National Park Service

National Park Service
U.S. Department of the Interior

Visitor Experience and Soundscapes: Annotated Bibliography

Bibliography by:

National Park Service/ Colorado State University

Ericka Pilcher
Frank Turina

Ambrose, S., & Burson, S. (2004). Soundscape Studies in National Parks *The George Wright Forum, 21*(1), 29-38.

Introductory Paragraph:

The National Park Service (NPS) recognizes the value and importance of natural sounds. NPS management policy 4.9 states: "The National Park Service will preserve, to the greatest extent possible, the natural soundscapes of parks. Natural soundscapes exist in the absence of human-caused sound. The natural soundscape is the aggregate of all the natural sounds that occur in parks, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive, and can be transmitted through air, water, or solid materials. The Service will restore degraded soundscapes to the natural condition wherever possible, and will protect natural soundscapes from degradation due to noise (undesirable human-caused sound)" (NPS 2000).

Aasvang, G. M., & Engdahl, B. (1999). Aircraft noise in recreational areas: A quasi-experimental field study on individual annoyance responses and dose-response relationships. *Noise Control Engineering Journal, 47*(4), 158-162.

Abstract:

A quasi-experimental field study has been conducted to investigate aircraft noise-induced annoyance in outdoor recreational areas The study, which is part of a larger project that also includes a social survey, was conducted near Fornebu Airport in Oslo, Norway. The study was designed to investigate annoyance due to aircraft noise in an outdoor setting under partially controlled conditions. Results are presented for exposure-annoyance relationships, acceptability judgments, and relationships between immediate annoyance responses to overflights and total annoyance over a longer period.

Keywords:

transportation noise; simulated-environment; annoyance; sensitivity; road; variables; railway; health

Aasvang, G. M., & Engdahl, B. (2004). Subjective responses to aircraft noise in an outdoor recreational setting: a combined field and laboratory study. *Journal of Sound and Vibration, 276*(3-5), 981-996.

Abstract:

The knowledge about human perception of noise in outdoor recreational areas is limited. The aim of the present study was to study the relationship between different noise indicators and subjective responses to aircraft noise, aiming at developing applicable noise indicators in areas for recreational purposes. The perception of aircraft noise was investigated in a combined field and laboratory approach. The partially controlled outdoor field study was conducted in a recreational area close to Fornebu airport, the main airport in Oslo (until August 1998). A group of subjects were asked to score their perceived annoyance and acceptability of actual flyovers during a 50 min session as well as the total annoyance for the whole session. The subjects were later presented to the same aircraft noises, as recorded during the field session, in a laboratory experiment simulating outdoor exposure. Subjects exposed both in field and laboratory responded similarly under both conditions. In both test situations a high correlation was found between different noise indices, as well as between all noise indices and responses to single events. A significant relation was found between the number of aircraft noise events judged as "not acceptable" and the total annoyance response. The present observations showed a correspondence between subjective responses to aircraft noise, both immediate and total judgments, and personal attitudes towards the noise source, but not with self reported noise sensitivity.

Keywords:

transportation noise; simulated-environment; annoyance; sensitivity; road; variables; railway; health

Alvarsson, J. J., Wiens, S., & Nilsson, M. E. (2010). Stress recovery during exposure to nature sounds and environmental noise. *International Journal of Environmental Research and Public Health, 7,* 1036-1046

Abstract:

Research suggests that visual impressions of natural compared with urban environments facilitate recovery after psychological stress. To test whether auditory stimulation has similar effects, 40 subjects were exposed to sounds from nature or noisy environments after a stressful mental arithmetic task. Skin conductance level (SCL) was used to index sympathetic activation, and high frequency heart rate variability (HF HRV) was used to index parasympathetic activation. Although HF HRV showed no effects, SCL recovery tended to be faster during natural sound than noisy environments. These results suggest that nature sounds facilitate recovery from sympathetic activation after a psychological stressor.

Keywords:

soundscape; nature sounds; environmental noise; skin conductance level; heart rate variability; stress recovery

Anderson, T. W., Mulligan, B. E., Goodman, L. S., & Regan, H. Z. (1983). Effects of sound preference for outdoor settings. *Environment and Behavior, 15*(5), 539-565.

