the crests of those waves there lived an alien world – but one of many preludes of our modern world. Reefs were made of giant clams, the fish were odd and primitive, and there were not yet any marine mammals. Instead, giant lizards, what today we call mosasaurs, armed with fearsome teeth and paddle-like limbs, ruled the seaways of the world. They shared this watery realm with the unusually long-necked plesiosaurs, the last of an ancient lineage of reptiles that evolved long before the ancestors of mosasaurs. In the air were pterosaurs, an ancient lineage of flying reptiles; flying alongside them were birds – with teeth. On the land there were dinosaurs and a number of small, but important, mammals. Many of these groups would go extinct some 35 million years later, but at this point in earth's history, they were just beginning to radiate, adapt, and evolve. The earliest fossils of mosasaurs are approximately 92 million years old; aquatic lizards thought to be the closest relative to mosasaurs are about 98 million years old. Somewhere in this 8 million year parcel of time is the key to unlocking the mystery of the mosasaurs, the 50 foot rulers of the Mesozoic seas, that survived until the very end of the Cretaceous, 65 million years ago. The journey of exploration will take us from the Netherlands to New Zealand, to the prairies of Southern Alberta and the windswept coastlines of Antarctica; here we will find the bones of these ancient monsters and their tiny forebearers, here we find the data we use to retell the story of their ancient world.

List of Posters

Viewing of the posters will take place outside Ballroom B in the hallway/open area

Researching Amphibian Numbers in Alberta (RANA): an update on the provincial monitoring program
Gavin Berg and Lisa Wilkinson

An overview of the Alberta Biodiversity Monitoring Program and its potential to generate data on amphibian occurrence across Alberta
Brian R. Eaton

The distribution and abundance of amphibians across land-use types in Alberta's Aspen Parkland
Sara E. Eaves, C. Paszkowski, and Ross Chapman

Alberta Amphibian Monitoring Program
Kris Kendell

Effects of introduced fish on Long-toed Salamanders (*Ambystoma macrodactylum*) in southwest Alberta
Kimberly Pearson and Cameron Goater

Amphibian ranaviruses from Saskatchewan cause morbidity and mortality in multiple amphibian species
Danna M Schock, V. Gregory Chinchar, Trent K. Bollinger, and James P. Collins

Fluctuating asymmetry in wood frog metamorphs exposed to lindane as tadpoles in an outdoor microcosm study
Kerrie C. Serben and D. J. Forsyth

Conservation of long-toed salamanders (*Ambystoma macrodactylum*) in the Alberta foothills
Lisa Wilkinson

Author Index

Author Index

ADAMA

RECOVERY EFFORTS ARE UNDERWAY FOR NORTHERN LEOPARD FROGS (*RANA PIPIENS*) IN BRITISH COLUMBIA AND ALBERTA

Doug Adama[1]* and Kris Kendell[2]

[1]Adama Wildlife and the Columbia Basin Fish and Wildlife Compensation Program, Box 158, Golden, British Columbia, Canada, V0A 1H0, adama@rockies.net
[2]Alberta Conservation Association, 7th Floor, O.S. Longman Building, 6909-116 Street, Edmonton, Alberta, Canada, T6H 4P2, kris.kendell@gov.ab.ca

One method of recovery employed in both Provinces entails the rearing of *R. pipiens* eggs and larvae to metamorphoses and reintroducing the newly metamorphosed frogs into historical habitat. While the rearing of amphibians is hardly a recent endeavor, rearing amphibians for conservation is. In Alberta, *R. pipiens* are reared in semi-natural outdoor ponds at the Raven Brood Trout Station. A natural diet of algae and other wetland vegetation is available as food for the larva. Drawing down the water over winter controls predatory aquatic insects. Tadpoles are reared at extremely low densities; 0.005 and 0.020 tadpoles per litre. Survival to metamorphosis is between 14 to 33 %. Average size at metamorphosis is consistent with wild populations in (33 to 40 mm) as is time to metamorphosis (75 to 90 days). In British Columbia, *R. pipiens* are reared in artificial ponds located outside and exposed to ambient light and temperature. Mixed vegetables and bloodworm are provided to supplement a diet of natural vegetation. Screening the tanks with mosquito netting and thoroughly cleaning the aquatic vegetation controls predation. Tadpoles are reared at densities between 0.06 and 0.25 tadpoles per liter. Survival to metamorphosis is between 75 to 94%. Average size at metamorphosis is between 26 and 31 mm and time to metamorphosis is 68 to 134 days. While we recognize that amphibian head starting is both challenging and controversial, we discuss the advantages and disadvantages of the two approaches with respect to survival to metamorphosis, size at metamorphosis, and cost effectiveness, in an effort to improve reintroduction success.

ASHPOLE 1

PESTICIDE EXPOSURE AND REPRODUCTIVE EFFECTS IN TWO SPECIES OF NATIVE AMPHIBIANS USING AGRICULTURAL HABITAT, SOUTH OKANAGAN, BRITISH COLUMBIA

Sara L. Ashpole*, Christine A. Bishop, John Elliott, and Laurie Wilson

Canadian Wildlife Service, 5421 Robertson Rd., Delta, British Columbia, Canada, V4K 3N2,
sashpole@uoguelph.ca, CAB.Bishop@ec.gc.ca, jelliott@ec.gc.ca, lwilson@ec.gc.ca

The Okanagan valley in British Columbia is an intensive agricultural area where 80% of the natural wetlands and riparian zones have been developed. Due to the presence of many rare species and the high potential for multiple exposure effects to pesticides and the lack of natural habitat, it is necessary to assess the risk of amphibian populations to the impact of pesticides. In 2003/2004 forty ponds, including 14 conventional and 9 organic agricultural ponds, were surveyed to determine breeding adult and larval productivity and relative population densities. Historic PCB and organochlorine contaminant levels were measured in sediment samples from eleven ponds. All samples had non-detectable PCB levels and with the exception of DDT and its metabolites, relatively low to non-detectable organochlorine pesticides. Sediment concentrations of DDT (0.24 - 47 ng/g d.w. (dry weight)), DDE (2.52 – 1938.9 ng/g d.w.), and DDD (5.26-1334.4 ng/g d.w.) had the highest levels detected. In 2004, early amphibian stages of development were investigated using two COSEWIC listed species; the Great Basin Spadefoot (*Spea intermontana)* and the Western Toad (*Bufo boreas*). Enclosures with eggs were placed in either conventional orchards (N=2) and exposed to realistic pesticide applications, or in organic orchards (N=3). Current use pesticides include azinphos-methyl, carbaryl, diazinon, endosulfan, and pirimicarb. Water samples for pesticides were conducted at standard times and after known spray events. Hatching success, tadpole survival to two days-post hatch, and developmental abnormalities were recorded. Substantial mortality was observed in both species at one of our conventional sites (92% and 100%) whereas, mortality was very low at one of our organic sites (3% and 4%). Mortality among our remaining sites ranged between 15% and 38%. A third year of inventories and reproductive studies examining amphibian development and a risk assessment of agricultural ponds will be conducted in 2005.

ASHPOLE 2

REMOVAL OF INTRODUCED AMERICAN BULLFROGS (*RANA CATESBEIANA*): AN ALARMING THREAT TO AMPHIBIAN SPECIES AT RISK IN THE SOUTH OKANAGAN

Sara L. Ashpole[1]*, Dave C. Cunnington[1], Brian Purvis[2]

[1]Canadian Wildlife Service, 5421 Robertson Rd., Delta, British Columbia, Canada, V4K 3N2, sashpole@uoguelph.ca, David.Cunnington@ec.gc.ca
[2]1446 River Street, Kamloops, British Columbia, Canada, V2C 1Y9, Canada, bpurvis@telus.net

In 2003, bullfrogs were observed at two permanent and one temporary irrigation ponds in the South Okanagan. It is believed that these frogs are a remnant population originating from the food industry in the 1950s. The proximity of these ponds to each other is less than a few hundred meters, with the closest pond only 300m from Lake Osoyoos and the Okanagan River system. To identify the potential threat of bullfrogs to native amphibians, and learn more about the current isolated populations, a pilot project was implement in 2004. Bullfrogs were only observed at the two permanent ponds identified the previous year. Adults were observed at one of the ponds, whereas all life stages were observed at the other. The total number of individuals removed and their life stage included: 22 adults (17 males and 5 females); 7 juveniles; 9265 tadpoles; and 16 egg masses. Bullfrogs were not detected at any additional ponds in the South Okanagan. However, anecdotal accounts and a possible recent acoustic observation at Lake Osoyoos raises great concern that this species may have a much wider local distribution than currently observed.

