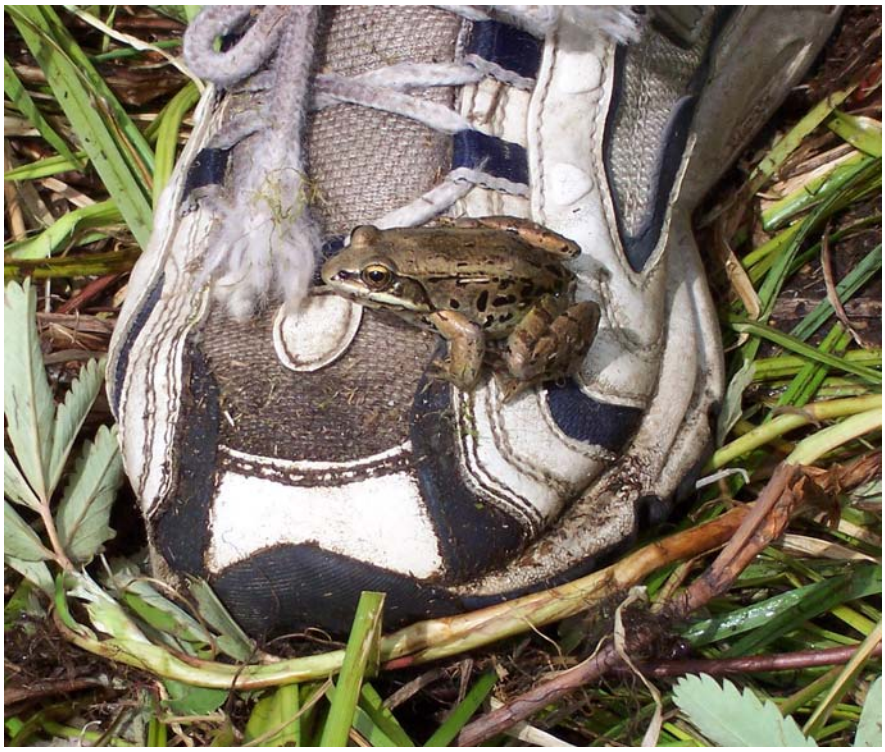
Second Alaska Amphibian Conference

PROCEEDINGS



FEBRUARY 10-11, 2006

JUNEAU, ALASKA

Egan Library Lecture Hall
University of Alaska Southeast

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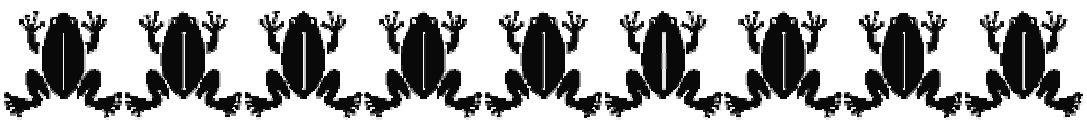
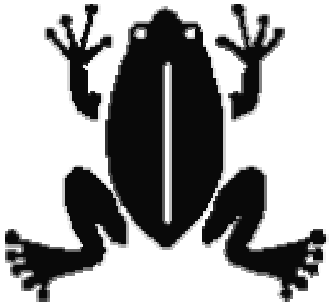


A note from the compiler: While assembling these proceedings, it became clear to me that this *Second Alaska Amphibian Conference* really is a tangible reflection of the progress we have made in coming to understand the lives of amphibians here in Alaska. A few short years ago, very little was known about amphibians in our state: Only a small number of amphibian projects had been conducted, and those mostly in isolation and relative obscurity. With few species and vast amounts of wilderness, Alaska was late getting into the game: Understanding and conserving amphibians was something only those "outside" had to worry about. In the last four years, we have seen interest in amphibians and amphibian conservation in the state blossom. A real, communicating network of biologists and managers with an interest in amphibian conservation has emerged, and numerous new projects have been undertaken that strategically address some of the major limitations in our knowledge. Though most of our work remains before us, it is appropriate to take some satisfaction in the progress we have made.

Abstracts for both oral presentations and posters are combined here, and are arranged in alphabetical order according the last name of the lead author. The body of work presented at this year's conference represents the efforts of the Alaska Department of Fish and Game, U.S. Fish and Wildlife Service, U.S.D.A. Forest Service, U.S. Geologic Survey, Alaska Natural Heritage Program, Takshanuk Watershed Council, University of Alaska Southeast, University of Alaska Anchorage, the University of Colorado, and private researchers. Topics include mapping the distributions of Alaskan amphibian populations, exploring statistical methods to monitor those populations, and understanding the effects of various extant and emerging stressors including chytrid fungus and global climate change. We are in the game indeed.



