Three lake sediment profiles, each covering almost the entire Holocene, were examined (primarily) for coleopteran remains. Two of the sites, Lake Tibetanus (560 m a.s.l.) and Lake Pikkujärvi (625 m a.s.l.), are situated at the present birch tree-line, whereas the third site, Lake Njulla (999 m a.s.l.), is situated well above it. The insect remains were extracted from samples previously studied for pollen and plant macrofossil analyses (Barnekow 1999). Quantitative habitat and temperature reconstructions were undertaken using the BugsCEP database and software (Buckland & Buckland 2006). The chronologies were established by 19, 6 and 5 AMS dates respectively (Barekow et al. 1998). The most diverse beetle record is that obtained from L Tibetanus. In this, a number of species confined to pine trees are recorded in samples dating between ca 4 500 and 2 000 yrs BC, which is roughly the same time interval that containing macroscopic remains of pine. At the present day, pine occurs sporadically below 450 m a.s.l. in the Abisko area. More significant is the occurrence of scattered finds of pine beetles in the record of L Njulla, including one species obligate to burnt trees. Species restricted to dung from grazing and browsing mammals were recorded from all of the sites, especially in samples from the mid Holocene. The presence of the dung beetle Aphodius lapponum in samples from L Tibetanus may indicate that reindeer herds may have periodically grazed near to the lake. Mutual Climatic Range (MCR) reconstructions based on stenothermic beetles, especially in the record from L Tibetanus, indicate a climate optimum between ca 5 500 and 4 000 yrs BC, with mean summer temperatures ca 3°C higher than present. A shorter warmer oscillation may have occurred about 2 000 yrs ago. An indication of a rather recent cold period corresponds to the Little Ice Age.

MODELING IN-SITU COSMOGENIC PRODUCTION OF RADIOCARBON IN TAYLOR GLACIER, ANTARCTICA

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The ^{14}C signature of gases trapped in glacial ice contains a wealth of information. Potentially it could be used for determining the age of the gas through radiocarbon dating. Furthermore, the ^{14}C variations in methane (CH_4) over the last glacial termination can teach us how much destabilization of (^{14}C depleted) methane clathrates contributed to the CH_4 budget. In the ablation zone of Taylor Glacier, Antarctica, ice with ages between 11.5 and 65 kyr is being exposed. The large ice samples (>500 kg) required for high precision ^{14}C measurements of trace gas species such as CH_4 and CO can easily be mined from near the glacier surface. Efforts to interpret ^{14}C data are complicated by in situ cosmogenic production of ^{14}C in ice. Production rates fall exponentially with depth, with fast muons producing measurable amounts of ^{14}C down to a depth of ~200m. Consequently the amount of ^{14}C in surfacing ice parcels is a function of their flow path in the glacier. Using surface velocity, strain rate and ablation rate measurements we model flow lines of ablating Taylor Glacier ice. On integrating the production rates along the path we obtain a theoretical estimate of the total ^{14}C production. Our sensitivity study shows that production rate uncertainties as reported in literature are the largest source of uncertainty, followed by ablation rate measurements and flow line modeling. Measurements in the 2010-2011 field campaign focus on understanding in-situ ^{14}C production in its own right. Sampling at a depth of ~10 m removes the neutron spallation component, after which we can study muogenic production in isolation. In combination with the exposure history modeling presented here, these measurements should significantly reduce the uncertainties in muogenic production rates reported in literature. In the future this work will serve as a framework for correcting $^{14}CH_4$ measurements for the effects of in situ production, which will allow determination of the true atmospheric signal.

HUMAN OR NATURAL IMPACTS? COMPARING PREHISTORIC AND MODERN GEOMORPHIC RESPONSE TO EXTREME CHANGE IN A MEDITERRANEAN ECOSYSTEM FROM EXCESSIVE GRAZING, SOUTHERN CALIFORNIA, U.S.A

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Holocene stratigraphy, geochronology, geomorphic processes, erosion rates, and sediment storage in channels and a reservoir, were used to develop a sediment budget to compare with observed prehistoric and historic depositional episodes for Santa Catalina Island, southern California. A history of extensive vegetation disturbance caused by >100 years of intense grazing provides a basis to evaluate the role of land use impacts to hillslope stability and sediment yield in a Mediterranean ecosystem. Knowledge of landscape stability comes from axial channel and tributary alluvial deposits, and soils in principal drainage basins. Soil-stratigraphy provides a record of periodic Holocene hillslope instability and associated aggradation along ephemeral channels. Fluvial deposits contain buried soils recording multiple episodes of pre-historic incision and deposition. Deep, moderately developed soils on steep hillslopes also indicate relative slope stability over several thousand yr. Pronounced channel aggradation began about 6940 to 5300 Cal yr BP. Tributary deposits indicate widespread deposition continued episodically, with the last two periods of aggradation occurring between about 920 to 1180 Cal yr BP and about 780 to 300 Cal yr BP. Pre-grazing Holocene depositional and erosional records are well represented in valley bottoms. Sparse stratigraphic evidence exists for widespread historic hillslope erosion and fluvial deposition in tributaries or trunk streams, and is supported by the sediment budget models. Results imply that extensive decrease in vegetation alone appears insufficient to trigger a cycle of hillslope erosion and alluviation, that historic hillslope erosion, channel incision, and sedimentation rates are much less than what occurred during the Holocene, and that other driving mechanisms must be considered. Holocene ^{14}C dates indicate prehistoric cycles of erosion and alluviation may be associated with increased storm frequency related to El Niño cycles.