BERG

RESEARCHING AMPHIBIAN NUMBERS IN ALBERTA (RANA): AN UPDATE ON THE PROVINCIAL MONITORING PROGRAM

Berg, Gavin[1]*, and Lisa Wilkinson[2]

[1] Alberta Conservation Association
[2] Alberta Fish and Wildlife Division, Provincial Bldg., #203, 111-54th Street, Edson, Alberta, Canada, T7E 1T2, lisa.wilkinson@gov.ab.ca

The Researching Amphibian Numbers in Alberta (RANA) continued into its eighth year of monitoring in 2004. The RANA program was initiated in 1997 in response to the global decline of amphibian populations. RANA has two primary objectives: 1) collect long-term data on amphibian populations in Alberta, and 2) provide public education on the importance of amphibians and wetland conservation. Two monitoring sites were initiated in 1997, and since that time, an additional five monitoring sites have been established, although not all sites have been operated every year. Monitoring sites represent the boreal, foothills, Rocky Mountains, aspen parkland, and montane ecoregions. Monitoring consists of pitfall trapping and surveying ponds for signs of amphibian breeding activity. Of the nine species of amphibians found in Alberta, all but two (grassland species) have been observed in the RANA program. Notably, only one Canadian toad has been observed. An evaluation of monitoring results, including population trends and distribution, will be presented. The RANA program has also made a significant contribution to public education, reaching over 6000 people in 2003.

BROWN

SHORT-RANGE TRANSLOCATIONS OF THE NORTHERN PACIFIC RATTLESNAKE (*CROTALUS OREGANUS*): PRELIMINARY OBSERVATIONS AND RESULTS

Jeff Brown[1]*, Christine A. Bishop[2], and Brenda Baptiste[1]

[1]NK'MIP Desert and Heritage Centre, 1000 Rancher Creek Rd, Osoyoos, British Columbia, Canada, V0H 1V6
jbrown05@uoguelph.ca
[2]Canadian Wildlife Service, 5421 Robertson Road, Delta, British Columbia, Canada, V4K 3N2

Growth and development in the southern Okanagan valley of British Columbia has lead to an increasing number of snake-human interactions as we continue to encroach on previously undisturbed habitat. With this increasing level of interaction there is a growing need to develop better management tools to ensure the long-term survival of threatened species such as the northern pacific rattlesnake. Short-range translocations (e.g. movements within the normal home range of the animal) of "problem" rattlesnakes is a common management practice in the southern Okanagan valley and is currently recommended by several wildlife agencies including the British Columbia ministry of Water Air and Land Protection and Parks Canada. However, little research has been done to evaluate the effects and success rates of these short-range translocations. Our objectives are to evaluate the effects of short-range translocation on the northern pacific rattlesnake and determine if it is a viable management strategy through the use of radio-telemetry. Between May and July of 2004 we surgically implanted 20 rattlesnakes with radio-transmitters. Snakes were located every second day where UTM coordinates, habitat, behavioural and thermal data was recorded. The sample was divided into a natural group and a translocated group. Transmittered rattlesnakes that moved into an area of human activity were placed in the translocated group and moved 500m or 1000m from their point of capture. All snakes in the natural group did not enter an area where a significant risk of human interaction was present. In July 2004, 14 rattlesnakes were in the translocated sample with 7 translocations at a distance 500m and 7 at a distance of 1000m. The remaining 6 transmittered snakes remained in the natural group. Of the 14 translocated rattlesnakes 10 (66.6%) have been moved from an area of human activity on multiple occasions. These preliminary results suggest the northern pacific rattlesnake is well aware of its immediate surroundings and is able to navigate effectively to preferred habitat within its normal home range regardless of human activity and translocation. However, more data from the 2004 field season is required before an in-depth analysis of these results can be performed.

BROWNE 1

POPULATION DECLINES OF FRESHWATER TURTLES IN POINT PELEE NATIONAL PARK

Constance L. Browne* and Stephen J. Hecnar

Department of Biology, Lakehead University, Thunder Bay, Ontario, Canada, cbrowne@ualberta.ca, Stephen.Hecnar@lakeheadu.ca

Turtles are of conservation concern worldwide and in Canada 8 of 10 freshwater turtles are considered to be at risk by COSEWIC. We examined the status of turtle populations in Point Pelee National Park in 2001/2002. Point Pelee is located in southwestern Ontario and historically has been the location of greatest turtle diversity in Canada. Recently, park staff have been concerned of turtle population declines. Our objectives were to examine the status of turtle populations and the effects of nest predation and road mortality. We used mark-recapture/trapping and intensive visual surveys to estimate population sizes and structure. Captured turtles were marked, measured, sexed, and released. We examined age structure by using carapace length as an indicator of age and compared data from 1971/1972 to 2001/2002. We examined the effects of nest predation and road mortality using population models with Ramas Ecolab. Nest predation rates were estimated by locating turtle nests and monitoring them daily to determine what percent became predated. Average annual road mortality rates were estimated using 18 years of road mortality data. We captured a total of 1599 turtles of 5 species. Blanding's (*Emydoidea blandingii*) and snapping (*Chelydra serpentina*) turtles have experienced a clear shift towards larger size classes since 1972, which suggests juvenile recruitment into these populations is limited. Predation rates on nests ranged from 62.5% to 100% among areas. Road mortality models suggested that road mortality alone could cause population declines in Blanding's turtles but not likely in snapping and painted (*Chrysemys picta*) populations. However, high nest predation levels are a much more serious risk to these populations. Nest predation of 70% predicted serious declines in Blanding's populations but not snapping and painted populations. However, predation rates of 90% cannot be sustained by any species.

BROWNE 2

HABITAT USE BY THE WESTERN TOAD (*BUFO BOREAS*) IN ALBERTA: RESULTS FROM SURVEYS AND RADIO-TRACKING

Constance L. Browne*, Carol Browne, and Cindy Paszkowski

Department of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada, cbrowne@ualberta.ca, cindy.paszkowski@ualberta.ca

The western toad is the only amphibian species in Canada that has been red-listed by IUCN as endangered. It has been assigned this status based on dramatic declines in the USA, which have resulted in a 50% population reduction in the past 10 years. Despite population declines elsewhere, western toads are still widespread in Alberta, however, habitat features required by this species are currently not known. Visual surveys of 232 ponds at Elk Island National Park, Alberta in 2003 indicated that the western toad has a scattered distribution in the park. It was only found at 17% of ponds whereas the wood frog (*Rana sylvatica*) and chorus frog (*Pseudacris maculata*) were found at 98% and 86% of ponds, respectively. The objective of our current research is to identify key habitat features required by western toad during all life phases (reproduction, terrestrial foraging, hibernation). In 2004 we are comparing habitat characteristics between western toad breeding-ponds and reference ponds where toads are absent. Western toads were captured for radio-tracking at undisturbed sites in Elk Island National Park and an adjacent grazing reserve. We are examining terrestrial habitat use of these toads by comparing micro-habitat characteristics of locations used by radio-tracked toads to random points on the landscape. A central objective of our research is to determine essential habitat features that must be left intact or restored following development to conserve populations of western toads in Alberta.

CHAISSON

FACTORS AFFECTING AMPHIBIAN SPECIES RICHNESS IN PICTOU COUNTY, NOVA SCOTIA

Krista G. Chaisson* and Ronald W. Russell

Department of Biology, Saint Mary's University, 923 Robie Street, Halifax, Nova Scotia, Canada, B3H 3C3, kristacha@hotmail.com, ron.russell@SMU.CA

Previous studies have suggested that human disturbance affects amphibian species richness and distribution. We surveyed 22 ponds in north-eastern Nova Scotia to compile amphibian species lists. We investigated the role of salt incursion, proximity to human disturbance and other biological, physical and chemical factors on amphibian species richness. Each pond was sampled at least weekly by visual surveys and nightly auditory surveys from May through September of 2003. Of the 13 amphibian species native to Nova Scotia, 9 were found at these sites. A comprehensive list of biological, chemical and physical variables were measured and compared to amphibian species richness. The results of a step wise regression analysis indicate that pond salinity and proximity to salted highways are major factors influencing amphibian species richness and distribution.

CUNNINGTON D

CONSERVATION OF AMPHIBIANS AND REPTILES AT RISK ON FEDERAL LAND IN THE SOUTH OKANAGAN

David Cunnington[1]*, Ron Hall[2], Stephen Hureau[1], Betty Reballato[3], and Mike Sarell[4]

[1]Canadian Wildlife Service, 5421 Robertson Rd, Delta, British Columbia, Canada, V4K 3N2, David.Cunnington@ec.gc.ca
[2]Osoyoos Indian Band, RR#3, S25, C1, Oliver, British Columbia, Canada, V0H 1T0, rhall@oib.ca
[3]British Columbia Conservation Foundation, 206-17564 56A Ave, Surrey, British Columbia, Canada, V3S 1G3, b_rebellato@hotmail.com
[4]Ophiuchus Consulting, RR#2, S53A, C4, Oliver, British Columbia, Canada, V0H 1T0, (ophiucon@vip.net).