Abstract:

Three methods were used to assess the Influence of a number of realistic sound stimuli on esthetic evaluations of outdoor settings. The authors reproduced 18 sounds—including those of children, songbirds, construction equipment, automobiles, aircraft, and wind-for college students serving as evaluators at field sites ranging from a forest to a downtown street. In two other procedures, settings and sounds were described in a questionnaire, or were presented using photographs and tape recordings. All three procedural produced similar results; natural and animal sounds had enhancing effects on evaluations of the heavily wooded natural and residential sites and other sounds had detracting effects on the same sties. The sounds were relatively neutral in effect at two downtown streets, where traffic sounds were found to be most enhancing. The results show that the interaction of a setting's visual and acoustic characteristics significantly influences evaluations of that setting, and that appropriateness of sounds only partly accounts for their influence on setting quality.

Babisch, W. (2005). Noise and Health. *Environmental Health and Perspectives, 113*(1), A14-A15.

Abstract:

Comments on the psychological effect of noise. Identification of noise annoyance, reduced performance and increased aggressive behavior as effects of noise; Non-auditory health effects of ear-safe sound levels if it chronically interfere with recreational activities; Need for environmental and health policy to determine the acceptable noise standards that consider the whole spectrum from subjective well-being to somatic health.

Beal, D. (1994). Campers' attitudes to noise and regulation in queensland national parks. *Australian parks and Recreation, 30*(4), 38-40.

Abstract:
Noise considered to be excessive and out of place has the potential to be a source of conflict among campers in national parks as well as a problem for park managers. Campers in three Queensland national parks were asked about their perceptions of ten different noises and their attitudes to regulation. Survey instruments were distributed by rangers and a total of 309 usable forms were returned. Natural noises were liked, relative quiet "people" noises were tolerated but loud technology-related noises were found very annoying by most campers. A majority of campers would like to see more patrols by rangers through the camping grounds as a means to enforcing the rules; campers were, however, ambivalent about the imposition of stricter rules of behavior.

Bell, P. A., Malm, W., Loomis, R. J., & McGlothin, G. E. (1985). The impact of impared visibility on visitor enjoyment of the Grand Canyon: A test of an ordered logit utility model. . *Environment and Behavior, 17,* 459-474.

Abstract:
An ordered logit probability model of the impact of visibility impairment on visitor enjoyment of the Grand Canyon was examined. Ninety male and female undergraduates rank ordered the six alternatives of a stimulus set. Each alternative consisted of one of three levels of visibility at each of three vistas, a driving time to the vistas, and a waiting time to get into an archaeological site. Results indicated that a wide range of driving times (0-2.5 hours) and waiting time (0-1 hour) yielded a significant coefficient for each of the five attributes in the alternatives. Examination of trade-off ratios indicated that subjects were willing to spend about an hour more in driving time or half an hour more in waiting time for a one-unit increase in visibility of the San Francisco Peaks. Differential vista sensitivities to changes in visibility were also demonstrated. Additional questions to be explored with the model are discussed.

Bjorner, T. B. (2004). Combining socio-acoustic and contingent valuation surveys to value noise reduction. *Transportation Research Part D-Transport and Environment, 9*(5), 341-356.

Abstract:
A combination of a socio-acoustic survey on self-reported noise annoyance and a contingent valuation questionnaire is used to estimate willingness to pay for noise reduction for urban residents living in Copenhagen. It is found that the annoyance level has a significant effect on the stated WTP. Expected WTP per dB reduction is subsequently calculated by combining WTP for each annoyance level with the estimated dose-response function for the relationship between noise exposure and annoyance. It is found that the expected WTP for a one dB noise reduction is increasing with the noise level from e.g. 2 EUR at 55 dB to 10 EUR at 75 dB.

Keywords:
noise exposure and noise annoyance; willingness to pay; contingent valuation

Booth, K. L. (1999). Monitoring the effects of aircraft overflights on recreationists in natural settings. *Noise Control Engineering Journal, 47*(3), 91-96.

Abstract:
This paper presents the results of research commissioned by the New Zealand Department of Conservation to produce a method to monitor the effects of aircraft activity on recreationists in natural settings. This research utilized qualitative methods (semistructured interviews) to examine the effects of aircraft overflights on recreationists. Interviews were conducted with visitors at two field sites, Mount Cook National Park and the Milford Track, Fiordland National Park, New Zealand, A visitor questionnaire survey was the monitoring method. The questionnaire was administered on site, however, remote areas were surveyed via questionnaires left in huts and other places of visitor contact, Questions pertaining to a

range of indicators were included in the questionnaire, When possible, aircraft activity records were collated from control tower records and/or airline company records. Thus, visitor reactions may be related to the frequency of flights.

