COASTAL TEMPERATE RAINFORESTS:
Integrating Science, Resource Management, and Communities

Symposium Program

APRIL 17-19 2012
COASTAL TEMPERATE RAINFORESTS

Symposium Sponsors

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North Pacific Landscape Conservation Cooperative
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U.S. Forest Service, Pacific Northwest Research Station
Central Council Tlingit & Haida Indian Tribes of Alaska
Coastal Temperate Rainforests: Integrating Science, Resource Management, and Communities

April 17-19, 2012

Centennial Hall, Juneau, Alaska
What is the Alaska Coastal Rainforest Center (ACRC)?

The Alaska Coastal Rainforest Center is a research center at the University of Alaska Southeast that expands research and outreach across coastal temperate rainforests. The Center enhances collaboration between universities, government agencies, tribes, Alaska Native corporations, industry, and other public and private entities sharing its goals. The Center’s key product offerings include white papers, framework assessments and gap analyses, data repositories, synthesis reports, scenario reports, and citizen science projects as well as policy discussions, workshops, and symposia.

Our Vision

The Alaska Coastal Rainforest Center will stimulate education and research by synthesizing ecological, economic, and social information to support vibrant and resilient communities and ecosystems.

Alaska Coastal Rainforest Center Partner Network:

| British Columbia Ministry of Forests, Lands, and Natural Resource Operations |
| Central Council, Tlingit and Haida Indian Tribes of Alaska |
| City and Borough of Juneau* |
| Geos Institute |
| Hakai Network, Simon Fraser University |
| Juneau Economic Development Council |
| NOAA Fisheries |
| NOAA National Weather Service |

| The Nature Conservancy |
| University of Alaska Anchorage |
| University of Alaska Fairbanks* |
| University of Alaska Southeast* |
| U.S. Fish and Wildlife Service, Alaska Region* |
| U.S. Forest Service, Alaska Region* |
| U.S. Forest Service, Pacific Northwest Research Station* |
| U.S. Geological Survey, Alaska Area |

* Founding Members

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# Calendar of Events

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<tbody>
<tr>
<td>10:00 AM - 3:00 PM</td>
<td><strong>Field Trip</strong></td>
<td>Auke Bay Harbor</td>
<td>Please arrive at Auke Bay Harbor Dock by 9:30 AM. More information: Page 8-9</td>
</tr>
<tr>
<td>8:00 AM - 12:00 PM</td>
<td><strong>International Plenary</strong></td>
<td>Centennial Hall, Sheffield Ballroom 1</td>
<td>Open remarks will begin at 8:15 AM. More information: Page 10-13</td>
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<tr>
<td>12:00 PM - 2:00 PM</td>
<td><strong>Lunch &amp; Keynote Speaker</strong></td>
<td>Centennial Hall, Sheffield Ballroom 1&amp;2</td>
<td>Lunch provided for all registrants. More information: Page 14</td>
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<tr>
<td>8:00 AM - 10:00 AM</td>
<td><strong>Morning Keynote Speaker</strong></td>
<td>Centennial Hall, Sheffield Ballroom 1</td>
<td>Opening remarks begin at 8:15 AM. More information: Page 26</td>
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<td>10:00 AM - 12:00 PM</td>
<td><strong>Concurrent Sessions: 2A &amp; 2B</strong></td>
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<tr>
<td>12:00 PM - 2:00 PM</td>
<td><strong>Lunch &amp; Keynote Speaker</strong></td>
<td>Centennial Hall, Sheffield Ballroom 1&amp;2</td>
<td>Lunch provided for all registrants. More information: Page 33</td>
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**Calendar of Events**

**Registration, Public Reception & Keynote Speaker**
Location: Centennial Hall, Sheffield Ballroom 1&2  
Time: 5:30 PM-8:00 PM  
Special Details: Reception is open to the public. Please visit registration table to pick up badge and registration materials.  
More information: Page 9

**Concurrent Sessions: 1A & 1B**  
Location: Centennial Hall, Sheffield Ballroom 1&3  
Time: 2:00 PM - 4:00 PM  
More information: Page 14-20

**Science Social**  
Location: The Buoy Deck  
Time: 5:30 PM - 7:30 PM  
Special Details: All registrants are welcome to attend. The Buoy Deck is located at 345 Egan Drive, see directions on page 42.  
More information: Page 21

**Concurrent Sessions: 3A & 3B**  
Location: Centennial Hall, Sheffield Ballroom 1&3  
Time: 2:00 PM - 4:00 PM  
More information: Page 33-37

**Poster Session, Banquet & Keynote Speaker**  
Location: Centennial Hall, Sheffield Ballroom  
Time: 5:00 PM - 8:00 PM  
Special Details: A poster session will take place between 5:00 PM and 6:00 PM. The banquet will begin at 6:00 PM. Pick up your banquet ticket at the registration table during registration. More information: Page 38-40
April 17, 2012
AUKE BAY TO BERNERS BAY FIELD TRIP

The ship will depart from Auke Bay Harbor at 10 AM and return by 3 PM. As we travel to and from Berners Bay, researchers and naturalists will illuminate the geological, natural, and social history of the region. There will be opportunities for informal discussions with temperate rainforest experts throughout the trip. Naturalists will also be available to point out wildlife and describe sights along the way, such as the Juneau ice field; subtidal, intertidal, temperate rainforest, and ridge-top alpine ecosystems; and anadromous fish streams. Wildlife sightings can include seals, eagles, mountain goats, Steller sea lions, black and brown bears, harbor and Dall’s porpoises, and orca and humpback whales. Catered lunch and coffee, tea, and beverage service will be provided. Binoculars will also be available for passenger use. Talks will occur every 20 minutes, lasting for 10 minutes, followed by a 10-minute period for observation and discussion.

8:45 AM  Shuttle from Centennial Hall (if needed)
9:30 AM  Board Catamaran
10:00 AM  Departure Orientation
10:15 AM  Welcome
Speaker: Michael Goldstein, Executive Director, Alaska Coastal Rainforest Center
10:30 AM  Introduction
Speakers: David Katzeek and Paul Marks, Cultural Knowledge Bearers, Goldbelt
11:00 AM  A Naturalist’s Perspective
Speaker: Riley Woodford, Naturalist, Alaska Department of Fish & Game
11:20 AM  Bedrock Geology, Landscape Evolution (Geomorphology) and Active Tectonics
Speaker: Cathy Connor, Professor, University of Alaska Southeast
11:40 AM  Glaciers and Glaciology
Speaker: Eran Hood, Professor, University of Alaska Southeast
12:00 PM  Lunch, provided
1:00 PM  Oceanography
Speaker: Ginny Eckert, Professor, University of Alaska Fairbanks
1:20 PM  Subsistence  
Speaker: Dolly Garza, Professor Emeritus, University of Alaska

1:40 PM  Intertidal and Nearshore Ecosystems  
Speaker: Mandy Lindeberg, Marine Biologist, Alaska Fisheries Science Center, NOAA

2:00 PM  Forest Ecology  
Speaker: Paul Alaback, Professor Emeritus of Ecology, University of Montana

2:20 PM  Héen Latinee - Ridge to Reef  
Speaker: Rick Edwards, Lead Scientist, Héen Latinee Experimental Forest, U.S. Forest Service

2:40 PM  Closing Thoughts and Thanks  
Speaker: Michael Goldstein, Executive Director, Alaska Coastal Rainforest Center

3:00 PM  Return to Auke Bay, shuttle transport available to Centennial Hall

5:30 PM to 8:00 PM  REGISTRATION & PUBLIC RECEPTION  
LOCATION: CENTENNIAL HALL, SHEFFIELD BALLROOM 1&2

Join us beginning at 5:30 PM for a public reception celebrating the opening of the symposium. Food and refreshments will be provided in the Centennial Hall ballroom, with registration for the following two days of events occurring in the lobby (please see page 10 for more registration information). Those already registered need to stop by to pick up registration materials. Day of registrations are welcome.

7:00 PM  Opening Remarks  
Speaker: John Pugh, Chancellor, University of Alaska Southeast

Keynote: “Alaska’s Place in the Future of Conservation”  
Speaker: Peter Kareiva, Chief Scientist & Director of Science, The Nature Conservancy

Abstract: In the lower 48, conservation has lost momentum, and has been misled by messages of doom and gloom, and nature without people. The human footprint is everywhere and even wilderness such as Alaska feels the heavy impact of human activities. A new conservation is embracing working landscapes, partnerships with corporations, and paying attention to the economic value of nature. The new conservation is also trying to connect today’s youth with nature, worried that if fails to do so, videos and the internet reality will trump nature. Alaska has always been special – the last great American wilderness of unrivalled beauty. But Alaska too is facing pressures of mining and logging and unsustainable fishing that could degrade its natural capital. The challenge will be for Alaska to avoid what has happened in the lower 48, and to remain a special place while also allowing for economic growth. This may well require new alliances and strategies that are less about litigation and more about a joint vision for the future.
Session Abstract: This session focuses on the world’s coastal temperate rainforests in time and space from the Earth’s deep past to the present state. It then focuses on the global significance of temperate rainforests. Representing only 2.5% of the world’s forests (243 million acres) these remarkable rainforests are among the most carbon dense ecosystems on the planet, are exceptionally productive (due to marine, freshwater, terrestrial, tidal-glacial ecotones), have extraordinary levels of lichen richness (more than the tropics), and contain unusual species found nowhere else on earth (many plants, lichens, invertebrates, amphibians, birds, and fish). Temperate rainforests are found in only 10 regions of the world, mostly along coastlines but not exclusively (e.g., Inland Northwest North America and Inland Southern Siberia). Northern hemispheric rainforests tend to be more similar to each other than those in the Southern hemisphere. Northern hemispheric rainforests, with Tertiary affinities, share remarkable similarities in lichen composition. Southern hemispheric rainforests (Valdivia, Australasia, South Africa) share many similar tree genera due to ancient Gondwana affinities. This session will provide a global synthesis of the importance of temperate rainforests setting the tone for why the Pacific coastal rainforests - the most significant concentration of temperate rainforests in the world - are so vital regionally and internationally. Session Chair: Dominick DellaSala, Chief Scientist, Geos Institute.