MONITORING THE OCCUPANCY OF PONDS BY FROGS IN RELATION TO STRESSORS: AN ARMI EXAMPLE

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The Amphibian Research and Monitoring Initiative (ARMI) seeks to understand changes in amphibian status in the United States. A focus of ARMI is to monitor anuran occupancy rates at what ARMI calls Mid-Level Monitoring Areas. Mid-Level Monitoring Areas ideally are designed to use occupancy models to relate changes in occupancy to potential stressors over time. One example is a monitoring area in the Willamette Valley of Oregon. It has 3 goals: 1) determine if the extinction probability of native amphibians is related to presence of introduced fish and bullfrogs; 2) determine the relationship between occupancy of ponds by native amphibians and the presence of introduced fish and bullfrogs; and 3) provide regular unbiased estimates of occupancy by native amphibians for ponds on DOI lands in the Willamette Valley. The use of occupancy models to address these goals is illustrated and preliminary results are presented.

MODELING THE DISTRIBUTION OF WESTERN TOADS USING A STATEWIDE AMPHIBIAN OCCURRENCE DATABASE

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The geographic distribution of amphibian species will remain difficult to determine in Alaska because comprehensive survey efforts are unlikely to occur anytime soon and there are numerous logistical challenges posed to survey efforts in such a remote landscape. Modeling distribution may be a key solution to this problem, however the primary data source available is a statewide database of amphibian occurrence (e.g. Pyare and Gotthardt, this symposium) that includes presence-only data and incorporates a dizzying array of data types with varying levels of accuracy and reliability, e.g. public reports versus museum specimens. We will illustrate our efforts to overcome such data challenges using a novel GIS modeling technique applied to the distribution of western

toads (*Bufo boreas*) in Southeast Alaska. This "fuzzy-envelope" GIS modeling approach will allow us to ascribe a value to each database record, based on the possibility of an actual occurrence, and generate a model that explicitly predicts the occurrence of toads on the landscape relative to a range of environmental variables. We will test data classification schemes and overall model performance using a "test" data set generated from more intensive and ongoing interagency survey efforts. If successful, our research demonstrates a way in which even simple historical data and public reports may have utility for long-term monitoring efforts.

WORLD-WIDE AMPHIBIAN DECLINES: CHYTRIDIOMYCOSIS AND CLIMATE CHANGE

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Within the last 30-40 years, many amphibians have suffered population declines on six continents and some species have apparently become extinct. While habitat destruction and introduction of invasive species clearly have been factors in such declines, infectious disease, primarily a pathogenic chytrid fungus, (*Batrachochytrium dendrobatidis)* has been implicated in amphibian mass mortalities on 5 continents. This pathogen, which attacks the outer skin of amphibians, is 100% lethal to susceptible amphibians over a wide range of temperatures from at least 4-23 C. Some species, such as bullfrogs and cane toads, are not susceptible to this pathogen, but can serve as reservoirs for spread of the disease. The interactions between this pathogen and amphibians have received intensive study over the last 6 years, but critical questions, especially how does it kill an amphibian, where did it originate, how is it transmitted from place to place, and can we stop it remain to be answered.

The issue concerning whether or not there are environmental co-factors that foster outbreaks of this pathogen is still unclear. Existing studies of possible effects of climate change on amphibian breeding and population declines have produced correlative, not cause and effect, results. The recent publication of Alan Pounds et al. in Nature will be discussed among others.

CURRENT AND FUTURE THREATS TO AMPHIBIAN POPULATIONS

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Considerable and increasing effort has gone not only into documenting the status of amphibian populations, but also trying to understand the causes of declines. Many factors have been proposed as causing declines, including habitat alteration, introduced predators, disease, contaminants, ultraviolet radiation, and climate change. Some of these are supported by more evidence (habitat alteration) than others (ultraviolet radiation). Most research has investigated single factors, however, there have been attempts to assess multiple causes of declines, particularly climate change and disease. Increasing human population growth, with associated acceleration of habitat alteration and climate change, poses the greatest threat to all biodiversity, including amphibians.