Federal lands in the South Okanagan provide important habitat to 5 species of amphibians and reptiles that are currently listed as at risk: the Western Rattlesnake (threatened), Night Snake (endangered), Great Basin Gopher Snake (threatened), Tiger Salamander (Southern Mountain population: endangered), and Great Basin Spadefoot (threatened). In 2003 a project was initiated to inventory these species on the Osoyoos Indian Reserve and the Vaseux National Wildlife Area. These properties contain some of the best habitat for these species in the South Okanagan, including numerous snake hibernacula, talus slope habitat, and fish-free amphibian breeding ponds. The inventory project was continued in 2004, and attempts to restore habitat and mitigate habitat loss were initiated.

The 2003 field season was hampered by extremely dry conditions and the disastrous forest fires that resulted. This was not a concern in 2004, and the study produced some interesting new results. In 2004 we were able to survey hibernacula adjacent to and inside areas burnt in 2003, and confirmed that these sites were still used by Western Rattlesnakes. Hibernacula and rock-flipping surveys produced new observations of Night Snakes, increasing the total number of Canadian observations by over 10% for the second year running. In 2004 we were also able to survey a number of wetlands that were dry in 2003, resulting in new detections of Great Basin Spadefoot tadpoles. Some of these sites were ditches and garden ponds, indicating this species responds well to creation of new breeding habitat. Unfortunately, Bullfrogs were detected at Osoyoos Lake, an area they had been suspected of colonizing. A small-scale search effort was also conducted for Pigmy Short-horned Lizards on the Osoyoos Indian Reserve. This species is listed as extirpated under COSEWIC, and no sightings have been confirmed since 1898. Unfortunately, no Pigmy Short-horned Lizards were found.

DUBOIS

THERMAL ECOLOGY OF WOOD TURTLES (*GLYPTEMYS INSCULPTA*) IN SOUTHERN QUEBEC, PRELIMINARY RESULTS OF A TWO YEARS STUDY

Yohann Dubois

Université de Sherbrooke, Département de Biologie, Université de Sherbrooke, Sherbrooke, Quebec, Canada, J1K 2R1, Yohann.Dubois@USherbrooke.ca

Almost all reptiles studied yet have a range of set temperatures (Tset) where the ratio between energy assimilation and expenditure is optimized, therefore maximizing the growth rate and reproduction output. Then, behavioral thermoregulation activities, such as basking and habitat selection, aim to bring the body temperature (Tb) near the Tset. First of all, we established the Tset by putting turtles (8 males and 8 juveniles) three times in a laboratory thermal gradient (16 to 37°C), each time during a 24-hour period (16h acclimatization and 8h Tb recording). Secondly, we recorded daily Tb (40 days, 30 minutes interval) of 21 free ranging wood turtles (7 males, 7 juveniles and 7 females) in 2004, and 14 turtles (7 males and 7 females) in 2003 by surgically introducing a temperature recording device (iButton, thermochron) in the backwards leg cavity. Daily Tb patterns have been compared to daily temperature patterns of 25 physical models randomly laid out in 8 habitat types available for turtles to demonstrate the active behavioral thermoregulation, and then test the hypothesis that wood turtles select their habitat according to temperature. We also tested the hypothesis that juveniles and females thermoregulate more precisely to maximize the growth rate and reproduction output, by comparing Tb patterns of males, females and juveniles.

DYSZY

EVIDENCE OF PHYSICAL DISTURBANCE OF ANURAN EGG MASSES BY INTRODUCED COMMON CARP (*CYPRINUS CARPIO*) AT DELTA MARSH, MANITOBA.

Katarzyna A. Dyszy[1]*, Dale A. Wrubleski[2], John R. Spence[1]

[1]Department of Renewable Resources, University of Alberta, Edmonton, Alberta, Canada, kdyszy@ualberta.ca
[2]Institute for Wetland and Waterfowl Research, Ducks Unlimited Canada, Stonewall, Manitoba, Canada

Delta Marsh, located on the south shore of Lake Manitoba, is home to several amphibian species that use the area extensively as breeding and summering grounds. Over the past 40 years however, deterioration of the marsh has been evident, partially owing to the proliferation of introduced common carp (*Cyprinus carpio*). These large benthivorous fish are known to uproot vegetation and increase turbidity during feeding and spawning activity, particularly along the shores of marshes. Such alterations of marsh habitat may have detrimental effects on amphibians at each of their life stages, but information on the effects of carp on amphibians is lacking. Fifteen artificial egg masses were set out along the shore of 3 sites connected to the main marsh (with carp access), 3 sites isolated from the main marsh (no carp access), and 1 site partially isolated from the main marsh via a conduit fence (thereby allowing water exchange and movement of small fish but preventing large fish such as carp from accessing the site). When compared with screened and isolated sites, physical disturbance of artificial egg masses was greater in connected sites, suggesting serious impacts on anuran abundances at the egg stage.

EATON

AN OVERVIEW OF THE ALBERTA BIODIVERSITY MONITORING PROGRAM AND ITS POTENTIAL TO GENERATE DATA ON AMPHIBIAN OCCURRENCE ACROSS ALBERTA.

Eaton, Brian R.

Integrated Resource Management, Alberta Research Council, P. O. Bag 4000, Vegreville, Alberta, Canada, T9C 1T4, brian.eaton@arc.ab.ca

Human development will increase in Alberta in the future, with corresponding increases in anthropogenic impacts on ecosystems within the province. Careful management is required to minimize the impacts of development on biodiversity in Alberta. The Alberta Biodiversity Monitoring Program (ABMP) is a science-based initiative designed to detect broad-scale changes in biodiversity and landscape patterns, allowing proactive management of the province's natural resources. The ABMP uses a set of sampling protocols to sample a variety of biotic and abiotic parameters, including amphibians.

The ABMP monitors both terrestrial and aquatic habitats. Currently, the ABMP is designed to sample approximately 1650 terrestrial sites established on a 20 x 20 km grid across Alberta, on a five-year rotational basis. Aquatic sites (lakes, streams, and wetlands) will be sampled near terrestrial sites. At lakes, amphibians will be sampled using visual surveys around the edge of the water body. Amphibians and reptiles seen during sampling in both terrestrial and aquatic habitats will be noted whenever encountered.

The Alberta Biodiversity Monitoring Program is an ambitious undertaking, one that will generate large amounts of data about the flora and fauna of Alberta. The project has the potential to increase our knowledge of the occurrence of amphibian and reptile species across Alberta, especially for remote areas that have been poorly sampled in the past.

GALBRAITH

REDUCING TURTLE MORTALITY ON ROADS: DO WE KNOW ENOUGH?

David A. Galbraith

Royal Botanical Gardens, P.O. Box 399, Hamilton, Ontario, Canada, L8N 3H8, dr_chelydra@hotmail.com

As urban and economic growth accelerates in many areas of Canada there is increasing concern over the effects of vehicular road traffic on wildlife. Several studies have quantified the effects of road kill on turtle populations, demonstrating that even a few adult females lost per year might be enough to push populations into a serious decline. Furthermore many people are concerned over the effects of traffic collisions on individual turtles from a compassionate perspective. Both of these points of view prompt inquiries to specialists and to organizations like CARCNET from individuals, engineering companies, government officials and others as to what mitigation procedures specialists would recommend. At least seven different tactics have been or are being undertaken in various areas to reduce the damage. These are:

I. Collision Avoidance/Prevention:
- Assisted movement of gravid females across dangerous roads during nesting season
- Culverts and/or fences to redirect all animals away from high risk roads
- Assisted movement of hatchlings across dangerous roads in the fall

II. Collision Harm Reduction:
- Artificial nesting sites to "lure" gravid females to nest somewhere non-dangerous
- Awareness campaigns and signage to prompt drivers to slow down in high turtle density areas

II. Post-Collision Mitigation:
- Rescue of eggs from road-killed mothers
- Rescue and recovery of road-wounded turtles

In this presentation I review the existing literature on reducing the effects of road mortality on individuals and on turtle populations and make recommendations as to how CARCNET can provide effective guidance to the general public on this issue. Some mitigation projects have proven to be highly successful, while others have not worked. Elements of project planning and further necessary empirical study will be considered.