International Plenary
“A Global Spotlight on Temperate Rainforests - Where, How Much, and Why Should We Care?”
Location: Centennial Hall, Sheffield Ballroom 1

8:00 AM to 12:00 PM

Registration Information: For those pre-registered, please visit the registration table in the main lobby of Centennial Hall either from 5:30 PM - 7:00 PM on April 17, or 7:00 AM - 8:00 AM on April 18 or 19. Registrants will receive registration packets and name badges. Day of registration is available as space allows.

7:00 AM Registration Opens; Coffee, tea, fruit and breakfast pastries will be provided.

8:15 AM Opening Remarks
Speaker: Michael Goldstein, Executive Director, Alaska Coastal Rainforest Center, followed by Speaker: President Edward K. Thomas, Central Council Tlingit & Haida Indian Tribes of Alaska
Abstract: The Pacific Rim hosts most of the world’s temperate coastal rainforest. Discussions of rainforests (temperate or tropical) often misuse the term “ancient.” From a deep time perspective, the discussion of rainforests should be couched in what we know about the evolution of forests in general and should be calibrated in this context. The world’s first forests appear in the Late Devonian, roughly 400 million years ago (mya). Conifer trees and forests first evolve around 300 mya and angiosperm trees and forests first appear around 120 mya. Despite the relative antiquity of conifers and angiosperms, the angiosperm-dominated rainforest of Chile-New Zealand-Australia have deeper antiquity than the conifer dominated rainforests of the NE Pacific Rim with the former beginning to assemble by 80 mya and the latter beginning to assemble as recently as 30 mya. In this context, the temperate forests of the NE Pacific Rim are relative newcomers.

Plant evolution and biome assembly occurs on a geologic timescale and as such are directly affected by long term trends in climate, continental position and connection, the evolution of mountain belts, and glaciations. For this reason, forest types often have greater antiquity than the landscapes that they presently occupy. This odd fact that coastal rainforests are relatively recent in context to forests in general but are largely older than the land they occupy is the source of much confusion and misattribution.

Several geologic events are critical to the assembly of the various extant coastal rainforest communities of the Pacific Rim. First, beginning as early as 250 mya and active still today, tectonics along continental margins formed mountain belts which in turn formed a diversity of altitude-stratified habitat zones and high levels of orographic rainfall. Second, the Cretaceous-Tertiary asteroid impact (66 mya) caused extinction of plants in North America removing such elements as Araucariaceae from the flora. Third, a series of hyperthermal events of various durations in the early Eocene (~55-50 mya) led to brief episodes of subtropical climate at polar latitudes that allowed transpolar migrations of thermophilous trees species across both poles. Fourth, the final fragmentation of Gondwana and the transition from a global greenhouse climate to a global icehouse climate occurred around 34 mya. These events had the effect of vicariating the southern hemisphere forests and cooling global climate. This cooling began a transition that resulted in northern hemisphere forests where Pinaceae became more common and widespread relative to Cupressaceae-Taxodiaceae and in southern hemisphere forests where Nothofagus forests were more common with increased latitude. This cooling also replaced Antarctic polar forests with ice sheets and eventually destroyed them altogether by 3 mya. Fifth, continental glaciation beginning around 2.5 mya, shaping the landscapes of the NE and SE Pacific Rims and repeatedly forcing biomes to shift over significant latitude and altitude. forests on the NW Pacific Rim in Asia have much higher diversity than similar latitude forests in North America because Pleistocene glaciation was much less expressed in eastern Asia. Modern conditions finally occurred with the withdrawal of the most recent glaciation around 10,000 years ago. In this context, modern conditions have existed only as long as the serial lifespans of ten “ancient” western red cedars.
9:30 AM  “Forgotten Rainforests: Temperate and Boreal Rainforests of the World”
Speaker: Dominick DellaSala, Chief Scientist, Geos Institute

Abstract: Temperate and boreal rainforests make up less than 3 percent of the total forest cover globally and are found in just ten regions: Pacific Coastal North America, Inland British Columbia, Eastern Canada, Valdivia (Chile and Argentina), Australasia (Australia, Tasmania, New Zealand), Japan, Europe (Norway, UK, Ireland, Balkans, Switzerland, Caucasus), South Africa, Inland Southern Siberia, and Russian Far East. Narrow temperate ranges (average annual 6-11 C), variably high precipitation (average annual 846 – 2658 mm), and cool, moist summers (up to 19% of annual precip) climatically define these unique rainforests. The Pacific Coastal region (Alaska to redwoods) is globally significant with 35% of the total cover, and, along with Eucalyptus mixed rainforests of Australia, are among the most carbon dense ecosystems on the planet. The Tongass is one of only 4 regions globally (the other three are Great Bear, portions of Valdivia and Tasmania) that still has relatively intact old-growth rainforest. Valdivia contains exceptional endemism with 60% of some taxa (herpetofauna) endemic and Japan contains high tree richness and endemism for a temperate region. High levels of lichen richness, perhaps even higher than tropical rainforests, characterize temperate rainforests from Europe’s sessile oaks to British Columbia’s towering conifers. Temperate/boreal rainforests around the globe are in rapid decline with some regions having little (redwoods) to no (Europe) intact or native forests. Globally, temperate/boreal rainforests remain “forgotten” in the sense of their omission from global accords to curtail deforestation emissions. Their tight association with cool, moist climates makes them a prime candidate for significant climate change impacts.

10:00 AM  Break

10:30 AM  “The North Pacific Rainforest: A Remarkable Place and an Unusual Opportunity”
Speaker: Gordon Orians, Professor Emeritus, University of Washington

Abstract: The North Pacific Temperate Rainforest of north coastal British Columbia and Southeast Alaska, the largest coastal temperate rainforest ecosystem in the world, encompasses a large island archipelago with a rich and genetically distinct biota caused by complex patterns of re-colonization following retreat of the ice that recently covered most of the area. This coastal rainforest, dominated in BC by the Great Bear Rainforest and Haida Gwaii and in Alaska by the Tongass National Forest, still has intact food webs and it intimately interfaces with a globally significant marine ecosystem. It features an elevation gradient from lowland valley old-growth forest to alpine rock and ice within short distances. Although the region has been substantially altered by human activities during the last half century, opportunities exist to use modern scientific tools to devise a management plan and conservation strategy that preserves the region’s rich biological diversity and ecological integrity while also achieving a sustainable use of the area’s valuable natural resources for the benefit of both residents and visitors.
**Abstract:** The concept of temperate rainforest is relatively new, and has largely arisen from individual studies of widely separated rainforest regions. Scientists are still working on developing a more robust integrated understanding of how rainforests work and in turn how to best conserve them in the face of climate change and growing human pressures. One of the most powerful scientific tools to promote integration and to better test our ecological concepts is to compare ecosystems that share essential characteristics such as climate and physiography but contrast in biota and history. For the northern Pacific rainforest the obvious comparison is with southern South America, since it is the only other place on Earth with a similar range of climate and breadth of rainforest ecosystems. While these two fjordland coastal regions appear superficially similar, their divergent biological and social histories provide important contrasts. By looking at the Patagonia region in detail you can develop a much clearer understanding of what are the key emergent properties of temperate rainforests and conversely what is really unique about our own rainforests. Like most rainforests in the southern hemisphere a key challenge for conservation are the largely unique or endemic species and even families of plants and animals that only occur in southern South America, and their susceptibility to fragmentation. The long period of isolation of these forests also makes them susceptible to exotic species invasions including forest type conversions. By contrast, patterns of disturbance ecology, and threats from resource development are common to both regions. We have much to gain from scientific and cultural exchanges with Patagonia so that we can learn from each other in the ways to best understand and conserve these unique ecosystems.