UPDATE ON THE STATEWIDE ALASKA AMPHIBIAN OCCURRENCE DATABASE

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Through collaboration among the Alaska Natural Heritage Program, University of Alaska Southeast, Non-game Program of the Alaska Department of Fish and Game and several other contributing organizations and individuals throughout Alaska, we are coordinating development of a comprehensive, statewide database of historical amphibian occurrence. The dataset currently represents >10 smaller data sets of >1200 records, 7 agencies and NGO's, numerous museums, and the results of numerous individual efforts. We are making progress in meeting some challenges of data compilation – consolidating different data, standardizing highly inconsistent coordinate systems used to record locations, identifying potentially duplicated data records – but other challenges remain

and overcoming these will require broader input from data providers and data users: data collection formats, formalization of a data repository, dealing with data of varying accuracy and reliability, how to distribute data and who to. We suggest rapid development of a common data collection format and a data sharing agreement among data providers to begin archiving records of amphibian occurrence beginning this Spring and Summer 2006.

ARE THERE INVASIVE AMPHIBIAN POPULATIONS IN ALASKA?

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Alaska's remoteness, northern latitude environments, and sparse human population have allowed most habitats to remain free of invasive species infestations that have been such an environmental problem in many areas of the world. Exotic or non-native species introductions in Alaska are becoming more commonplace as the human population increases, modern transportation methods provide improved mobility and access to remote areas of the state, and a desire for more imported consumer goods provide vectors for intentional and unintentional introductions.

Many of these introduced exotic species do not result in environmental harm and some may even be intentional and beneficial to humankind as in the case of food crops and animals. However, as introductions become more frequent and a warming Alaska climate becomes more conducive to warm climate species survival, more exotic species populations will be able to spread and compete with native species or alter habitat. Occasionally, an exotic species may become truly invasive, as defined by Executive Order 13112, and "cause economic or environmental harm or harm to human health."

The Alexander Archipelago in Southeast Alaska has been found to have a high incidence of endemism due to its historical isolation, ecological complexity, and narrow distribution between the Pacific Ocean and coastal mountain ranges. Island endemics have been found to be especially sensitive to exotic species introductions because of their restricted ranges and specific habitat requirements.

Two known populations of non-native frogs have become established in Southeast Alaska and have been able to persist or spread at a time when many amphibian populations worldwide are in decline. I will present what is currently known about these two populations and agency plans for the next field season to monitor them. Primary

objectives for the coming season will be to better delineate distribution, species abundance, and invasiveness; i.e. are they causing harm to the environment.

THE DISTRIBUTION OF THE LONG-TOED SALAMANDER (AMBYSTOMA MACRODACTYLUM) IN ALASKA.

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The distribution of the Long-toed salamander in Alaska is reviewed and summarized from literature, museum and specimen records from the author's field surveys in Alaska in 1980, 1982, 1983, 1984, 1985, 1989, 1991, and 1992. The first literature records for the state date back to Hodge 1973. Amphibian specimens from Alaska have been examined in the University of Puget Sound James Slater Natural History Museum, Tacoma, WA; the NOAA Fisheries Collection, Auke Bay, Juneau, AK; and the Tongass Historical Society original Robert Hodge Collection from BC and AK published on in 1976. The Hodge 1976 collection has since been moved to the Auke Bay NOAA Collection site. Little has been learned regarding this species' distribution in Alaska since 1992 when the first record for the Vank Island Group was detected on Sokolof Island (Norman 1998); this was also the first insular record and the westernmost published record for the state. Other island records were found in 1992 surveys in the Stikine Delta Group. These records were published by the author in 2004. The Taku River drainage, with a single voucher in the NOAA Auke Bay Collection from 1984 represents the northern record for the species in Alaska, and for the North American continent. Stebbins 1985 and 2003 represent coverage for the species' distribution as rather general swaths over the southeast Panhandle of Alaska. The true distribution as published appears to be in much more restricted to the Taku and Stikine River drainages and to at least 1 island immediately outside the Skine Delta. Purposeful surveys for the species on Mitkof Island, and other Islands in the Alexander Archipelago, have been negative. The author's very limited surveys for amphibians in general at Chignik Bay, Ugashik Bay, the Egegik River area, Larsen, Uganik and Uyak Bays, Kodiak Island, Prince William Sound Area, Prince of Wales Island, Baranof Island and Dall Island, have been negative. Other amphibians have been detected on Vank, Revillagigedo, Zarembo, Kuiu, Kuprenof, Mitkof, Wrangell, Onslow, Etolin, Rhynda, Farm and Little Dry Islands and many mainland areas in the Stikine River and Juneau Areas.