GREGORY

THE BENEFITS OF BETTER CONDITION: REPRODUCTIVE OUTPUT IN A VIVIPAROUS SNAKE, *THAMNOPHIS SIRTALIS*

Patrick T. Gregory

Department of Biology, University of Victoria, PO Box 3020, Victoria, British Columbia, Canada, V8W 3N5, viper@uvic.ca

A central issue in life-history studies is the extent to which organisms are 'capital' vs. 'income' breeders (i.e. using stored resources vs. current food intake). Snakes are primarily capital breeders, but income during vitellogenesis also can contribute to reproductive output. In Manitoba, the garter snake, *Thamnophis sirtalis*, has a short active season, with mating occurring upon emergence from hibernation and vitellogenesis shortly thereafter. Given the brevity of this sequence, these animals should be almost exclusively capital breeders. In this experiment, reproductive output of recently mated snakes was not influenced by food eaten either shortly after mating or later in pregnancy; rather, those resources contributed only to postpartum mass (i.e. these snakes also are mainly lecithotrophic, rather than placentotrophic). Litter mass was influenced by initial mass of the mother, but not by her body condition. However, mother's body condition significantly influenced the likelihood that she would become pregnant. Perhaps most important, among pregnant snakes, those with higher initial body condition gave birth substantially and significantly earlier. Thus, snakes in good body condition may gain further fitness benefits following pregnancy (e.g. more time to acquire resources and for offspring to grow before winter). If so, these life-history variations may be relevant to population dynamics.

HAWKES

THE EFFECTS OF VARIABLE BUFFER WIDTH ON THE ABUNDANCE, DISTRIBUTION, AND SURVIVORSHIP OF AMPHIBIANS IN COASTAL DOUGLAS-FIR FORESTS

Virgil C. Hawkes

University of Victoria, Department of Biology, PO Box 1700 STN CSC, Victoria, British Columbia, Canada, V8W 2Y2, vhawkes@lgl.com

Few studies have evaluated the direct effects of logging on terrestrial and semi-aquatic amphibians, especially over an extended period. Results from previous work suggest no perceptible negative impacts on amphibians except possibly for one study of *Ensatina eschscholtzi*. Most previous studies of the effects of forestry on amphibians have relied strictly on counts (proxy for abundance) and species-richness measures. However, relationships between counts and abundance are rarely demonstrated, making it difficult to calculate how well counts reflect temporal changes in population numbers. Furthermore, a thorough understanding of population dynamics depends not only on knowing abundance, but also requires knowledge of the fundamentals of population processes, such as population size and survivorship, and it is these we need to study to determine whether and how populations are affected. This study provides an opportunity to focus on survivorship of amphibians in relation to habitat mitigations on managed landscapes.

HECNAR

EFFECTIVENESS OF CANADA'S RESERVE SYSTEM FOR CONSERVING AMPHIBIAN AND REPTILE DIVERSITY

Stephen J. Hecnar and Darlene R. Hecnar

Department of Biology, Lakehead University, 955 Oliver Road, Thunder Bay, Ontario, Canada, P7B 5E1, Stephen.Hecnar@lakeheadu.ca

Protecting natural habitats in reserves is the primary method used to conserve biological diversity. Surprisingly, little attention has focussed on the role of protected areas for conserving amphibians and reptiles. Our goal was to provide a preliminary review of habitat protection in Canada and consider its effectiveness for conserving amphibians and reptiles. As of 2004, over 12% of Canada's land area is protected in >4000 sites which are administered primarily at provincial and federal levels. The size of protected areas ranges from <1 to >6 million hectares, but most are small (70 % <1,000 ha, median size = 178 ha). Park size does not differ longitudinally ($r = -0.03$, $p=0.06$) but is significantly larger with increasing latitude ($r = 0.27$, $p<0.001$). The pattern of park size increasing with latitude opposes the trend of species richness for both amphibians and reptiles. Examining species lists for a range of sizes of protected areas in Ontario indicated that the proportion of the regional pool of species increases as park size increases ($F=28.0$, $n=31$, $p<0.001$), but even large reserves rarely contain more than 80% of the regional species pool. The amount of area protected varies among herpetofaunal provinces of Canada from 6% (Eastern Boreal) to 19% (Pacific Coast). The proportion of a region that is protected was not correlated with either amphibian ($r = -0.57$, $n=8$, $p=0.14$) or reptile ($r = -0.36$, $n=8$, $p=0.37$) species richness. The extent of habitat protection in Canada is similar to the global average. However, most reserves are too small, too isolated, or occur in the wrong areas (mountains, high Arctic), for effective conservation of amphibians and reptiles. Even with habitat protection, species losses from reserves will continue because of stochastic population extinctions, lack of rescue effect, and habitat change associated with global climate change. Despite these problems, Canada's reserve system still plays a vital role in amphibian and reptile conservation, but we cannot rely on reserves alone to reduce species losses. An approach combining reservation, restoration, and reconciliation, is required to maximise effectiveness in conservation.

HILTON

EFFECTS OF FOREST HARVESTING AND FOOD LIMITATION ON BODY CONDITION OF JUVENILE NORTHWESTERN SALAMANDERS (*AMBYSTOMA GRACILE*)

A.J. Hilton* and J.S. Richardson

University of British Columbia, Vancouver, British Columbia, Canada

Amphibians are sensitive to microclimate changes due to their physiological requirements for moist conditions. Microclimate changes that occur after clearcutting may make it difficult for amphibians to find suitable moist refugia. Forest harvesting may also impact amphibian prey, possibly altering prey density and abundance. These changes to prey and microclimate may decrease the foraging efficiency of salamanders in harvested areas, lowering body condition, and perhaps survival. We used large-scale field enclosures in an experiment using a 2 by 2 factorial design with forest harvesting (clearcut, forested) and food (supplemental food, ambient) as factors to examine the effects on relative growth rates of juvenile northwestern salamanders. We hypothesized that relative growth rates would be lower in clearcuts than forested sites. We also hypothesized that salamanders would be food limited in clearcuts, and that addition of food to clearcut enclosures would increase growth rates (predict: statistical interaction). In forest sites, we hypothesized that salamanders were not food limited, and consequently, food addition would have no effect on relative growth rates. Fourteen individually marked and measured salamanders were released into twenty-four 6 m x 6 m field enclosures in three clearcuts and 3 forest sites in October 2003. A food addition of mealworms was added to half of the enclosures each week throughout the experiment. Salamanders were recaptured and measured in April-May 2004. We will present preliminary results of the study and discuss the implications for juvenile northwestern salamanders on the wet west coast.

HOLT

INTER AND INTRA-POPULATION VARIATION IN SNAPPING TURTLE DEVELOPMENT RATE

Sarah Holt

Department of Zoology, Univerity of Guelph, Guelph, Ontario, Canada, N1G 2W1, sholt@uoguelph.ca

Within a turtle species, developmental rate at a given temperature is suspected to increase in populations which have shorter and cooler summers (Ewert 1985). Over the summers of 2002 and 2003, the embryonic development rate of snapping turtles was modeled in six populations from Wildsville, LA (91˚47’0”W, 31˚37’10”N), to Algonquin Park, ON (90˚06’25”W, 41˚55’57”N). In Algonquin Park, the embryonic development rate was also compared among clutches of 10 females. No significant difference in development rate was observed among females. At first glance, we also found that the interpopulation variation in development rate did not correlate with average local temperature or latitude, though development rate did vary significantly among populations. Closer inspection of the data revealed that embryonic development rate was correlated non-linearly with incubation temperature, and thus estimation of development rate from natural nest temperatures was only viable for populations where natural nests stayed within the normal range of incubation temperatures (22-30C).

IRWIN

THE UNIQUE OVERWINTERING METHOD OF THE NORTHERN CRICKET FROG, *ACRIS CREPITANS*, AND ITS POTENTIAL LINK TO THE SPECIES' DECLINE.

Jason T. Irwin

Biology Department, Okanagan University College, 3333 University Way, Kelowna, BC Canada V1V 1V7
jirwin@ouc.bc.ca

The winter portion of the life cycle of amphibians and reptiles tends to be little studied, despite the fact that it is the longest portion of the annual cycle and often the most stressful. The northern cricket frog reached its northern limit in southern Ontario but has recently been extirpated from the country. The cricket frog has an unusual overwintering method that makes it susceptible to particularly cold and dry winters, and which likely contributed to its decline in Canada and elsewhere. I hope that an understanding of this scenario will stimulate further research into the role of winter conditions on amphibian and reptile population dynamics.

ISAAC

CHARACTERIZING THE THERMAL ECOLOGY OF THE SHARPTAIL SNAKE, *CONTIA TENUIS* IN BRITISH COLUMBIA.