11:00 AM  
“Coastal Rainforests of South America - Why Compare with the North Pacific Rainforest?”  
**Speaker:** Paul Alaback, Professor Emeritus of Ecology, University of Montana

11:30 AM  
“Learning to Navigate the Social, Cultural, Ecological Dimensions of Building Sustainability in the Coastal Temperate Rainforest”  
**Speaker:** Ken Lertzman, Professor, Simon Fraser University

**Abstract:** The coastal rainforests of the Northwest Coast of North America share a suite of ecological and social opportunities and challenges. Building conservation strategies that meaningfully address issues of sustainability for the human residents of the rainforest ecosystems is a big challenge. In coastal British Columbia, several areas have been the subject of intense, high-profile, public controversy over the last 20 years. In each case, adopting a strategy of “ecosystem-based management” (EBM) has been key to resolving conflicts and building partnerships across communities, ecosystems, and disciplines. In each case a substantial amount of forest has been protected and novel approaches to forestry adopted for the areas where forest management will be practiced. As well, the EBM system is intended to address issues of community sustainability, values, and human well-being. Some aspects of this mix have been more successful than others. Meaningfully linking management and conservation strategy across terrestrial, freshwater, and marine systems is in its infancy. Making real progress on human well-being, and community, social, and economic sustainability has been more challenging than areas more easily addressed by scientific research and engineering solutions. We have a goal of supporting communities to build, sustain, or recover the resilience they will need in order to survive the economic, climatic, ecological, and social challenges ahead. To do this, we need solutions that challenge a lot of our assumptions about the nature of resource economies and dependent communities. We need solutions that are as game-changing in these dimensions as EBM was in its ecological and conservation planning dimensions.
**LUNCH KEYNOTE**

**LOCATION: CENTENNIAL HALL, SHEFFIELD BALLROOM 1**

12:00 PM  
Lunch, served in Sheffield Ballroom 2, eaten in Sheffield Ballroom 1

12:30 PM  
Opening Remarks  
Speaker: Bruce Botelho, Mayor, City and Borough of Juneau

Speaker: Terry Chapin, Professor Emeritus of Ecology, University of Alaska Fairbanks

**Abstract:** Rapid increases in per capita consumption, and to a lesser extent population growth, have led to unsustainable trajectories in the relationship between people and the biosphere. This occurs as people seek to meet their desires and needs, not because they deliberately degrade their environment. To what extent might a stronger sense of place increase peoples’ awareness of their environment and shift behavior toward a more sustainable trajectory? Many cultural worldviews are strongly embedded in acceptable relationships between people and nature. Peoples’ behavior is also influenced by social norms and ideological worldviews. How might social norms that motivate stewardship behavior be strengthened relative to those that create tradeoffs with environmental benefits? Economic valuation of ecosystem services and regulation of people’s use of the environment address some economic and political dimensions of individual choice. However, educational and outreach activities that reconnect people with nature and strengthen individual sense of place provide an important additional motivation for stewardship behavior. Earth stewardship will require attention to these multiple dimensions of sense of place.

**CONCURRENT SESSIONS 1A & 1B**

**A:** “Adapt or Die, Mitigate or Fry: Adaptation and Mitigation Strategies for a Globally Significant Rainforest Region”  
Session Chair: Dominick DellaSala, Chief Scientist, Geos Institute

**B:** “From Sun to Sea: A Top-Down Exploration of Climate Effects on the Coastal Temperate Rainforest”  
Session Chairs: Tom Ainsworth, Meteorologist in Charge, NOAA Weather Service, and Eran Hood, Professor, University of Alaska
**Session 1A**

"Adapt or Die, Mitigate or Fry: Adaptation and Mitigation Strategies for a Globally Significant Rainforest Region"

**LOCATION: CENTENNIAL HALL, SHEFFIELD BALLROOM 3**

**Session Abstract:** Temperate rainforests of the Pacific coastal region have a tight association with cool, moist climates that have provided ideal conditions for rainforest assemblages to persist for up to 7,000 years. A rapidly changing climate coupled with cumulative land-use stressors present unprecedented challenges to managers and conservationists wishing to maintain rainforest ecosystems and the critical ecosystem services we depend upon. Panelists will share lessons learned from adaptation strategies conducted across the region, including key findings, obstacles, and pragmatic steps for answering the question of whether there is sufficient time to save all the pieces. Session Chair: Dominick DellaSala, Chief Scientist, Geos Institute.

2:00 PM  
"Strategies for Incorporating Climate Model Uncertainties into Coastal Rainforest Management and Planning”

**Speaker:** Stephen Gray, Director of the Alaska Science Center, U.S. Geological Survey

**Abstract:** Given the potential for continued warming to bring significant impacts to coastal rainforest ecosystems, climate model projections are becoming a key component of regional adaptation planning and natural resource management. However, critical model uncertainties remain, particularly as they relate to our ability to understand future precipitation trends, seasonal changes, and climatic extremes. Using a suite of examples drawn from throughout North America, this talk will explore how resource management and planning processes can be adapted to fit the realities of climate model uncertainties. Likewise this talk will show how climate model uncertainties can actually help us identify viable response strategies, and how uncertainty can aid in prioritizing current management actions. Furthermore, this talk will outline the Alaska Climate Science Center’s plan for supporting advanced climate modeling efforts and, in particular, how downscaling approaches will be used to address critical adaptation and management needs.

2:20 PM  
"The Stock and Flow of Carbon in Terrestrial Ecosystems of the North Pacific Coastal Temperate Rainforest”

**Speaker:** David D’Amore, Research Soil Scientist, U.S. Forest Service, Pacific Northwest Research Station

**Abstract:** The north Pacific coastal temperate rainforest has some of the largest carbon stocks in the world. Carbon accumulation in terrestrial ecosystems is an important mitigating factor for excess CO2 in the atmosphere. Terrestrial ecosystems absorb approximately 30% of anthropogenic carbon emissions worldwide. The carbon accumulation rate of the large, intact forests of the north pacific coastal temperate rainforest has not been quantified and the contribution of this region to the global balance of carbon flows between atmospheric and terrestrial pools is uncertain. We addressed this information gap with a coordinated research program to investigate carbon cycling across a range of ecosystem types. The strong hydrologic gradient among soils across hillslopes served as a template for constructing a conceptual design and approach for constraining carbon budget estimates in unmanaged watersheds. A set of long-term experimental forest stands allowed us to measure carbon accumulation across different ages of young growth stands. (Continued on Page 39).
Abstract: The iconic ecosystems of western Washington support diverse and abundant wildlife populations, and provide important resources and services for human communities. However, the new and variable conditions that are emerging due to rapid climate change are expected to significantly alter the natural systems that wildlife and human communities both depend on. In response to this threat, EcoAdapt and the Geos Institute have created a series of conservation decision-support tools to help determine how important temperate rainforest watersheds in western Washington are likely to be affected by climate change, and to identify spatially explicit strategies and actions to facilitate adaptation across ecosystem types. The project is being implemented in a two-phased approach: (1) terrestrial ecosystems (completed) and (2) freshwater and coastal marine ecosystems (in progress). For terrestrial ecosystems, habitat and conservation area data, select biodiversity and species data, predicted future development risk, and projected climate change data were used as inputs to develop GIS-based conservation maps for the region. We are in the process of expanding this project to develop similar conservation maps for freshwater ecosystems. The resulting climate-informed maps will identify priority areas and strategic actions that, when combined, are expected to provide species and linked ecosystems with the greatest likelihood of persistence and function under changing climate conditions. They are intended to evaluate the vulnerability of new and ongoing conservation planning processes in the region to climate change impacts, and will provide an integrated assessment of spatially explicit adaptation opportunities along the linked terrestrial and freshwater systems studied.

Abstract: The Yale Framework is a collaborative product of nationally recognized scientists and policy experts intended to provide application tools for “climate-smart” ecological assessments. Here, we apply elements of the framework to Pacific coastal rainforests (coastal Alaska to California redwoods). We chose this region because it contains 35% of world’s temperate rainforests and some of the last remaining intact ones; northern locales (e.g., Juneau, AK) are experiencing rapid increases in average annual temperature, and the project involves collaboration among researchers and managers. Our specific objectives are to develop an adaptation blueprint using framework elements by: (1) comparing baseline (historic and current) to future climate scenarios; (2) identifying key processes likely to shift in response to climate change; and (3) identifying relatively stable climatic areas and intact patches that might function as microrefugia. We used the framework’s emphasis on levels of biological organization stepping down from regional (Pacific Coastal) to subregional (rainforest zones) to landscape to focal species (e.g., conifers, epiphytic lichens, spotted owl, marbled murrelet) to microsite. Maxent models and regional climate datasets were used to map current rainforest distributions that were compared to future potential distributions using downscaled climate change models (19 bioclimatic variables; multiple models). An MC1 functional vegetation model was used to locate potential microrefugia expected to retain the same dominant vegetation from historic through late-century based on multiple-model agreement (Hadley, CISRO, MIROC). (Abstract Continued on pg 39)
Abstract: This presentation will weave together three projects to highlight the challenges, needs, and opportunities for addressing the effects of climate change on ecosystems. First, it will present preliminary results from ten focus group sessions that examined the challenges and applied science needs associated with managing marine and freshwater species, habitats, and ecosystems in light of current and projected climate change impacts. These focus group sessions involved more than 150 marine, coastal and freshwater managers, practitioners and scientists working at the nexus of conservation and climate change within the geography of the North Pacific LCC. Second, it will present an approach to compiling the quickly emerging body of literature on climate impacts and adaptation strategies and will highlight the key impacts that are revealed. And finally, it will discuss Washington State’s soon-to-be-released Climate Change Response Strategy, focusing on efforts to turn the recommendations into actions.