PRELIMINARY RESULTS OF LARGE-SCALE SURVEYS FOR WESTERN TOADS IN SOUTHEAST ALASKA WITH RELEVANCE TO LANDSCAPE-LEVEL MONITORING AND CONSERVATION PLANNING

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There is a paucity of objective information available about the current distribution of the western toad (*Bufo boreas*) in Southeast Alaska, despite growing interest in its status and monitoring its population trends in the region. In 2005, a 2-yr, multi-agency pilot study was initiated to conduct an inventory of western toads utilizing a large-scale, occupancy-based approach modeled after the USGS "mid-level" amphibian monitoring framework. Specifically, we set out to: (1) test the utility of a rapid visual-survey protocol with agency partners; (2) test and refine a landscape-scale sampling design that incorporated random sampling of wetland-patches consisting of low- or high-potential habitat designations; (3) determine if baseline occupancy estimates are adequate for future monitoring; and (4) identify microhabitat- and landscape-scale correlates of toad occurrence. We conducted repeat-observer surveys during the prime breeding period (May 1 – July 15) at 105 randomly selected and an additional 155 opportunistically surveyed wetland habitat patches in 3 potential monitoring areas in Southeast Alaska: Prince of Wales Island, Admiralty Island, and the Chilkat Valley. Among all patches surveyed (n=260), encounter rates of toads (all stages) ranged from 18-21% among the 3 areas, whereas evidence of recent breeding (eggs, larvae, metamorphs, and yearlings) were encountered in 10-18% of patches. Among randomly selected patches, both general toad occurrence and evidence of recent breeding were encountered at 10-40% of patches among the 3 areas. We also encountered rough-skin newts at 15-17% of randomly selected patches on Prince of Wales and Admiralty Island. These numbers likely underestimate true occupancy in these areas because they do not account for detection error, which we are currently evaluating, and include sampling effort in marginal habitats. Nonetheless, these results appear promising for occupancy-based monitoring in the region, and future plans and further implications of these results for large-scale conservation planning will be discussed.

ALASKA'S ABNORMAL WOOD FROGS

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Amphibians are viewed as sentinels of environmental health, the "canaries in the coal mine" of the natural world. Amphibian populations are declining globally, a matter of concern for researchers since the early 1990's. Straightforward causes, such as habitat loss, do not solely explain these declines. Amphibian populations are declining in remote areas with no physical habitat disturbance, leading to speculation that declines may have subtle causes, such as synergistic effects among multiple environmental stressors. Some of the stressors suspected of causing declines are known to cause physical abnormalities in amphibians. Abnormalities in amphibian populations can therefore be important indicators of impaired population health. In 2000, concern about amphibian abnormalities and declines prompted the U.S. Fish and Wildlife Service to initiate a study of abnormal amphibians on National Wildlife Refuges throughout the United States. In conjunction with this study, our group has examined 6,723 metamorphic wood frogs (*Rana sylvatica*) from 67 breeding sites on 5 National Wildlife Refuges in Alaska (Kenai, Arctic, Innoko, Yukon Delta, and Tetlin). We have found abnormal frogs in both remote and developed sites, and within the boundaries of all Alaskan Refuges; however prevalence of abnormal frogs varies by site, refuge, and year. Baseline prevalence of abnormal frogs in wild populations should be less than 2%, yet we have documented a higher prevalence of abnormal frogs at all Alaskan Refuges studied. The most common abnormalities are missing or shrunken limbs and parts of limbs and abnormal eyes. In 2004, we focused the study on the Kenai Refuge to identify stressors that might cause the observed abnormalities. These stressors include chemical contaminants, parasites, ultraviolet radiation, and interactions among these factors. The stressor-identification study also includes diagnostics such as radiographs, cellular-level biomarkers, and evidence of endocrine disruption. Preliminary results are presented.