L.A. Isaac

Department of Biology, University of Victoria, Victoria, British Columbia, Canada, laisaac@uvic.ca

Physical conditions (e.g. temperature and moisture regimes) have profound effects on the behaviour and physiology of ectotherms. In squamates, the performance of various biological functions is temperature sensitive and is maximized over a relatively narrow region of high body temperatures (T_bs). Thermal fluctuations in the environment cause variation not only in physiological processes but also in the behaviours associated with them. Thus, when conditions allow it, many species of snakes thermoregulate behaviourally to maintain optimum T_bs. Thermal qualities thus play a key role in habitat selection by snakes.

In Canada, the presence of the Sharptail Snake (*Contia tenuis*) has been recently confirmed from only a few localities on Southern Vancouver Island and the Gulf Islands. Habitat loss, modification and fragmentation associated with increased human settlement in these areas continue to be the primary threats to the persistence of this species. The Sharptail Snake is listed as Endangered by COSEWIC (1999) and is ranked as S1 (critically imperiled) by the British Columbia Conservation Data Centre.

The main goal of this project was to investigate the thermal ecology of Sharptail Snakes through a combination of field and laboratory work. I measured temperature selection of snakes in the field by taking 'spot' measurements of cloacal temperatures using fast-reading thermometers. Typically, I found Sharptail Snakes on cool days (T_b between 10-20°C) and they were most active in the spring and fall periods when temperatures were lowest. I used temperature recorders to measure temporal variation in temperatures of known and potential microhabitats. Generally speaking, temperatures in areas where Sharptail Snakes were found did not significantly differ from locations where Sharptail Snakes were not found. I determined the preferred or 'target' T_bs of snakes when given a choice in the laboratory. Sharptail Snakes preferred relatively low body temperatures. Finally, I quantified the relationship between behavioural performance (i.e. crawling speed) and T_bs. Sharptail Snakes were able to perform well over a broad range of low T_bs and this is consistent with its known natural history.

A thorough understanding of the thermal ecology of British Columbia as well as other Sharptail Snake populations (e.g. Washington) could provide important information to assist in the identification of habitats that may be critical to the survival and recovery of other Sharptail Snake populations.

KENDELL

ALBERTA AMPHIBIAN MONITORING PROGRAM

Kendell, Kris*

Alberta Conservation Association, 7th Floor, O.S. Longman Building, 6909-116 Street, Edmonton, Alberta, Canada, T6H 4P2, kris.kendell@gov.ab.ca

The Alberta Amphibian Monitoring Program is a volunteer program delivered jointly by the Alberta Conservation Association and Alberta Sustainable Resource Development. The program was initiated in 1992, consisting of a small group of volunteers in southern Alberta. In 1997, the program developed into a province-wide program to increase the public's awareness of amphibians and collect important information on the presence of all ten species of amphibians found in Alberta. Information collected has been used to better understand amphibian distribution in the province and has contributed to management decisions and status designations for some species.

Volunteer participants of the program are provided with educational materials to familiarize themselves with the various species of amphibians in the province. They are then asked to listen for calling frogs and toads in the spring and search for individuals during the summer. The volunteers then submit this basic presence information to the program co-ordinator, where it is then entered into a database.

An adjunct to the program is a snake hibernaculum (den) inventory and reptile-monitoring program. As with the amphibian species, many of Alberta's reptiles are poorly understood with respect to their distribution in the province. To better understand the distribution of reptile species the public is also encouraged, through the program, to submit information on reptile observations and den site locations.

LICHTENBERG

EFFORTS TO RE-ESTABLISH NORTHERN LEOPARD FROGS ON THE FLATHEAD INDIAN RESERVATION

Janene Lichtenberg[1]*, J. Kirwin Werner[2], and Art Soukkala[3]

[1]Confederated Salish and Kootenai Tribes, Wildlife Management Program, P.O. Box 278, Pablo, Montana, USA, 59855, janenel@cskt.org
[2]Salish Kootenai College, Department of Environmental Science, P.O. Box 70, Pablo, Montana, USA, 59855, USA, jkw@ronan.net
[3]Confederated Salish and Kootenai Tribes, Wildlife Management Program, P.O. Box 278, Pablo, Montana, USA, 59855, arts@cskt.org

The northern leopard frog (*Rana pipiens*) was once common throughout Montana, but is now extirpated from most of western Montana including the Flathead Indian Reservation. The Confederated Salish and Kootenai Tribe's Wildlife Management Program is working to return leopard frogs to the Flathead Indian Reservation. Potential source populations were screened for species relatedness using DNA techniques in 2001. Methodology was tested using Columbia spotted frogs (*Rana luteiventris*) in 2002. In 2003, 8 egg masses were collected from 5 leopard frog source populations. Each mass was placed within a float that in turn was placed inside an enclosure to protect the eggs from predators and keep track of individuals. An estimated 16,500 tadpoles hatched from these egg masses. Five hundred tadpoles were released into each enclosure and the remaining tadpoles were released into the surrounding water. Tadpoles outside the enclosures appeared to grow and developed faster than tadpoles inside enclosures. During July 2003, we released 1,342 tadpoles and 21 metamorphs from within the enclosures into the surrounding water. Tadpoles had been maintained in the enclosures from 4 to 8 weeks and survival was 68%. Time constrained surveys were conducted after the release to monitor leopard frog metamorphs until the end of September 2003. Between 20 and 40 young frogs were observed during these surveys. We have been unable to determine the fate of the individuals released in 2003 despite numerous surveys and site visits in the spring and summer of 2004. Only 2 egg masses were translocated to the Reservation in 2004 and one of these masses exhibited low hatching success. Currently, 450 hatchlings are being reared within 5 enclosures. An additional 200 hatchlings are being raised in small rearing tanks following a protocol similar to that being used in the Creston, British Columbia repatriation efforts. The remaining hatchlings were released directly into the surrounding waters. We are currently evaluating our methods and discussing options to increase the number and size of metamorphs released each year and to track the fate of metamorphs after they are released.

MCDONALD

AN UPDATE ON SUNCOR'S AMPHIBIAN RECLAMATION MONITORING IN NORTHEASTERN ALBERTA

McDonald[1], Nicole, C. De La Mare[2], S. Attaway[1] and L. Paquin[3]

[1]Golder Associates Ltd., Bay 1, 245 MacDonald Cres., Fort McMurray, Alberta, Canada, T9H 4B5, Nicole_McDonald@golder.com
[2]Golder Associates Ltd., 300-10525 170 Street, Edmonton, Alberta, Canada, T5P 4W2
[3]Suncor Energy Inc. P.O. Box 4001, Fort McMurray, Alberta, Canada, T9H 3E3

As a part of approval conditions for Millennium mine, Suncor Energy Inc. has been conducting amphibian monitoring of their reclaimed wetland areas for the past three years. *Bufo hemiophrys*, a provincially listed species, were found on 5 of 9 sites during the first year of monitoring and these numbers increased over the subsequent years. During the monitoring, acoustical and environmental data were sampled for *Rana sylvatica*, *Pseudacris triseriata* and *Bufo hemiophrys*. We will provide a summary of trends and general phenology observations including relationships between abiotic environmental variables with species call indices, a comparison of peak calling period for species on the reclaimed sites and general habitat observations. Observations made on Suncor's reclaimed sites have assisted in revamping the regional habitat model for *B. hemiophrys* used in environmental impact assessments and has initiated further research on the future of *B. hemiophrys* in the oil sands region.

NORRIS

THE INFLUENCE OF NORTHERN PIKE ON WOOD FROG TADPOLE POPULATIONS IN BOREAL ALBERTA

Kirsten C. Norris* and Cindy A. Paszkowski

University of Alberta, Edmonton, Alberta, Canada, kirsten.norris@ualberta.ca

Wood frogs (*Rana sylvatica*) and northern pike (*Esox lucius*) are two common inhabitants of Canada's boreal ecosystem. While wood frogs tend to breed in fishless waterbodies, recent periods of drought and dryness have limited the numbers of small fishless waterbodies and forced the wood frogs to select fish-inhabited waterbodies for breeding. Small-bodied fish populations have been demonstrated to have a negative impact on wood frog tadpole populations, however, little is known about the impact of large bodied-fish, such as northern pike. Northern pike are well known for their voracious appetite, eating most anything that they come across, including both adult frogs and tadpoles. But do the pike actually have a negative impact on the tadpole populations? And if there is an impact, is it caused by direct predation or indirect competition? To determine this, I stocked both pike and wood frog tadpoles in experimental ponds, and measured the activity, growth, survivorship, and patterns of metamorphosis of the tadpoles and emerging metamorphs. I also measured tadpoles from control ponds, which remained fishless but were stocked with tadpoles. Experimental pike caught on a regular basis had their stomachs flushed to provide a 'snapshot' of their diet. Preliminary evidence shows that the northern pike do have a negative impact on the activity, growth and survivorship of wood frog tadpoles. My findings will contribute to the development of management plans in Alberta lakes that will promote sportfish populations while conserving co-existing amphibian populations.