Abstract: Ecosystem management and adaptation in the face of climate change requires information on habitat condition across large scales; however, in Alaska data are often lacking, and comprehensive environmental surveys are impractical and expensive to carry out. Intrinsic Potential (IP) models provide a means to identify at a large scale those portions of the landscape that can provide essential habitat for various fish species. These models are derived from watershed patterns and processes that operate at broad temporal scales and are not readily affected by human activities. Therefore, they lend themselves well to climate scenario planning. We are developing an IP habitat model for Chinook salmon juveniles in major tributaries of the Copper River in southcentral Alaska, utilizing existing digital elevation models (DEMs), salmon radio telemetry and aerial survey data, expert opinion, and field surveys. In the short run, this model will help resource managers map critical habitat for Chinook throughout the Copper River watershed, will help direct field research to appropriate stream reaches, and will assist managers in prioritizing restoration actions, such as culvert replacement. However, using down-scaled climate models, we can also incorporate future hydrologic, precipitation or glacial melt changes, and thereby predict changes to productive salmon habitat throughout the watershed. Changes to overall salmon production, distribution of important habitats, and areas of potential resource development concern can be mapped. It is our hope that this type of modeling will be broadly applicable throughout the state, and will inform future research into the ecological impacts of climate change in Alaskan river systems.
Session Abstract: The vertical extent of the coastal temperate rainforest and the interactions between the ocean, atmosphere, and coastal mountain ranges results in a large number of climate zones and ecosystems over a relatively small area. The number of ecotones and the sharp gradients between them lead to highly interactive ecosystems including icefields, steep forested hillsides, glacier fed and freshwater streams, wetlands, estuaries, and deep fjords. This session will look at the Tongass region as a whole and describe these closely connected physical and biological systems, how they interact with each other, and how a changing climate will alter the delicate and dependent balance between these systems. Potential societal impacts of a changing climate will be offered followed by an open discussion on how people perceive the changes and how society should respond to them. The main themes of this session are: climate drivers of the Tongass, the historical evolution of Alaska’s glaciers, the effects of climate on vegetation, the effects of climate on marine ecosystems, and the public response. Session Chairs: Tom Ainsworth, Meteorologist in Charge, NOAA Weather Service, and Eran Hood, Professor, University of Alaska.

2:00 PM  “When Are Climate Change Signals Liable to Emerge for the Waters of Coastal Southeast Alaska?”
Speaker: Nicholas Bond, Joint Institute for the Study of the Atmosphere and Ocean, University of Washington

Abstract: The North Pacific atmosphere-ocean system is subject to considerable variability on decadal time scales. These variations serve to obscure systematic trends in association with climate change. The present study characterizes this noise for the marine environment of coastal SE Alaska using historical reconstructions based on atmospheric and oceanic reanalyses. The “signal” associated with climate change through roughly 2050 is assessed using output from IPCC-class global climate models. An ensemble model approach is employed to estimate projected decadal means and overall trends for air-sea interaction and upper ocean variables (e.g., winds, mixed layer depths). The analysis will also consider changes in the timing of seasonal transitions. This information should be useful towards anticipating the relative timing and strength of the responses of the marine ecosystem of Southeast Alaska in future decades. It may also help guide the design of observing strategies, in particular effective sentinels for climate change related to this ecosystem.
Abstract: The ongoing melting of Alaska’s glaciers contributes significantly to global sea level rise as well as driving landscape changes throughout much of coastal Alaska. In this talk, we will review past and current trends in ice losses from Alaska’s glaciers and examine the drivers of these losses. The latter include a warming climate, a warming ocean, and dynamic instabilities, plus the feedbacks inherent in all of these processes. Glacier retreat has generated new landscapes including deep fjords, proglacial lakes, and freshly exposed land, all ripe for colonization by plants and animals. Past and ongoing ice losses are also propelling substantial glacial isostatic rebound in southeast Alaska: coastal shorelines have emerged as much as 6 m in Glacier Bay since 1750 AD, and current rates of uplift exceed 3 cm/yr in at least two locations. The most prominent display of these emergent shorelines is at shallow-sloped estuarine environments, where young forests have rapidly colonized uplifted beaches.

Abstract: Climate has always influenced the distribution, abundance, and productivity of forest trees, but there is growing concern that rapid climate change might disrupt forests in an unprecedented manner. Bioclimate envelopes or climate profiles are used to project shifting potential habitat for forest tree species as influenced by climate change. These tools are too simplistic to provide actual predictions of range-wide tree species advances or retreats, or future compositional changes in forest ecosystems, however. To have predictive utility, these bioclimate models must be infused with factors such as migration rates of tree species, disturbance and soils that favor regeneration and growth, inter-tree species competition, and the activity of biotic agents (e.g., forest insects and pathogens). This daunting task clearly will require a multidisciplinary approach and be based on extensive ecological information for each tree species. Our presentation uses knowledge of western hemlock, Sitka spruce, western red cedar, Douglas-fir, and shore pine in the coastal temperate rainforests of the North Pacific as cases to explore the interaction of climate and each of the ecological factors mentioned above. We close with a description of the widespread yellow-cedar decline as an example of the interaction of a specific climate variable (snow) and yellow-cedar’s other niche factors to expose a unique physiological vulnerability of the species. For yellow-cedar, there is now adequate knowledge of climate influences and key ecological details of the tree to anticipate future changes in cedar populations and guide an adaptive conservation strategy. Coauthor: Colin Shanley, GIS Analyst, The Nature Conservancy.

Abstract: Massive water runoff from the coastal temperate rainforest with increasing amounts of carbon is surging into the deep fjords and outer coastal waters. Higher runoffs earlier in the spring and warmer/lower streams in the summer are affecting fish habitat and migration. What is the prognosis for the coastal zone ecosystem – and the local societies that depend on them?
Abstract: A facilitated, interactive dialogue between the audience and the four presenters. Questions that will be addressed: Did the presentations support audience perception? Are there achievable adaptation or mitigation strategies to minimize impacts to the interactive systems? Should certain systems have the highest priority for attention?
Join us across the street at the Buoy Deck (directions on page 42) for tacos and drinks. All registrants are invited.

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**U.S. Geological Survey**

Alaska contains many of the most important biological, hydrological, mineral, and energy resources of the Nation and is subject to a wide variety of natural hazards, particularly earthquakes, volcanic eruptions, and landslides. The USGS Alaska Science Center with headquarters in Anchorage, Alaska, studies the complex natural science phenomena of Alaska and provides resource managers with scientific information, tools, and technologies to inform decision making.

The USGS Alaska Climate Science Center was established in 2011 as the first of eight regional Climate Science Centers. The center’s mission is to work with others to provide the science needed to anticipate, monitor, and adapt to climate change. This center is hosted by the University of Alaska in Anchorage.

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**U.S. Fish and Wildlife Service**

Working with partners to support science-based conservation

Visit the Alaska Region and the Juneau Field Office at: http://alaska.fws.gov/
Every spring the nutrient-rich Stikine River Delta near Wrangell draws millions of migrating shorebirds alongside bald eagles, sandhill cranes, bears, and harbor seals. Join the Tongass National Forest and partners in celebration of this extraordinary place at the Stikine River Birding Festival and take in birding tours, a golf tournament, family activities, and local art.

The thousands of Aleutian terns that descend near Yakutat every spring comprise the largest and southernmost known breeding colony of this rare bird. The Aleutian tern and its cousin, the Arctic tern, are celebrated during the Yakutat Tern Festival, which features Native dancers, kids' activities, bird banding, and birding tours on land and sea.

*And don’t miss the Chugach National Forest’s Copper River Delta Shorebird Festival May 3-6 in Cordova, Alaska.

Information on all three birding festivals at www.MyAlaskaForests.com

WetlandsLive: A Distance Learning Adventure is a free educational program all about wetlands for students in grades 4 to 8 and their educators, featuring live webcasts from Panama City, Panama; Vancouver, BC; and Cordova, Alaska. For more information (including resources for teachers) and to register, go to WetlandsLive.pwnet.org. Connect. Learn. Act.
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“Studying for my degree in Environmental Science at UAS was one of the greatest experiences of my life. The small student to faculty ratio provided an opportunity for interactive and dynamic discussions in the classroom and in the field. I was able to work on projects looking at water quality in streams, heavy-metal mobility in peat wetlands, and solute loading in snowpacks.”

—Jon Bower

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We promote development, coordination, and dissemination of science to inform landscape-level conservation and sustainable resource management in the face of a changing climate and related stressors.

The area encompassed by the North Pacific Landscape Conservation Cooperative (NPLCC) supports scores of native plant and animal species, a growing human population, and a rich diversity of natural resource-dependent traditions, cultures, and businesses. Resources within this 200,000 square-mile area are affected by climate change and related large-scale environmental stressors.