STUDYING WOOD FROGS IN RELATION TO GLOBAL CHANGE

Walt Sadinski

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Many in the United States and Canada are concerned that changes in global environmental conditions are altering ecological systems in significant ways that we do not understand. Climate ultimately drives all ecological processes. Thus, much concern is focused on climate change and its relationship to other components of global change, such as the emergence of diseases. Climate and disease can significantly affect the fitness of amphibians. Amphibians are ectotherms that typically require humid or aquatic conditions, often reproduce in wetlands, and are known to be susceptible to various pathogens. These traits have broad implications for the persistence of amphibian populations in the face of global change and also make them useful to study as indicators of such change. The wood frog, *Rana sylvatica*, is one such potentially useful indicator. Wood frogs live from the southeastern U.S. northward across most of Canada and Alaska. They breed primarily in temporary and other fishless wetlands where their success is dependent upon suitable temperatures and hydroperiods. They also breed explosively, call during mating, lay communal egg masses, and metamorphose relatively quickly. Potentially fatal diseases such as Chytrid fungus, Ranaviruses, and water molds have been documented in wood frogs, but we know little about effects of these diseases throughout most of the wood frog's range. The above traits of wood frogs make them susceptible to climate change and the emergence of diseases, but also amenable to a variety of research methods. We are working to create a network of sites to study wood frogs as indicators of global change in terrestrial wetlands across their range. We plan to integrate methods to measure fitness, distribution, and abundance in relation to climate and the emergence of diseases. This will require a multi-collaborative effort among agencies and other institutions in the U.S. and Canada to be successful.

THE MONITORING OF BUFO BOREAS BREEDING ACTIVITY, ABUNDANCE AND PHENOLOGY IN HAINES BOROUGH (2002-2005)

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Since 2002, the activity, animal abundance, and breeding phenology at several known breeding sites of boreal toads have been monitored in Haines Borough. Sites range from relatively pristine to heavily altered by human activity, from turbid glacial meltwater to gravel quarry ponds to natural clear water ponds. These sites were visited repeatedly (approx. every x to x number of days) over the course of the spring and summer. Observations of breeding behavior, egg laying and the growth, development and emergence of tadpoles were collected. Instances of predation on tadpoles were noted and photographed when possible. Techniques for estimating tadpole numbers were developed and refined. Numbers of emerging metamorphs per site ranged widely, from zero to thousands. Observations illustrate that breeding activity occurs under a wide range of conditions and reproductive success varies widely in the species. The relationship between such site specific and multi-year observations and wider scale data collection efforts will be discussed as will conservation ramifications.

LESSON LEARNED: APPLICATION OF DISTANCE SAMPLING IN SOUTHEAST ALASKA TO ESTIMATE THE ABUNDANCE OF AMPHIBIAN BREEDING POPULATIONS

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Information regarding the status, distribution, habitat needs, life history, vulnerabilities, and population trends remains virtually unknown for amphibians in Southeast Alaska (SEAK). At this time, management agencies within the state of Alaska do not have an established (or accepted) standardized sampling protocol for monitoring, or for determining the distribution of amphibian populations. With this in mind, the Alaska

Department of Fish and Game (ADF&G), Division of Sport Fish, initiated a study in 2005 using 'distance sampling' as a means to estimate population size of breeding amphibians, and to assess the habitats being selected by the adults during the breeding season. Although 'distance sampling' has been used successfully for estimating abundance and computing densities for many different animal populations in a variety of habitats around the world, it had not been used for amphibian populations in Alaska. A total of 72 distance sampling transects were conducted in palustrine wetlands, located immediately adjacent to lacustrine wetlands at four different survey sites within the study area. One group of larvae and zero egg masses were found on the distance sampling transects. A number of incidental amphibian observations were recorded at the survey locations. Distance sampling proved not to be a successful survey method for this project; however, our work did provide us with a "pilot" study in which sound statistical methods were employed. The results of our effort will be shared with other entities in working toward developing a standardized protocol for purposes of monitoring and inventory in Alaska.

CITIZEN SCIENCE: MAPPING THE DISTRIBUTION OF WOOD FROGS IN SOUTHCENTRAL AND INTERIOR ALASKA.

David F. Tessler*[1] and Tracey A. Gotthardt[2]

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The Alaska Wood Frog Monitoring Project was established to obtain volunteer support in gathering baseline distribution data on wood frogs (*Rana sylvatica*) and their habitats in Southcentral and Interior Alaska. Concurrent objectives are to promote public involvement in the conservation of amphibians and wetlands, and to develop a robust volunteer program that can be utilized in the future to monitor amphibian occupancy over time. This project expands the Cook Inlet Amphibian Monitoring Program initiated in 2002 by the Alaska Natural Heritage Program. Calling survey protocols follow the national standards set forth by the U.S. Geological Survey in the North American Amphibian Monitoring Project (NAAMP).

We conducted 15 educational training programs at schools and various public venues throughout Southcentral and Interior Alaska between March and May 2005. In addition, we developed and produced a CD-ROM of training, outreach, and promotional materials for distribution to partnering entities, so that partners throughout the state could conduct

their own public programs and training sessions, delivering a uniform message and methodology. We published the website www.akfrogs.net to provide background information, survey instructions, and data sheets for potential volunteers, and produced two educational posters for distribution to schools and youth groups. We contacted school districts, youth organizations, and conservation groups directly, and used a variety of mass media elements including radio, newspapers, and flyers to promote the project.