PASZKOWSKI

THE DISTRIBUTION AND ABUNDANCE OF AMPHIBIANS ACROSS LAND-USE TYPES IN ALBERTA'S ASPEN PARKLAND

Eaves, Sara E.[1], C. Paszkowski,[1]*, and Ross Chapman[2]
[1]Department of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada, T6G 2A7, cindy.paszkowski@ualberta.ca
[3]Elk Island National Park, Fort Saskatchewan, Alberta, Canada, T8L 2N7

The objective of this study was to assess amphibian habitat-use in the highly modified Aspen Parkland of the Beaver Hills, Alberta, Canada. The Aspen Parkland is a transition zone between the western boreal forest to the north and the prairies to the south, and less than 15% of this ecoregion has not been altered by agriculture or urbanization. Over 200 permanent and semi-permanent ponds (< 6 ha in area), classified as "crop", "pasture", "residential" or "natural" based on surrounding land-use, were surveyed for amphibians in 2001 and 2002 using call surveys and live-trapping of adults and young-of-the-year. Local, pond-level features (e.g., size, depth, water chemistry, vegetation) and landscape-level habitat features (e.g., proportion of forested area, distance to nearest road) were also measured. The wood frog (*Rana sylvatica*) and boreal chorus frog (*Pseudacris maculata*) were the most widespread species, occurring at > 75% of ponds. The relative abundances of these two species were lowest in crop and pasture ponds. Western toad (*Bufo boreas*) abundance was greatest at "natural" and pasture ponds, and tiger salamander (*Ambystoma tigrinum*) abundance was greatest within crop ponds themselves. Canadian toad (*Bufo hemiophrys*) was extremely rare and found only in Elk Island National Park. Several landscape and local habitat features were significantly correlated with relative abundances of wood and chorus frogs and of tiger salamander. Results suggest that ponds situated in different land-use types vary in their suitability as amphibian breeding and foraging habitats, and that landscape-level features significantly influence amphibian abundance.

PAULI

IS MALATHION INSECTICIDE TOXIC TO AMPHIBIANS?

B.D. Pauli[1], N. Gallant[2], and M. Charbonneau[3]

[1]National Wildlife Research Centre, Canadian Wildlife Service, Raven Road, Carleton University, Ottawa, Ontario, Canada, K1A 0H3, bruce.pauli@ec.gc.ca
[2]University of Ottawa, Department of Biology and Centre for Advanced Research in Environmental Genomics, Ottawa, Ontario, Canada, K1N 6N5, ngallant@science.uottawa.ca
[3]Watershed Ecosystems, Department of Biology, Trent University, Peterborough, Ontario, K9J 7B8, enviro_mental@hotmail.com

Malathion is an organophosphorus insecticide with numerous uses, including registrations for the control of mosquitoes. Concerns over mosquito transmission of West Nile Virus mean that use of malathion may increase. Malathion can be applied over wide areas by truck-mounted or aircraft-mounted sprayers. Because of the potential for aquatic contamination from this use pattern, it is important to determine the toxicity of malathion to amphibians. We are investigating the toxicity of this insecticide to native amphibian species, as well as *Xenopus* spp., using laboratory exposures to two malathion formulations and major formulation ingredients. In our experiments, mortality is recorded daily, and behavioural observations suggesting intoxication are noted. Lethal concentrations are then calculated for each species and formulation. The results indicate that toxicity can depend on the formulation of insecticide as well as on the species being tested: in certain cases the filter-feeding *Xenopus* appeared more sensitive to the toxic effects of the insecticide than *Rana pipiens,* but this could depend on the formulation being tested. The results further indicate that regulating the use of an insecticide such as malathion based on laboratory-based toxicity data for amphibians is difficult given the observed differences stemming from formulation or species tested. Data collected in the laboratory also do not take into account possible enhancements in toxicity that might occur in the field. As a result, a risk assessment for amphibians from the use of malathion for mosquito control is difficult.

PEARSON

EFFECTS OF INTRODUCED FISH ON LONG-TOED SALAMANDERS (AMBYSTOMA MACRODACTYLUM) IN SOUTHWEST ALBERTA.

Pearson, Kimberly*, and Cameron Goater

University of Lethbridge, Department of Biological Sciences, 4401 University Drive, Lethbridge, Alberta, Canada, T1K 3M4, Canada, kim.pearson@uleth.ca

Species that are introduced outside of their native ranges are an important threat to biodiversity. In southwest Alberta, Canada, sport and bait fish have been introduced to most waterbodies. We examined the effects of introduced trout and minnows on the distribution, demography and behaviour of larval long-toed salamanders through a combination of field surveys, laboratory experiments and an outdoor mesocosm experiment. Results from field surveys at 30 high-elevation lakes confirmed previous studies showing allopatric distributions of trout and long-toed salamanders. The same pattern was also documented at 27 low-elevation ponds. In the mesocosm experiment, salamander survival was significantly reduced in ponds containing trout or minnows. Surprisingly, larvae exposed to minnows were 28-65% smaller than larvae in control ponds, indicating strong interspecific competition for zooplankton prey. Laboratory studies confirmed that trout preyed directly on salamander hatchlings and larvae, whereas minnows injured hatchlings but did not consume them. In laboratory aquaria, salamander larvae spent significantly more time within a refuge when exposed to minnow cues, but showed no behavioural response to trout. This confirmed the expectation that long-toed salamanders lack specific behavioural responses to trout, but respond very generally to disturbances within the water column. Thus, direct predation and a lack of specific antipredator behaviour are among the likely mechanisms responsible for the observed allopatric distribution of trout and long-toed salamanders. Our data also show that gape-limited fish reduce growth and survival of salamanders, perhaps more so than trout, through mechanisms such as competition and behavioural alteration.

SANZO

EFFECTS OF ROAD SALT (NaCl) ON THE DEVELOPMENT AND GROWTH OF WOOD FROGS, *RANA SYLVATICA*

Domenico Sanzo*, Stephen J. Hecnar and Stephanie Baker

Department of Biology, Lakehead University, 955 Oliver Road, Thunder Bay, Ontario, P7B 5E1, Canada
sanzod@yahoo.com

The environmental impact of roads is an issue of increasing interest in the fields of ecology and conservation. The vast global road network that exists impacts all habitats and environments. Roads affect many living organisms through mortality from traffic, habitat loss, or habitat degradation resulting from chemical runoff. Large quantities of salts (eg. NaCl, CaCl) are applied to roads as de-icing agents in northern countries. For example, it is estimated that four to five million tonnes are used annually in Canada alone. Road salts readily dissociate in water and their concentrations continue to increase in roadside wetlands. Despite increasing inputs of salt, and well-demonstrated effects on vegetation, surprisingly little work has examined its effects on wetland animals. Amphibians may be experiencing detrimental effects because of their strong dependence on water. We examined the effects of the most widely used road salt (NaCl) on the growth and development of wood frogs, *Rana sylvatica*. We exposed recently hatched tadpoles to varying salt concentrations (control (0.00 mg/l), low (0.39 mg/l), medium (77.50 mg/l), high (1030.00 mg/l)). Low and high concentrations corresponded to concentrations that exist in regional wetlands, while medium represented the average concentration. Preliminary results indicated that a significant difference in mortality existed between the high concentration and the control, low and medium concentrations ($F(3,225)=5.89$, $p=0.001$). Analysis of variance indicated a significant difference in the net weight of newly metamorphosed frogs between control animals and those exposed to the high concentration ($F(3,80)=5.41$, $p=0.002$). We also observed some behavioural and developmental abnormalities. Our results suggest that road salts have the potential to adversely affect amphibian populations and communities at realistic field concentration. Further studies of the effects of road salts on other amphibian species are warranted.

SCHOCK 1

LARGE-SCALE DIFFERENCES IN DISEASE SUSCEPTIBILITY AMONG POPULATIONS OF TIGER SALAMANDERS IN SASKATCHEWAN AND MANITOBA

Danna M Schock[1]*, Trent K Bollinger[2] and James P Collins[1]

[1]School of Life Sciences, Arizona State University, Tempe, Arizona, USA, 85287-4601, danna.schock@asu.edu
[2]Canadian Cooperative Wildlife Health Centre, University of Saskatchewan, Saskatoon, Saskatchewan, Canada

Infectious diseases play essential roles in the ecology and evolution of all life. While the eclectic and burgeoning literature on host-pathogen biology attests to widespread interest within the scientific community, the need to understand host-pathogen relationships well enough to manage their effects has taken on renewed urgency as infectious diseases emerge, or in some cases, re-merge, as major threats to human and wildlife populations. Identifying patterns of host susceptibility, and elucidating the factors responsible for those patterns, are key to understanding what precipitates disease outbreaks and how to manage the effects.