In close partnership with science and management organizations, the NPLCC will maximize the ability of its partners to make informed decisions with respect to conservation and sustainable resource management of natural and cultural resources subject to climate change and related large-scale stressors. It will do this by helping to coordinate the development, accessibility, and use of high-priority, management-relevant science and information related to our coastal, marine, estuarine, freshwater, and terrestrial ecosystems.

As an international member-driven partnership of state, federal, and provincial agencies; Tribes and First Nations; nongovernmental organizations; universities; and others, the NPLCC builds upon the institutional knowledge these cooperators bring to address natural and cultural resource management challenges of the 21st century.

As climate change affects snowpacks, stream characteristics, precipitation patterns, and the temperature, acidity, and level of our oceans, seas, and estuaries, we also expect responses to our biological systems by shifting species distributions and increased risk of wildfire, disease, and insect outbreaks. Effects on natural and cultural resources will extend beyond defined local and international borders. Predicting and preparing for these widespread changes will require new science along with a heightened level of coordination between resource managers and scientists throughout the Pacific temperate rain forest region.

Learn More
Visit us at www.fws.gov/NPLCC

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Mary Mahaffy, NPLCC Science Coordinator, 360 753-7763, mary_mahaffy@fws.gov
Abstract: Yakutat Tlingit people managed their resources based on Tlingit Law. The understanding for the rules for life is based upon the special connection with their ancestors’ values and traditions. The laws governing the use of trees were a priority. The firewood that kept them warm, and cooked their food was a combination of the spirit of the fire as well as the wood, their shelter, and material to build canoes, tools, and clothing. This was all a gift of the tree. Trees and other plants were believed to have spirits and therefore were treated with care. Yakutat Tlingit were deeply tied to a place; they have co-evolved along with their environment for thousands of years.

Gordon Orians, Director Emeritus of the World Wildlife Fund, and lifelong ecologist and ornithologist, will be providing a link between traditional and scientific ecological knowledge in the coastal temperate rainforest.
“Transcending Boundaries Across Human and Natural Systems of the North Coastal Temperate Rainforest”

LOCATION: CENTENNIAL HALL, SHEFFIELD BALLROOM 3

Session Abstract: The natural and managed flow of resources in the north coastal temperate rainforest has global, regional, and local impacts. Many boundaries, artificial and natural, static and dynamic, constrain our ability to understand, conserve, and manage natural resources. These boundaries operate over various geographic, ecological, and political scales. Overcoming the challenges confronted when working on cross-boundary research will provide a greater understanding of the energy and material flows through interconnected systems. Aquatic and terrestrial resource conservation and management combined with an understanding of fundamental natural cycles, depends on an ecological analysis that transcends these borders. This session will provide an overview of several natural and human boundaries to provide insight into opportunities and challenges related to integrating scientific analyses across this broad and diverse region. Session Chairs: David D’Amore, Research Soil Scientist, U.S. Forest Service, Pacific Northwest Research Station, and Paul Hennon, Research Forest Pathologist, U.S. Forest Service, Pacific Northwest Research Station.

10:00 AM  “Osmotic Movement: Indigenous People, Concepts and Environment
or Osmotic Movement: Impacts of Indigenous People”

Speaker: Steve Langdon, Professor, University of Alaska Anchorage

Abstract: Classically, western thought, particularly in its modern form, has divided existence into various ontological categories considered bounded, distinct and separate as defined by certain criteria. Examples of this formulation include nature and culture, organic and inorganic, and human ethnic (cultural) groups. By contrast, Tlingit concepts and practices display a different ontological construction of the dynamic intersections and processual relations among entities of existence – these include transformation among forms, shared intrinsic beingness, movement across life/death domains, and informed, principled modifications of “habitat.” Concerning categories of humans long discussed in the ethnological literature as Tlingit, Haida and Tsimshian, close attention to the oral traditions of peoples assigned to these categories reveals a web of interrelations that include movements of peoples, ideas, materials, objects, symbols, songs, dances and other entities among these ethnic “containers” made possible by an underlying pan-cultural template that makes these movements possible through shared understandings. Central messages to be drawn from this presentation pertaining to advancing our understanding is that of becoming through time (processes) as opposed to fixed being in time and interpenetration of open forms rather than interaction among closed forms.
Abstract: Nearly all ancient philosophies broke the material world into the classic domains of earth, air, water (or sea), and fire. Had the ancients lived in a rainforest fire may not have figured so dominantly, but the classic domains of earth, sea, and air are still reflected in our modern approaches to natural resource management. In the recent State of the Union address, our president highlighted the irrationality and complexity of some federal management by pointing out that one Department has authority over salmon when they are in the ocean and a different one while they are in freshwater. He might also have noted that salmon change nationality several times during their life history as well. Although partitioning the natural world into tidy categories serves mankind in many respects, it can restrict our understanding of the range of natural interactions with serious consequences in the coastal rainforest fringe of the eastern north Pacific. The rainforests of the north Pacific coastal temperate zone are one of the largest maritime forests in the world. Much of the rainforest of Southeast Alaska is surrounded by saltwater and reciprocal exchanges of biota, energy and nutrients among forests, streams and ocean are large. Important but underappreciated interactions occur though these massive exchanges across well-established conceptual and administrative boundaries. Quantifying the movement of water and materials from ridge top to estuary is a critical information need in understanding how terrestrial runoff influences the coastal waters of the coastal temperate rainforest. Changes in local and regional hydrology, water quality, and nutrient export caused by global warming may have serious consequences on ecosystem goods and services. A more explicit understanding of how terrestrial, freshwater, and marine ecosystems interact will be critical to managing for the future.

Abstract: Salmon travel through a number of geo-political boundaries during their lifecycle challenging managers who are bound by jurisdictions and areas of authority. To meet these challenges, unique management structures have been created to achieve common goals such as preventing overfishing and ensuring salmon return to their natal streams to reproduce. This talk discusses the institutional framework for salmon management in the exclusive economic zone (3 to 200 nautical miles) off Southeast Alaska, focusing on the federal fishery management plan as the nexus between the Pacific Salmon Treaty and the State of Alaska management of the troll fishery.
11:00 AM  “Migratory Birds and the Long Link Across Borders”  
Speaker: Jim Chu, Migratory Bird Program Specialist, U.S. Forest Service

Jim Chu works for the US Forest Service International Programs in the Wings Across the Americas Program. Jim is the coordinator for the Copper River International Migratory Bird Initiative (CRIMBI). In 2001, representatives from several units of the Forest Service and Ducks Unlimited created CRIMBI because they recognized that migratory bird conservation requires an international effort. The initiative is designed to link the Copper River Delta (Chugach NF - Cordova Ranger District) with the rest of the Western Hemisphere. To date, the initiative has partners in Mexico, Panama, Ecuador, Colombia and Peru.

11:20 AM  “Climate Culture and Resilience – A Case Study”  
Speaker: Ken Lertzman, Professor, Simon Fraser University

Abstract: Ecosystems and social systems both respond to changing climate. This dynamically changing triangle is embedded in the long-term history of cultures and ecosystems. Examination of those histories show some examples of adaptive change in response to climate and other cases which show declines or collapse and transformation. We studied long-term interactions between fire and climate in subalpine ecosystems on the south coast of British Columbia and found a period with increased fire between 1200 and 2400 years before present. This period is dramatically coincident with a period of major culture change in the indigenous people of the area, the ancestors of the Coast Salish. This period is well described in the archaeological literature. We developed a hypothesis describing these cultural changes as adaptive responses to regional climate change and its ecosystem impacts. Critical elements of this hypothesis are linkages between regional ecosystem resilience and mechanisms of social adaptation supporting cultural resilience. Some of these linkages, such as marine-freshwater-terrestrial interactions and other regional-scale ecological subsidies are meaningful in terms of consideration for modern adaptation to changing climate.

11:40 AM  “Framework of Integration from the North Pacific Landscape Conservation Cooperative”  
Speaker: John Mankowski, North Pacific LCC Coordinator, U.S. Fish and Wildlife Service

Abstract: Landscape Conservation Cooperatives (LCCs) are public-private partnerships composed of states, tribes, federal agencies, non-governmental organizations, universities and others. LCCs recognize these challenges transcend political and jurisdictional boundaries and require a more networked approach to conservation—holistic, collaborative, adaptive and grounded in science—to ensure the sustainability of North America’s land, water, wildlife and cultural resources. The area encompassed by the North Pacific Landscape Conservation Cooperative (NPLCC)—the entire Pacific coastal rain forest region—supports scores of native plant and animal species, a growing human population, and a rich diversity of natural resource-dependent traditions, cultures, and businesses. Resources within this 200,000 square-mile area are affected by climate change and related large-scale environmental stressors. In close partnership with science and management organizations, the NPLCC will maximize the ability of its partners to make informed decisions with respect to conservation and sustainable resource management of natural and cultural resources subject to climate change and related large-scale stressors. It will do this by helping to coordinate the development, accessibility, and use of high-priority, management-relevant science and information related to our coastal, marine, estuarine, freshwater, and terrestrial ecosystems.
**Session Abstract:** The Pacific northwest coastal temperate rainforest provides a wide range of ecosystem services that are vital to human health and livelihood. Collectively, these services can be grouped into the following categories: provisioning (e.g. food, forest products, and fresh water), regulating (e.g. carbon sequestration, purification of water and air, and pest control), supporting (e.g. soil formation, nutrient cycling, and primary production), and cultural services (e.g. recreation, scientific discovery, and spiritual enlightenment). This session will include presentations on (1) incorporating demands for ecosystem services—alongside studies that focus on increasing or maintaining the supply of ecosystem services—to increase the value of various initiatives throughout the region, (2) integrating supply-side and demand-side measures of ecosystem services to inform adaptive management, (3) utilizing ecosystem service valuations to inform policy decision making, (4) quantifying, throughout the chain of production, the impacts from shifting to wood-based energy in rural communities, (5) utilizing economics and ecosystem services to inform resource management decision making on public and private lands, and (6) utilizing cultural ecosystem services to complement and inform decision making.