INTERPRETING ALLUVIAL CHRONOLOGIES AND GEOMORPHIC RESPONSES TO ENVIRONMENTAL CHANGE IN A REGION COMPLICATED BY CONTRASTING BEDROCK LITHOLOGIES, NORTHWEST NEW MEXICO, USA

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Geomorphic evolution of alluvial systems in arid and semiarid settings typically reflects the complex interactions between driving and resisting forces, principally climate and geology, and the geomorphic processes and responses resulting from those interactions. Geomorphic response to regional climate change events are commonly recorded in the alluvial stratigraphy over broad areas. In northwest New Mexico, the geomorphic evolution and Holocene alluvial record large ephemeral discontinuous arroyo system were influenced and complicated by the presence of contrasting bedrock types: resistant marine sandstone in headwater regions and erodible fluvio-deltaic mudstone containing resistant paleochannels sandstone in the lower reaches. Late Pleistocene and Holocene stratigraphy, the presence of weakly to moderately developed surface and buried soils, radiocarbon dates and archaeological materials, correlation to dated stratigraphy in adjacent watersheds, and drainage basin morphometry were used to analyze the geomorphic evolution of the watershed. The complex and at times conflicting alluvial stratigraphic record is reconciled by the distribution of rock types and their influence on geomorphic processes. Lithologic type controlled regional base level migration, erosional development of tributaries, sediment production and transport, loci of incision and deposition, development and preservation of fluvial stratigraphy, and the soil-geomorphic signature upon the landscape. Resistant paleochannel sandstone units locally impeded incision and caused non-uniform base-level migration into tributary basins resulting in spatially variable distribution of surface soils and their hydrologic characteristics. The geologic complexities in this setting underscore the need to conduct thorough geologic and geomorphic characterization to understand the geomorphic history and assess the past, present, and future responses to natural and anthropogenic environmental change.

SHOCK-MELT EVIDENCE FOR A COSMIC IMPACT WITH EARTH DURING THE YOUNGER DRYAS AT 12.9 KA

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Firestone et al. (2007) and Kennett et al. (2009a, 2009b) presented a new hypothesis based on shock-melted impact proxies, including nanodiamonds

(NDs) and microspherules, which are consistent with a cosmic impact (crater-forming or aerial detonations) at the onset of the Younger Dryas cooling at 12.9 ka. Found at nearly fifty locations across North America, Greenland, Europe, and Syria, the impact markers occur in a thin stratum, usually 1 to 5 cm thick, called the Younger Dryas boundary (YDB). There are several lines of evidence for shock impact melting in the YDB, as follows. For the melted microspherules, bulk compositions and REE abundances match crustal values, consistent with known impacts, but inconsistent with compositions of micrometeorites, volcanic material, and anthropogenic spherules. Some glassy objects from the YDB are aerodynamically formed into teardrops, dumbbells, and other shapes. These morphologies are common to microtektites and macrotektites from the Southeast Asian strewnfield, but are not apparent in micrometeorite collections. Micro-impact craters that form at low velocity of less ~10 meters per second are found on the surface of YDB glassy spherules, which often display impact welding with other spherules. Such features are apparent only in impact-related microtektites and spherules, but not in anthropogenic, volcanic, or meteoritic material. The YDB layer contains SiO_2 spherules along with flow-textured lechatelierite grains that require very high temperature flash heating (>2700o K) for impact melting. Such grains are unique to impacts and lightning strikes (fulgurites), but the morphology of the YDB grains rules out formation by lightning. YDB microspherules and melt glasses, requiring high impact pressures and/or temperatures with extremely rapid quenching rates, cannot be derived from volcanism, wildfires, anthropogenic sources, or meteorites, leaving high-velocity cosmic impact as the only plausible explanation.