Our research focuses on understanding factors that can generate population-level differences in host susceptibility to infectious diseases. Our model system is the tiger salamander (*Ambystoma tigrinum*) and a group of closely-related lethal amphibian viruses. The viruses are members of the genus *Ranavirus* and are responsible for mass mortality events across western North America, from Arizona to Manitoba. Multi-year laboratory and field studies have revealed predictable large-scale differences in disease susceptibility and severity among tiger salamander populations in Saskatchewan and Manitoba, Canada. These differences in disease susceptibility transcend lifestage and rearing conditions.

Although several mechanisms could potentially generate such patterns, we focused on testing three mechanisms that are likely, based on the biology of tiger salamanders and what we understand of the biology of the viruses. We tested whether there are differences among tiger salamander populations in exposure to immuno-suppressive chemical contaminants, differences in local host-pathogen ecologies, or differences in genetic diversity, that could explain the differences in disease susceptibility. Although exposure to chemical contaminants is an obvious candidate hypothesis, we have found no evidence in support of it. Rather, several lines of evidence suggest that differences in tiger salamander population structure and genetics may be generating this pattern, indicating that factors intrinsic to local salamander-virus relationships are generating the observed patterns in host susceptibility. Implications of these findings for management of infectious diseases in wild populations will be discussed.

SCHOCK 2

AMPHIBIAN RANAVIRUSES FROM SASKATCHEWAN CAUSE MORBIDITY AND MORTALITY IN MULTIPLE AMPHIBIAN SPECIES.

Schock, Danna M.[1*], V. Gregory Chinchar[2], Trent K. Bollinger[3], and James P. Collins[1]

[1] School of Life Sciences, Arizona State University, Tempe, Arizona, USA, 85287-4601, danna.schock@asu.edu
[2] Department of Microbiology, University of Mississippi Medical Center, 2500 North State Street, Jackson, Mississippi, USA, 39216
[3] Canadian Cooperative Wildlife Health Centre, Department of Veterinary Pathology, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, Canada, S7N 5B4

Most emerging infectious diseases are caused by multi-host pathogens, which frequently cause severe disease in some host species but do not cause overt signs of disease in others. Further, the impact of a pathogen on a given host species is not necessarily related to the severity of obvious disease it causes in some individuals; sublethal effects of infection can have important and far-reaching effects on host populations. This complexity necessitates a basic understanding of pathogen's host range in situations where we wish to predict and/or manage the effects of an infectious agent.

Ranaviruses (family *Iridoviridae*, genus *Ranavirus)* are large, double stranded DNA viruses that have caused amphibian die-offs around the world. Several viral species within the genus *Ranavirus* infect multiple host species within the same taxonomic class, and, in some cases, a single virus species can infect both amphibians and fish. The apparently broad host ranges of ranaviruses suggest that the ecology of ranaviruses may be complex and potentially involve multiple host species. In light of the propensity of other ranaviruses to infect multiple host species, we tested whether ranaviruses isolated from three syntopic species of amphibians in Saskatchewan are able to infect heterologous hosts (i.e., hosts other than the ones from which they were first isolated).

The three viruses tested in our study were initially isolated from wild populations of wood frogs (*Rana sylvatica*), leopard frogs (*Rana pipiens*) and tiger salamanders (*Ambystoma tigrinum*) in Saskatchewan that experienced die-offs in 2000. Molecular characterization of the three viruses indicate that the leopard frog and wood frog isolates are closely related and are likely strains of Frog Virus 3 (FV3), the type virus of the genus *Ranavirus*. The tiger salamander virus is also member of the genus *Ranavirus* but is distinct from the frog strains and likely constitutes a distinct viral species. Moreover, the tiger salamander virus is closely related to other viruses isolated from tiger salamanders throughout western North America.

The wood frog virus and leopard frog virus caused 100% mortality in both frogs species and in ~10% of the tiger salamanders. The tiger salamander virus killed ~50% of the wood frogs, none of the leopard frogs and 100% of the tiger salamanders. There were sublethally infected individuals in all virus treatments not causing 100% mortality.

Our results suggest that multiple host species may be involved in the ecology of these Saskatchewan ranaviruses and that further study is required before the ecology of any one of the viruses can be understood sufficiently well to predict or mitigate its effects on any of the host species.

SCOTT

NORTHERN PRAIRIE SKINKS IN MANITOBA: WHERE ARE THEY?

Scott, Jacey L.[1]*, David J. Walker[1], Richard K. Bayduck[1] and James R. Duncan[2]

[1]Faculty of Environment, University of Manitoba, Winnipeg, Manitoba, Canada, R3T 2N2
umscot23@cc.umanitoba.ca
[2]Manitoba Conservation, 200 Saulteaux Crescent, Winnipeg, Manitoba, Canada, R3J 3W3

Northern prairie skinks, *Eumeces septentrionalis septentrionalis*, are small, semi-fossorial lizards that occupy the Carberry Sandhills of southwestern Manitoba. Long-term species viability is threatened by the loss of native mixed-grass prairie in this region. Despite the unique conservation challenges presented by northern prairie skinks, very little is known about the ecology and habitat requirements of this species. Using a combination of coverboard sampling and tracking throughout the active season, we described the vegetation communities in which skinks were found, recorded prey and predator abundance and monitored the microclimates provided by cover objects. The average snout-vent length of adults in this study was 71.5mm with an average mass of 7.65g. It was found that adult skinks emerged earlier from overwintering than juveniles and the majority of skinks were captured during the mating season, before nesting, when ambient temperatures rose above 20°C. Multivariate analysis suggests that skinks are restricted to areas consisting of native grasses and low-lying shrubs on well-drained slopes associated with high heat loads and high prey abundance. Our tracking data indicates that northern prairie skinks use tufts of grass and abandoned burrows as natural cover objects. In Manitoba, northern prairie skinks appear to be responding to the microclimates provided by the physical structure of the vegetation and the prey base provided by grassland vegetation.

SERBEN

FLUCTUATING ASYMMETRY IN WOOD FROG METAMORPHS EXPOSED TO LINDANE AS TADPOLES IN AN OUTDOOR MICROCOSM STUDY

Serben, Kerrie C.[1,2]*, and D. J. Forsyth[3]

[1]Vizon SciTec Inc., 3650 Wesbrook Mall, Vancouver, British Columbia, Canada, V6S 2L2, kserben@vizonscitec.com
[2]Toxicology Graduate Student Program, Toxicology Centre, University of Saskatchewan, Saskatoon, Saskatchewan, Canada
[3]Canadian Wildlife Service, Environment Canada, Saskatoon, Saskatchewan, Canada

Measurement of fluctuating asymmetry (FA) has been promoted as an early warning biomonitoring tool to detect effects of stressors on populations prior to the manifestation of more obvious effects, such as a decline in population size. Few studies have used this endpoint in pesticide toxicity studies. Wood frog (*Rana sylvatica*) tadpoles were exposed to low concentrations of lindane throughout the larval period in outdoor microcosms. Four traits were measured six times on each metamorph: femur length, tibiofibula length, radio-ulna length, and eye-naris length. Signed (L-R) differences were converted to absolute FA estimates (|L-R|) for analysis of lindane treatment effects. Despite the large number of repeated measurements and the large sample size, the measurement error was high: overall percent measurement error (%ME) for each trait was 46% (femur length), 54% (tibiofibula length), 62% (radio-ulna length), and 83% (eye-naris length). The levels of FA, after factoring out %ME, were too low to detect any differences due to lindane treatment. While effects were observed on weight, hormone concentrations, and sex differentiation, no significant differences were observed with FA, indicating that this endpoint was not sensitive enough to serve as a biomarker of exposure to lindane in the wood frog.