**10:00 AM “Demand Side Ecosystem Services”**  
**Speaker: Trista Patterson, Ecological Economist, U.S. Forest Service**

**Abstract:** Ecosystem service interventions are pursued in the aim of assuring that benefits continue to flow to present and future generations. Elements that contribute to success are 1) ecosystem health (to provide the services), 2) judicious use of ecosystem services (so that benefits are not wasted or ecosystems needlessly impacted), 3) system resilience (to anticipate, recover from, or to avoid propagating ecosystem service disruption or deficit), and 4) a system architecture which generates appropriate feedback signals (i.e. to improve relational efficiencies between these over time). Many studies and interventions - conservation easements, fee simple land purchases, payments for ecosystem services etc. - have been engaged toward these aims. However, almost exclusive focus is placed on increasing or maintaining the supply of ecosystem services. Little attention is cast on the growing range and intensity of demands for ecosystem services, the role this plays in ecosystem service deficits, efforts to understand, predict or control these impacts, or the complex ways these trends directly and indirectly affect factors of ecosystem service supply. Whether due to data shortcomings, study design, or part of the ecosystem service ‘conceptual flaw’, ecosystem service models and intervention often fail to distinguish the four elements of information above. Addressing growing deficits in ecosystem services for the long-run, requires a whole-system approach. The vast majority of literature, policy, strategy, and intervention to date do not meet these criteria, or place findings in ways they can be related to the broader challenge. The Southeast Alaska coastal rainforest system represents a unique opportunity to address many of these shortcomings, in part because communities and land areas are isolated and data representing supply, demand, and disturbance factors are therefore easier to identify. Through examples, I show how addressing demand-side ecosystem services can often lead to a higher return-on-investment in ecosystem service initiatives. The paper illustrates how this plays out at local, regional, state, national, and international scales, and provides guidance for evaluating whether tools, models, and approaches engaged in other areas are sufficient for the aspiration or task at hand.
Abstract: The concept of ecosystem services has been rapidly adopted by management practitioners to inform decision-making in resource systems. Although most ecosystem services have both natural (supply) and human (demand) components - a fact that managers inherently understand - many ecosystem services assessment methods do not incorporate both types of information. We describe a simple but powerful approach for integrating supply-side and demand-side measures of ecosystem services to inform adaptive management, using the case study of Southeast Alaska. A GIS knowledge base is developed in which every ecosystem services has at least one indicator of its supply (e.g., deer habitat, salmon productivity) and its use (e.g., deer harvest, sport-fishing clients). Indicator data are transformed into watershed ranks to produce ‘base maps’ of ecosystem services supply and use, also known as the ‘provision-shed’ and ‘benefit-shed’, respectively. Landscape-scale relationships between supply and use can be used to identify and prioritize ‘leverage points’ in the resource system - where management actions targeting ecosystem services will have the largest regional impacts. For example, we identify a subset of watersheds in Southeast Alaska where changes in regulating services supporting salmon populations will have disproportionate negative impacts on subsistence harvesting and sport-fishing. In addition to managing for sustained benefit flows, these are places where adaptive management will yield the most learning about the system, its variability and its potential thresholds. Such practical information can be generated by managers using our approach with their existing data sources and expert knowledge.

Abstract: Regulatory agencies in the United States do not generally consider economic values of ecosystem services in their policy decisions. We report the results of a two-year collaborative effort by a team of economists, conservation biologists, and staff members of the California Ocean Protection Council to provide spatially explicit and policy-relevant values for ecosystem services generated in coastal regions in California. We constructed a matrix in which the rows are types of ecosystem services and the columns are types of marine ecosystems along the California coast. Where possible, we populated this matrix with ecosystem service values per unit of area drawn from the economics literature. We then evaluated whether the values for given services, in given ecosystems, could be reasonably approximated by applying the replacement cost or the avoided cost method. Reported values of coastal ecosystems varied widely, and much of the valuation research did not address specific ecosystem services. Even when ecosystem services were explicitly addressed, the services often were not described or valued in a spatially explicit manner. These results suggest that rigorous application of non-market values to policy decisions requires original valuation studies of specific services in specific ecosystems. Several examples from field research on nature-based tourism in Southeast Alaska are offered that confirm the general conclusion: Ecosystem service values per unit area vary widely depending on the surrounding biophysical, socioeconomic, and management conditions.
Abstract: This presentation addresses integrated ecological and economic solutions for small communities’ basic needs - heat, transport, energy - and reducing drivers of and vulnerability to climate change. Small and rural communities may require a coordinated approach to overcome the limitations of economies of scale. Low-carbon development strategies present potential for large payoffs at a household and community scale, and reduce vulnerability and forcing of climate change. Southeast Alaskan forests previously harvested for timber are currently re-growing with dense forest that require thinning in order to maintain ecosystem service benefits such as habitat, hunting, etc., and thinned material presents a potential biofuel source. This example is particularly relevant to small communities seeking distributed and coordinated energy/climate strategies. It presents a network approach to evaluating multiple pathways to delivering energy, and a calculation of carbon, heat, and dollar savings presented by each alternative. This study quantifies the environmental impacts throughout the supply chain of production; from the point of energy extraction and transport (upstream), through consumption and emissions accounting (downstream). (Continued on page 41).

Abstract: Many ecosystem services are public goods that can be provided by both private and public landowners. As is the case with other public goods, government provision of these environmental public goods may either crowd-out private provision or entice private landowners to increase their own provision of these goods. Furthermore, the provision of these services on public lands may influence the location of development by private landowners, which can, in turn, affect management on those same public lands. Effective management of natural resources requires a thorough understanding of the dynamic that exists between public and private landowners and the impact of their land-use decisions on the provision of ecosystem services within the confines of their properties.

Abstract: The field of ecosystem services promises to improve natural resource management through better accounting of the benefits that ecosystems provide to people as well as the consequences of ecosystem degradation on human well-being. Ecosystem services research tends to focus on the valuation of material contributions without substantially delving into intangible cultural benefits associated with nature, such as sense of place, identity or spirituality. Intangible cultural and social values have an important role to play in decision-making but monetary values and biophysical features tend to dominate planning priorities. If social and cultural considerations are not addressed explicitly, they may be ignored or represented poorly in spatial planning processes. (Continued on page 41).
Lunch Keynote
Location: Centennial Hall, Sheffield Ballroom 1

12:00 PM  Lunch, served in Sheffield Ballroom 2, eaten in Sheffield Ballroom 1
12:30 PM  Opening Remarks
Speaker: Carl J. Markon, Deputy Regional Executive, Alaska Area, U.S. Geological Survey

Keynote: “Climate Change and the Changing Village Life”
Speaker: Dolores Garza, Professor Emeritus, University of Alaska

Abstract: The abundance of fresh safe water and the myriad resources associated with a healthy rainforest and associated marine waters have supported stable healthy Native cultures in Southeast Alaska for 6000+ years. This has required that the Tlingit and Haida peoples have and maintain generational knowledge of, and respect for, these many resources. Today all Southeast Alaska residents have a relationship and dependence on the local forest and marine resources. Climate change has had, and will continue to, impact these many human/natural resource relationships. How we measure these impacts requires multi-faceted long-term efforts. Historic and traditional ecological knowledge is necessary to form the baseline upon which change can be measured. Traditional stories which embed resource abundance and distribution as well as conservation ethics must be reviewed. Harvesting and gathering data can be collected from Elders, which will provide information on decadal changes in abundance and distributions. There are several models to develop “standardized” gathering and reporting of local knowledge to document changes. Any comprehensive effort will require the commitment and efforts of communities and their members. Considering what we may face in the next 50-100 years this is necessary.

Concurrent Sessions 3A & 3B

A: “Political Systems, Politics, and the Formulation of Coastal Temperate Rainforest Policy in the United States and Canada”
Session Chair: Bruce Botelho, Mayor, City Borough of Juneau

or

B: “Change at Your Doorstep: Youth and Educators Speak Out”
Session Chair: Faith Ducan, Conservation Education Specialist, U.S. Forest Service
Session Abstract: Professor Martin Nie and Professor George Hoberg will explore the ideas, actors and institutions (and the external influences on these), underlying forest policy decisions that have guided the implementation of ecosystem management in the Great Bear Rainforest, the Tongass National Forest, and coastal temperate rainforests in Washington and Oregon. The presentations and the response panel which follows will grapple with these and similar issues:

- How does policy across this landscape differ and why?
- What are the implications and results of these differences?
- Is one system more responsive, resilient, or adaptive?
- What are we managing for and how? Who decides?