Approximately 500 people attended educational programs in 2005, and we received hundreds of phone calls and requests for information. Fifty adult volunteers conducted 346 surveys at 97 unique sites. Frogs were detected at 73% of sites, but the proportion of unreported negative results is unclear. Since 2002, frogs have been observed at 183 unique locations. Wood frogs were observed from Fairbanks south to Homer, and from Shageluk east to Chitina; from sea-level to 880 meters. Calling frogs were reported from 1 April until 25 May. Latest frog sighting was 15 August.

The 2nd Alaska Amphibian Conference

FEBRUARY 10-11, 2006

Juneau, Alaska

AGENDA

-Friday, February 10-
Egan Library Lecture Hall
University of Southeast

8:30 Welcome and Opening Remarks – TBA

8:45 Current and future threats to amphibian populations - Dr. Stephen Corn, Aldo Leopold Wilderness Research Institute, Missoula, Montana

9:15 Studying wood frogs in relation to global change – Dr. Walt Sadinski, USGS Upper Midwest Environmental Sciences Center, LaCrosse, WI

9:45 Contributing factors to wood frog abnormalities on the Kenai National Wildlife Refuge - Mari Reeves, US Fish and Wildlife Service, Environmental Contaminants, Anchorage, AK

10:15 BREAK

10:30 Worldwide declines in amphibians, chytridiomycosis & climate change - Dr. Cynthia Carey, University of Colorado, Boulder, CO

11:00 Are there invasive amphibian populations in Alaska? - Lance Lerum, Fish, Wildlife, & Ecology, Admiralty National Monument, AK

11:20 Update on the statewide Alaska amphibian occurrence database Tracey Gotthardt and Dr. Sanjay Pyare, Alaska Natural Heritage Program, Anchorage, AK and the University of Alaska Southeast, Juneau, AK

11:30 LUNCH

1:00 Preliminary results of large-scale surveys for western toads in Southeast Alaska with relevance to landscape-level monitoring and conservation planning – Dr. Sanjay Pyare, University of Alaska Southeast, Juneau, AK

1:30 Monitoring wood frog populations in interior and southcentral Alaska through a partnership in citizen science – David Tessler and Tracey Gotthardt, Alaska Natural Heritage Program and the Alaska Department of Fish and Game, Anchorage, AK

-Friday, February 10-
Egan Library Lecture Hall
University of Southeast
(CONTINUED)

1:50 The Monitoring of Bufo boreas Breeding Activity, Abundance and Phenology in Haines Borough (2002-2005) - Tim Shields, Takshanuk Watershed Council

2:20 BREAK

2:30 Statistical methods for a region wide amphibian monitoring program - Randy Mullen, Alaska Department of Fish and Game, Douglas, AK

3:00 Monitoring the occupancy of ponds by frogs in relation to stressors: an ARMI example – Dr. Mike Adams, USGS Forest & Rangeland Ecosystem Science Center, Corvallis, OR

3:30 Panel Discussion: How can Alaska integrate efforts with other national and regional research and monitoring efforts
Chairs: Drs. Mike Adams, Steve Corn, Cynthia Carey

4:15 Day wrap-up/adjourn – Dave Tessler

-Saturday, February 11-
Egan Library Lecture Hall
University of Southeast

08:30 – 10:00 Workshop 1. Environmental Stressors to Consider in Alaska. This workshop will focus on developing interagency strategies for monitoring relevant stressors and their potential impacts on amphibian populations across the state.
Moderators: Drs. Steve Corn and Sanjay Pyare

10:00 – 10:15
Break

10:15 – 11:45 Workshop 2. Monitoring: Response variables, statistical inference, and methods. This workshop will highlight elements of monitoring strategies and serve as a forum to discuss cooperative, interagency framework for monitoring the most common amphibians in Alaska.
Moderators: Dr. Mike Adams and David Tessler

11:45 – 1:00
Lunch (will be ordered in)

1:00 – 2:30 Workshop 3. Monitoring Chytrid Fungus & Malformations. This workshop will cover sampling for chytrid fungus and amphibian malformations, with the goal of coordinating sampling and monitoring protocols across the state for both chytrid and malformations.
Moderators: Dr. Cynthia Carey and Mary Reeves