STEVENS

BEAVER PONDS AS HABITAT FOR A BOREAL ANURAN: THE OLDER THE BETTER

Cameron E. Stevens* and Cynthia A. Paszkowski

Dept. of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada, T6G 2E9, stevens@ualberta.ca

The boreal forest of Canada provides habitat for a distinctive assemblage of amphibians; however, their ecology and use of beaver ponds is poorly understood. Our first objective explored habitat-use patterns for breeding wood frogs (*Rana sylvatica*) and determined whether pond succession affects the dynamics of populations that were assessed using standardized call surveys on 54 beaver ponds in the Boreal Foothills during spring 2001 and 2002. Regression and model averaging through AIC statistics indicated that canopy cover and pond age influenced the abundance of breeding wood frogs with pond area, fish occurrence, and density of ponds within 250 m as covariates in the models. Our second objective determined whether wood frogs select older ponds due to ideal larval environments (e.g., warm water) associated with changes in riparian structure (i.e., less canopy cover due to extensive foraging by beaver) by comparing larval performance in 5 new (< 10 yrs) versus 5 old (> 10 yrs) beaver ponds using field enclosures during 2002 and 2003. Survival of larval wood frogs did not differ between new and old ponds; however, larval growth rates were significantly (34 %) greater in older sites. A food supplementation treatment (i.e., rabbit chow) nested within pond had a positive and significant effect on larval growth that was comparable in new and old ponds. Observed differences in larval performance between pond types reflected abiotic conditions that were approximately 3^{o} C warmer and 2 times more saturated with dissolved oxygen in older sites. Forest management strategies and trapping regulations that protect beaver habitat and populations may also ensure healthy amphibian populations through their effects on enhancing the longevity of beaver colonies and the persistence of old ponds on the landscape.

WHITING

ASSESSING HABITAT SELECTION OF A SMALL ANURAN WITHOUT TELEMETRY AND THE ECOLOGICAL SENSITIVITY OF *PSEUDACRIS TRISERIATA*

Arthur Whiting[1] and D.M. Green[2]

[1]University of Alberta, Edmonton, Alberta, Canada
[2]McGill University, Montreal, Quebec, Canada

The Western Chorus Frog, *Pseudacris triseriata*, though widespread in North America is declining in the Saint Lawrence River valley, the north-eastern tip of its range. We sought to determine the critical habitats for the Western Chorus Frog and investigate the relationship between habitat preference and dispersal pattern using data from an array of drift fences set in varying habitats around a breeding pond. The distribution of dispersing adults and juveniles changed from one fence to the next, suggesting selection of habitats. Reasoning that preference for a habitat is proportional to residence time in that habitat, we tested frogs in circular enclosures in the four available habitats. The frogs remained longer in humid prairie compared to forest, shrub and arid prairie habitats and remained for the least amount of time in an experimentally denuded habitat. Recapture data for frogs moving between drift fences set 50 metres apart also showed that individuals in shrub dispersed faster than those in either humid or arid prairies. Juvenile growth was similar among habitats, indicating that habitat selection was likely not based upon food availability. Nevertheless, captures per meter of fence in both shrubby and humid prairie vegetation were similar, suggesting that target-oriented dispersal could be responsible for the observed non-random distribution of emigrants from the pond. A sensitivity analysis suggested that larval survival and juvenile fertility have the greatest impact on population growth and that terrestrial habitat availability is unlikely to be the primary reason for the decline of chorus frog populations.

WIND

MONITORING METAL UPTAKE IN AMPHIBIANS AND MACROINVERTEBRATES NEAR AN ABANDONED MINE SITE

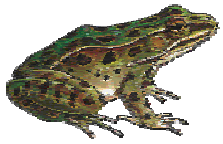
Elke Wind[1]* and Trudy Chatwin[2]

[1]E. Wind Consulting, 348 Machleary St., Nanaimo, British Columbia, Canada, V9R 2G9, ewind@telus.net
[2]Trudy Chatwin, Ministry of Water, Land and Air Protection, Nanaimo, British Columbia, Canada

An abandoned copper mine southwest of Campbell River, British Columbia continues to contaminate fish-bearing creeks downstream of the site more than 30 years after its closure. In an attempt to lower copper levels within the Tsolum River, one of the main drainages from the mine site was relocated through Spectacle Lake to settle out contaminants. This work presented a unique opportunity to monitor the effects of increased metal exposure on local amphibian and macroinvertebrate populations in relation to levels found throughout the watershed.

In fall 2003, before creek diversion, amphibians and macroinvertebrates were captured and euthanized for whole body metal tissue analysis at six sites—Spectacle Lake, three reference sites, and two sites close to the abandoned mine site (contaminated sites). Pre-creek relocation results indicated that the metal levels within the tissues of amphibians and macroinvertebrates at Spectacle Lake were similar to reference sites. The majority of metals in water, and in the tissues of amphibians and macroinvertebrates, were found in only trace amounts at all sites. An exception to this was copper, which was higher at both contaminated sites than maximum acceptable water quality criteria set for the local watershed by the provincial government. In addition, tissue copper levels were higher at the contaminated sites compared to reference sites. The level of copper within the tissues of amphibians and macroinvertebrates was not found to correlate with concentrations in water. However, copper and zinc tissue levels correlated with body length for Northwestern salamanders at two out of the three sites tested. The first post-creek relocation surveys will be conducted in fall 2004.

Notes



9th Annual Meeting of CARCNET/RÉCCAR
Hotel Deluxe, Edmonton, Alberta
24 - 27 September 2004

CONFERENCE EVALUATION FORM

(Please complete and leave the form in the designated box provided or send later to the address listed below.)

	POOR				GOOD
Conference organization/information	**1**	**2**	**3**	**4**	**5**
Conference materials	**1**	**2**	**3**	**4**	**5**
Conference length	**1**	**2**	**3**	**4**	**5**
Scientific content and scope of workshop	**1**	**2**	**3**	**4**	**5**

What was good about the workshop was:

_____

_____

_____

_____

_____

What could have been better was:

_____

_____

_____

_____

(Please see over)

Please return to:

Kris Kendell
Alberta Conservation Association
7th Floor, O.S. Longman Building
6909-116 Street,
Edmonton, AB T6H 4P2
Fax: (780) 422-9685

Please use the space below for any comments you wish to add

Thanks!

And Big Thanks to our Partners…

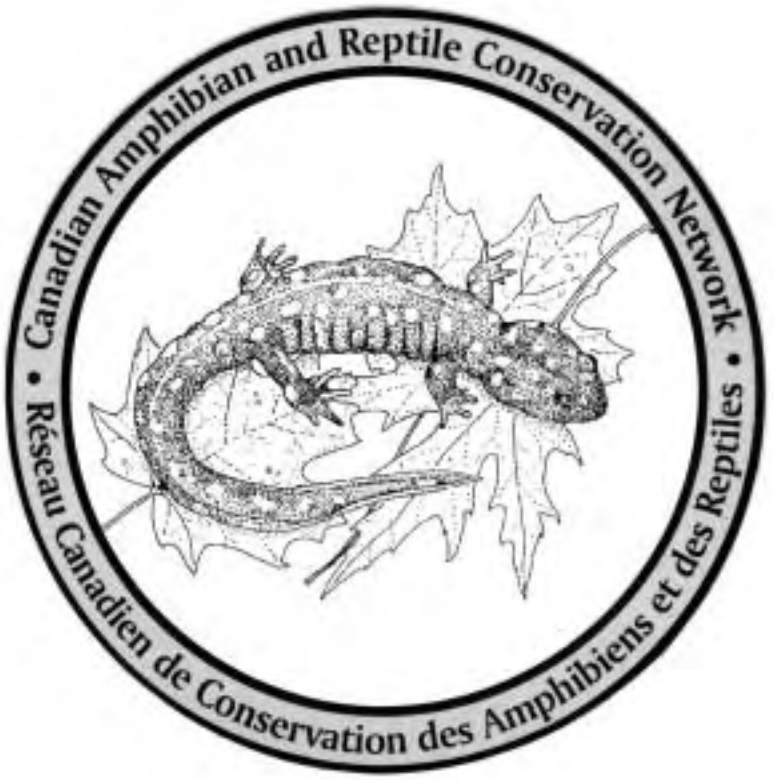
ACA is a non profit, non government association working collaboratively to conserve and enhance Alberta's wildlife, fisheries and habitat. (http://www.ab-conservation.com/)

The NAWMP is an international action plan to conserve migratory birds throughout the continent, with the goal of returning waterfowl populations to their 1970s levels by conserving wetland and upland habitat. (http://www.nawmp.ca/eng/index_e.html)

ERAS fulfills its objectives of promoting the study and conservation of reptiles and amphibians and facilitating communication between its members through the publication of a society journal, the procuring of lecturers in herpetology, and the provision of opportunities for members to meet and discuss herpetological topics. (http://www.edmontonreptiles.com/)

Alberta Sustainable Resource Development works with Albertans to ensure a balance between the economic, environmental and social values of the province and ensures the continuous contribution of benefits from Alberta's public land and wildlife resources to Albertans. (http://www3.gov.ab.ca/srd/fw/)

Beaverhill Bird Observatory monitors landbird migration in the Beaverhill Lake Natural Area, which currently consists of standardized daily program of mist netting and censuses. (http://www.bsc-eoc.org/national/bbo.html)



http://www.carcnet.ca/