Session Chair: Bruce Botelho, Mayor, City and Borough of Juneau.

2:00 PM  “Policy Regarding Ecosystem-Based Management in the “Great Bear Rainforest”
Speaker: George Hoberg, Professor, University of British Columbia

Abstract: This talk will focus on the challenges of designing and implementing the rules for ecosystem-based management (EBM) in the “Great Bear Rainforest” adjacent to the Tongass in British Columbia. The evolution of conservation policy in the region will be described, focusing on the distinctive role of multi-stakeholder consultations and “government to government” relations between the Government of British Columbia and First Nations in the region. The role of EBM in conservation efforts in the region will be described, focusing on the retention of old forest. For much of the past decade, the government, First Nations, and stakeholders have been struggling to design and enact operating rules that reflect the principles of EBM as articulated by the Coast Information Team in 2004. The process and outcomes for EBM in the region are reflective of the challenges of a bold new experiment in governance amidst enduring political conflicts among industry, environmentalists, and First Nations.

2:30 PM  “National Forest Law with Relevance to the Tongass National Forest”
Speaker: Martin Nie, Professor, University of Montana

Abstract: This talk will focus on recent developments in National Forest law, policy and management that are of most relevance to the Tongass. Throughout the country, divergent interests are collaborating about how they would like particular national forests to be managed. Issues related to protected lands, forest restoration, and economic development are being addressed. What is most remarkable about these initiatives is the similarities they share, from a widespread frustration with the status quo to the search for more certainty in forest management. Nie will summarize some of the major themes to emerge out of these initiatives and what lessons might be learned from them. Some of the issues to be discussed include wilderness designation, the politics and economics of landscape-scale restoration, stewardship contracting, collaboration and conflict resolution, and forest planning.
**Panel Discussion**

Description: Presenters George Hoberg and Martin Nie will be joined by the following panel members: Chris Maisch, State Forester & Director, Alaska Department of Natural Resources, Division of Forestry; Dave Secord, Director of Strategic Programs, Tides Canada Foundation; and Richard Harris, Executive Vice President, Sealaska.

**SESSION 3B**

“Change at Your Doorstep: Youth and Educators Speak Out”

Location: Centennial Hall, Sheffield Ballroom 3

Session Abstract: Education and outreach is an essential aspect of coastal temperate rainforest management and conservation. The integration of place-based climate and ecosystem science into primary and secondary education is key to the development of community environmental awareness and understanding. This integration of place-based science is incomplete without cultural ties. This session explores the formation and importance of the youth perception of change in the coastal temperate rainforest, through both traditional and non-traditional teaching strategies. Our session will showcase elementary student visualizations of change, a set of middle school student posters on energy use, and a high school student panel discussion, providing youth with an opportunity to share their understanding of climate, change, and their natural environment. Formal and non-formal educators will present success stories followed by a discussion among those in attendance about strategies to employ in the classroom and at home to develop inquisitive minds. Educational resources including books and curricula will be shared with educators at the conclusion of the session. Session Chair: Faith Duncan, Conservation Education Specialist, U.S. Forest Service.

2:00 PM High School Panel: Central Council Tlingit & Haida Indian Tribes of Alaska Environmental Youth Leadership Team

Student Panel: Aquino J. Brinson, Alyssa Cadiente-Laiti-Blattner, Nicole George, Dominique Stitt, and John Gardner

Description: This Environmental Youth Leadership Team is part of the Central Council Tlingit & Haida Indian Tribes of Alaska (CCTHITA) Heen Latinee Outdoor Classroom Project, a collaboration between CCTHITA and the U.S. Forest Service. The first series of the CCTHITA Héen Latinee project has generated collaborations with the Goldbelt Heritage, Juneau School District, and Alaska Coastal Rainforest Center. Nine high school students from the Juneau School District are receiving one on one education and group experiences from U.S. Forest Service scientists, Tlingit Knowledge bearers, and the Native Lands and Resources Environmental staff of CCTHITA. Participants in the first series of the project are provided classroom and outdoor experiences utilizing western science instruments to test topology, water, and weather changes. Students also learn Tlingit scientific practices as well as the importance and responsibility of the Tlingit people to be stewards of the land, air, and sea.
Youth Panel Continued: Youth will present on their Héen Latinee Project findings and make recommendations for policy, further research needs, and adaptations based on what they have determined detrimental to sustain the Tlingit way of life. They will briefly describe the processes, testing, research, and lessons that led them to these conclusions and more importantly what led them to more question. This panel presentation will provide time for the audience to ask questions of the youth, adults, collaborators and Tlingit knowledge bearers involved in the project.

Researchers, Cultural Specialists, and Staff involved: Rick Edwards, U.S. Forest Service; Karen Maher, U.S. Forest Service; Raymond Paddock, Central Council Tlingit & Haida Indian Tribes of Alaska; Leilani Knight, Central Council Tlingit & Haida Indian Tribes of Alaska; Kate Jensen, Central Council Tlingit & Haida Indian Tribes of Alaska; Paul Marks, Goldbelt; and David Katzeek, Goldbelt.

2:45 PM   Story Interlude
Speaker: Pete Griffin, Storyteller, retired from the U.S. Forest Service

Description: In 1971 University of Washington professor Barry Commoner published his Four Laws of Ecology: “Everything is connected to everything else; everything must go somewhere; nature knows best; and there is no such thing as a free lunch.” Pete Griffin, retired from the U.S. Forest Service, will tell stories from his personal experience that illustrate some of those ecological principles at work in the real world.

2:55 PM   Break

Please take this time to view and ask questions about the following elementary and middle school student work on display:

Elementary Art Visualizations of Change: Elementary youth answer the question what does change look like? K-2nd graders use the approach to picture spring above and below the ground with black line drawings. 4th-6th graders use color and texture to describe how the profile of a king salmon looks different if something changes in its watery habitat. Artwork by K-5th grade students from the Ketchikan School of Arts and Sciences, led by art teacher Loren McCue, Ketchikan School District.

Middle School Climate Change Posters: Students from the Juneau Community Charter School, with math and science teacher Renee Drummond, will present a poster on residential energy use. To complete the project each child made observations of their lives, making note of the resources they used on an average day. They then chose one resource to explore, where it came from, the way in which they used it, and what happened to it after use. They created a method for measuring how much of it they used, and then responded to what they found. It integrated graphing, research, writing, the creation of directions, and also creative reflection, as well as a better look how they are personally impacting the Earth. A 15-minute break will be allotted to speaking with students and looking more closely at their work.

Students: Sabrina Jones, Erin Wallace, Nelli Wayne, Lilly Kate Deetz, Honesty Zahnd.
3:10 PM  Success Story  
Speaker: Pamela Garcia, Instructional Coach, Juneau School District

Abstract: Pam Garcia, elementary educator and instructional coach, will share some successful activities that get K-12 kids outside to make observations and connections with the place they live in. These structured activities provide students time to wonder, learn, and appreciate the beauty and importance of the natural world around them. Opening inquisition, nature journaling, and integrated nature trails will be discussed.

3:25 PM  Success Story  
Speaker: Clay Good, Education Consultant, Retired from Juneau School District

Abstract: Clay Good taught oceanography, biology and physical sciences at Juneau-Douglas High School (JDHS) 1984-2007, during which time he also coached the National Ocean Sciences Bowl (NOSB), Alaska Region perennial championship teams from Juneau; chaired the science department; served as president of the Juneau-Education Association; and won awards from the National Association of Marine Educators and the National Association of Geoscience Teachers. Clay Good will highlight research done by JDHS oceanography students regarding climate change for NOSB.

3:35 PM  Success Story  
Speaker: Faith Duncan, Conservation Education Specialist, U.S. Forest Service

Abstract: Touching upon three extra-classroom tracks for addressing climate change studies, Faith L. Duncan, conservation educator from the Tongass National Forest brings the success stories to a close. Change is really at your doorstep: by examining the tenets of a Children’s Forest, aspects of communication made possible by the "Hands on the Land" website, and availability of “unplugged” opportunities for multiple learning styles exist on public lands. These programs are successful, and complement standard classroom experiences and can contribute to a youth’s understanding of climate change.

3:45 PM  Session Summary  
Speaker: Dave Cleaves, Climate Change Advisor, U.S. Forest Service, Washington D.C.

Dave Cleaves, will be sitting in on the Education Session through live video feed from Washington D.C. He will provide thoughts, reflections and a general summary to conclude the session.
Our symposium culminating event begins with a poster session and open house, followed by a banquet catered by Juneau-famous Abby’s Kitchen. Peter Kareiva will deliver the evening’s keynote presentation, “Beyond Biodiversity: Ecosystem Services and Corporate Sustainability.” Banquet tickets will be available at the registration table and are provided with all 2-day, 3-day, and full day April 19th registrations.