SPATIALLY EXPLICIT RECONSTRUCTION OF PAST LAND COVER FROM POLLEN RECORDS USING A MULTIPLE SCENARIO APPROACH

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Recent advances in the speed of desktop computers and in software development have begun to make quantitative reconstruction of past land cover possible at a relatively coarse scale, e.g. a 100km x 100km grid (e.g. Gaillard et al. 2010). Many ecological and archaeological questions can only be explored with much finer-scale reconstructions, with grid-cells on the order of a few metres. This talk will present current work with the Multiple Scenario Approach (Bunting & Middleton 2009), which can generate spatially explicit reconstructions at these finer scales. The MSA utilises a GIS approach to simulate a wide range of possible vegetation distributions constrained by aspects of the local environment at the time of interest (e.g. geology, topography, palaeogeography such as coast line position). It uses models of pollen dispersal and deposition to simulate the pollen count at a specified point in the landscape in each of these scenarios, which can then be compared statistically with actual pollen assemblages from that point to identify the best-fit 'simulated analogues'. The approach overtly identifies situations of equifinality, where ecologically distinct vegetation distributions can produce the same pollen assemblage, and therefore become palynologically indistinguishable. One advantage of this approach is that the different properties of each sedimentary basin, relating to size and surface vegetation, are incorporated at the scenario generation stage, and the GIS approach can allow for hydroseral development over time in sampled basins. Current work focuses on validation and identifying the best ways to present the outcomes.

BRIDGING THE GAP: LONG-TERM PERSPECTIVES AND CONSERVATION PRACTICE

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An extensive literature has developed in recent years which argues that palaeoecological methods, which provide insights into long-term ecosystem processes, need to be seen as part of the conservation toolkit. However, relatively little information about how these insights can be translated into conservation policy and practice has been published. The Bridging the Gap project is an informal network which works to improve communication between palaeoecologists, ecologists and conservation practitioners with the specific goal of improving the status of long-term ecological information in conservation planning, policy and practice. In this poster we present a case study from northern Scotland where long-term records can usefully inform and modify conservation practice, and outline our current activities and future plans.

HOW THE LGM MAP OF SWITZERLAND WAS PRODUCED

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The new map "Switzerland during the Last Glacial Maximum, 1:500000" (LGM map) depicts the topography of Switzerland during the peak of the last glaciation. It visualizes the state of the art of LGM research in Switzerland using high-quality cartography. The LGM map is based on the Swiss National Map 1:500000 (LK500). Cartographically it consists of four principal layers: 1. Thin firn: contour lines and relief from LK500, with rock hachures. 2. Thick firn: contour lines and relief from LK500, rock hachures masked. 3. Valley and piedmont glaciers: contour lines and relief from LK500 masked, new contour lines, new manually created relief. 4. Ice-free areas: contour lines and relief from LK500, new/adapted hydrography.
Based on the authors' hand-drawn manuscript map, the LGM map was created in the following steps:

- Separation of firn surfaces from glacier surfaces. Fitting of the external rims of the glaciers to the topography of the ice-free areas.
- Adoption of the contour lines on the glacier surfaces from the manuscript; verification and adaptation, where necessary.
- Masking of rock hachures in areas of thick firn.
- Generation of a mask using the lines separating firn and glaciers, as well as the external rims of glaciers.
- Creation of the relief for the mask surface, i.e., the glacier surface, based on the contour lines and glacial dynamic considerations.
- Fitting of the new relief, smoothing of the transition between firn and glacier surfaces.
- Adaptation of the hydrography: braided rivers, based on geological data; elimination of man-made waters.
- Printing with eight spot colours.

Cartography software used: Adobe Illustrator (with Avenza MaPublisher), Adobe Photoshop. The LGM map is available as a hard copy, a pixel map or a GIS dataset in vector format. Schlüchter, C. (compil.) (2009): Switzerland during the Last Glacial Maximum. – swisstopo; ISBN 978-3-302-40049-5.

A LATE HOLOCENE RECORD OF HUMAN ECODYNAMICS IN BARBUDA, LESSER ANTILLES

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Barbuda is a small, dry, and relatively flat Island which has a rich cultural heritage dating back ca. 5000 years Before Present (BP). The Island is located within the Main Development Region (MDR) of Atlantic Hurricanes and regularly experiences storm surges associated with the passage of tropical cyclones. Numerous archaeological sites have been discovered on low-lying areas, which were occupied by pre-Columbian cultures including Saladoid and Post-Saladoid Amerindian cultures. In order to better understand the long-term human-environment interactions within this unique setting, we present preliminary analyses of a 2000-year multi-proxy record of environmental change from Freshwater Pond, Barbuda. Multiple sedimentary proxies including ostracods, gastropods, charophytes, micro- and macroscopic charcoal and pollen are being analyzed to reconstruct the vegetation, climate, and fire history of the Island and will then be linked to the archaeological record to provide insights into our understanding of long-term Human Ecodynamics in the Caribbean region. Preliminary analyses of the sediment carbonate content as well as the ostracod, gastropod and charophyte fauna suggest lake levels were low