5:00 PM  
Poster Session and Open House  
Location: Sheffield Ballroom 2

Sheffield Ballroom 2 will be occupied by informational tables sponsored by participating organizations, and a poster session of over 35 contributions. Organizations present include: U.S. Forest Service, University of Alaska Fairbanks, NOAA Fisheries, Central Council Tlingit & Haida Indian Tribes of Alaska, Girl Scouts of Alaska, Juneau Economic Development Council, U.S. Fish & Wildlife Service, Wilburforce Foundation, EcoAdapt, and Discovery Southeast. Poster Session contributors are located on page 38-40.

7:00 PM  
Opening Remarks  
Speaker: Beth Pendleton, Regional Forester, U.S. Forest Service, Alaska Region  
Keynote: “Beyond Biodiversity: Ecosystem Services and Corporate Sustainability”  
Speaker: Peter Kareiva, Chief Scientist & Director of Science, The Nature Conservancy

Abstract: In depressed economic times and huge human appetites for energy, timber, and minerals, nature often gets mistreated. This is because biodiversity by itself has a tiny constituency. Alternatively, conservation that embraces ecosystem services and works by partnering with corporations promises much greater traction. The devil is in the details however. The great intact ecosystems of Alaska provide unparalleled ecosystem services. Valuation of these services is a good first step. Using this valuation there are two pathways to a wild Alaska forever: development by design, and corporate practices that are mindful of ecosystem services. Examples of these approaches around the world will be described with a discussion of what they might mean if applied to Alaska. Whether or not these approaches will yield positive outcomes remains an open question that depends primarily on the extent to which ecosystems are resilient – which is one of ecology’s biggest uncertainties.

Poster Session Contributors (in alphabetical order by author)

Sustainable Ecosystem-Based Management of Living Marine Resources (SELMR)  

Regeneration on Wood and Soil Substrates at Timberline-Alpine Meadow Borders  
Adelaide C. Johnson, US Forest Service, Pacific Northwest Research Station and J. Alan Yeakley, Portland State University
Poster Session Contributors Continued

Bird Conservation in Southeast Alaska and Important Bird Areas
Amanda Millay, University of Alaska Southeast

Large Stranded Renewable Energy: Alternatives to Electricity for Transmission and Low-cost Firming Storage as Pipelined Hydrogen and Ammonia Carbon-free Fuels
Bill Leighty, Leighty Foundation

Effects of Acid Cloud Ions on Two Picea Species
Blue Ross

Traditional Knowledge + New Technology = The Cat’s Meow of Fish Weirs
Carol Mahara, Tongass National Forest

Utilizing Juneau, Alaska Area Temperate Glaciers to Train the Next Generation of Climate Scientists and Educate Alaskan Visitors in the Tongass National Forest
Cathy Connor, University Alaska Southeast

Using Gigapan Imagery and Google Earth Path and Profile Tools to Enrich Alaskan Landscape Interpretation in an Introductory Geomorphology Course
Cathy Connor, Jennifer J. Shinn, Zachary A. Pechacek, and Cameron Piscoya, University Alaska Southeast; Tristan B. Freeman, University Alaska Fairbanks

Rapidly Deglaciation and Uplifting Landscapes in Glacier Bay National Park and Preserve GBNPP Provide Alaskan High School Students with Summer Field Research Experiences in an Emerging Rainforest Habitat
Cathy L Connor, and Michael Hekkers, University Alaska Southeast; Steven Schaller, Glacier Bay National Park and Preserve; Rebecca Parks, Juneau Economic Development Council

Climate Model Predictions for Alaska-BC Coastal Forest Habitats:
an Expert Review
Colin Shanley, and David Albert, The Nature Conservancy

David Albert and Colin Shanley, The Nature Conservancy; Carl Schoch, Coastwise Services

Differences in Glacial and Non Glacial Watersheds in Juneau Alaska
David Sauer, University of Alaska Southeast

Changes in the Temperature and Salmon Run Timing of a Local Rainforest Stream
David Tallmon, University of Alaska Southeast; Ryan P. Kovach, University of Alaska Fairbanks; John Joyce, NOAA

Sustainable Ecosystem-Based Management of Living Marine Resources (SELMR)
E.A. Hutchinson and K.R. Criddle, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks

Anthropogenic Stressors Effect Marbled Murrelet (Brachyramphus marmoratus) Populations throughout Pacific Temperate Rainforests
Earnest Eckerson, University of Alaska Southeast

Evaluation of Steelhead Habitat in Southeast Alaska
Freddie Munoz, University of Alaska Southeast

The ACCAP and SNAP Climate Change Models
J. Brook Gamble and Sarah Trainor, Alaska Center for Climate Assessment & Policy; T. Scott Rupp, Nancy Fresco, Tom Kurkowski, Philip Loring, John Walsh, and Jeremy Mathis, Alaska Center for Climate Assessment & Policy

The Paleogeography, Glacially Induced Crustal Adjustments, and Early Holocene Climates from analysis of Shell-bearing Raised Marine Deposits in Southeast Alaska

Forest Inventory and Analysis of Coastal Temperate Rainforest in Alaska
Justin Holgerson, U.S. Forest Service, PNW

Pacific Salmon and their Role in Coastal Temperate Rainforest Ecosystems
Kahle Ess, University of Alaska Southeast

Forest Comparisons
Keren Goldberg Belle, University of Alaska Southeast

An Introduction to the Alexander Eighteen
Larry Johansen, Rowdy Dog Images

Outdoor Recreation and Individual and Community Health
Linda E. Kruger, US Forest Service PNW
Abstract continued from page 16, Session 1A: Results were compared to current and proposed reserve designs to determine robustness of conservation strategies in a changing climate. Our results have application to forest plan revisions, landscape conservation cooperatives of the US Fish & Wildlife Service, and high profile species in the region. used as inputs to develop GIS-based conservation maps for the region. We are in the process of expanding this project to develop similar conservation maps for freshwater ecosystems. The resulting climate-informed maps will identify priority areas and strategic actions that, when combined, are expected to provide species and linked ecosystems with the greatest likelihood of persistence and function under changing climate conditions. They are intended to evaluate the vulnerability of new and ongoing conservation planning processes in the region to climate change impacts, and will provide an integrated assessment of spatially explicit adaptation opportunities along the linked terrestrial and freshwater systems studied.
Abstracts Continued

“The Stock and Flow of Carbon in Terrestrial Ecosystems of the North Pacific CTRF”
Speaker: David D’Amore, Soil Scientist, U.S. Forest Service Pacific Northwest Research Station

Abstract continued from page 15, Session 1A: Carbon accumulation rates range from 2 to 7 tons C ha⁻¹ across the range of young (20-80 y) and mature (100-300 y) forests. Carbon sequestration rates as estimated by net ecosystem production were 2.0 ± 0.8 tons C ha⁻¹ in three experimental watersheds. The pool of soluble carbon that is transferred from soils via streamwater as dissolved organic carbon (DOC) is an important component of carbon cycling in the region. DOC was an important vector for carbon loss that ranged from 10-30% of the total carbon flux from the watersheds. These estimates confirm assumptions that the NCTR is currently absorbing atmospheric CO₂ at rates comparable to the average worldwide rate of carbon uptake in terrestrial ecosystems.

“Modeling Economic and Carbon Consequences of a Shift to Wood-based Energy in a Rural ‘Cluster’; A Network Analysis in Southeast Alaska”
Speaker: David Saah, Managing Principal, Spatial Informatics Group, LLC

Abstract continued from page 32, Session 2B: The model utilized can be adapted for future feasibility analyses as knowledge and data improves. Inputs can be altered based on new parameters, pathways, and assumptions. Scenarios output can facilitate dialogue between land managers, planners, community members, and decision-makers. However, without quantified testing and verification among alternatives, communities may not have the ability to change or coordinate among the necessary actors to bring about implementation at the desired scale or duration.

“Place Matters: A Participatory Approach for Bringing Social and Cultural Ecosystem Service Priorities into Decision-Making”
Speaker: Sarah Klain, Ph.D. Candidate, University of British Columbia

Abstract continued from page 32, Session 2B: Therefore, to foster explicit inclusion of intangible values alongside material values connected to ecosystems, catalog locally important ecosystem services and inform spatial natural resource decision-making, we developed a flexible semi-structured interview protocol. This includes prompts to enable stakeholders to 1) verbally articulate material and non-material benefits from and values pertaining to nature; 2) spatially identify places associated with these benefits and values; and 3) assign relative monetary, non-monetary and environmental threat value across a land- or seascape. We tested this protocol in northern Vancouver Island and Hawaii. Our results demonstrate that this interview protocol enables people to articulate powerful connections to nature, even with an outside academic researcher. Despite limitations to representing non-monetary values spatially and quantitatively, these methods offer an innovative approach to cataloging and mapping ecosystem services to inform spatial planning. The research outputs, which provide a fuller representation of the values and benefits people associate with ecosystems, can complement and inform environmental decision making processes.
Directions to Auke Bay Harbor from Centennial Hall: Don Statter Public Harbor is located in Auke Bay where Glacier Highway and Mendenhall Loop Road split. If you are driving from downtown, you will turn left prior to De Harts Auke Bay Store. Parking is available at Don Statter Public Boat Harbor.

Directions to the Buoy Deck from Centennial Hall: Cross Egan Drive, the Buoy Deck will be on the left at 345 Egan Drive.
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