Brown, T. C., Peterson, G. L., Brodersen, R. M., Ford, V., & Bell, P. A. (2005). The judged seriousness of an environmental loss is a matter of what caused it. *Journal of Environmental Psychology, 25*(1), 13-21.

Abstract:

Environmental losses, each described along with its cause, were judged for seriousness. Four types of cause were studied: illegal behavior, carelessness, economic and population growth, and natural events. Identical environmental losses (e.g., of a herd of elk or a large stand of trees) were considered most serious when caused by illegal behavior or carelessness, and only slightly less serious when caused by growth. Losses due to these three types of human causes were considered much more serious than when the same losses were caused by natural events. Naturally caused environmental losses were probably considered least serious because they do not provoke the sense of violation or responsibility commonly associated with human-caused losses, and because naturally caused losses are often considered unavoidable and in the natural scheme of things.

Keywords:

Comparative negligence, outcome severity, responsibility, compensation

Burson, S. (2004). *Natural Soundscape Monitoring in Yellowstone National Park December 2003-March 2004* (Grand Teton National Park Soundscape Program Report No. 200403).

Abstract:

Sounds associated with oversnow vehicles (snowmobiles and snowcoaches) are an important management concern at Yellowstone National Park. Acoustical standards and thresholds are defined in park planning documents. The primary purpose of this study was to monitor soundscape relative to the standards and thresholds outlined in the Yellowstone and Grand Teton National Park's Winter Use Plans (WUP). Acoustical data were collected at five sites in YNP during the winter use season December 2003-March 2004. The acoustic data indicate that the soundscape thresholds for oversnow vehicles were exceeded at Old Faithful, along the groomed motorized routes between Old Faithful and Madison Junction (Mary Mountain 1000) and Madison Junction and the West Yellowstone entrance (Madison Junction 2.3). Sound from oversnow vehicles regularly extended at least on mile adjacent to the main motorized routes resulting in backcountry zone WUP acoustic thresholds being exceeded at Mary Mountain Trail 1000 and Mary Mountain 4000 (2001 WUP thresholds). Acoustical thresholds were not exceeded along a groomed non-motorized trail at Lone Star Geyser (one mile from a main groomed motorized route). The sound level and the percent time oversnow vehicles were audible dramatically decreased from the 2002-2003 to 2003-2004 winter season. The reduced sound and audibility levels were largely explained by the fewer numbers of snowmobiles used, the change from 2 to 4-stroke engine technology and the 2003-2004 group requirements.

Burson, S. (2005). *Natural Soundscape Monitoring in Yellowstone National Park December 2004-March 2005* (Grand Teton National Park Soundscape Program Report No. 200502).

Abstract:
Sounds associated with oversnow vehicles (snowmobiles and snowcoaches) are an important management concern at Yellowstone National Park. Acoustical standards and thresholds have been defined in park planning documents for the winter use season. The primary purpose of this study was to determine the impact of oversnow vehicles on the natural soundscape. These data were then compared to the impact definition thresholds in the 2004 Yellowstone and Grand Teton National Park Temporary Winter Use Plans Environmental Assessment. Acoustical data were collected at seven sites in Yellowstone National Park during the winter use season 15 December 2004-13 March 2005.
Oversnow vehicles were audible in the Old Faithful developed area an average of 69% of the day between 8 am and 4 pm. Oversnow vehicles were audible 29% (Old Faithful Upper Basin) and 47% (West Thumb Geyser Basin) of the day within geyser basins adjacent to developed areas. Along travel corridors the percent time audible ranged from 55% (West Yellowstone 3.1, but see text for details) to 61% during Presidents Day weekend (Madison Junction 2.3). The percent time audible in backcountry areas ranged from 4% (Lone Star Geyser) to 26% (Mary Mountain 8K). Sounds from oversnow vehicles were audible at least one mile adjacent to the main motorized routes at Mary Mountain 8K and Lone Star Geyser. Oversnow vehicles operating in the Gallatin National Forest on the west boundary of Yellowstone National Park were often audible at the West Yellowstone 3.1 monitoring site, three miles away. The maximum sound levels for oversnow vehicles exceeded 70 dBA at Old Faithful, along the groomed travel corridor between Madison Junction and the West Yellowstone entrance (Madison Junction 2.3 and West Yellowstone 3.1). Oversnow vehicle use was restricted on some road segments due to inadequate snowcover early and late in the winter use season. Consistent with acoustic data collected the previous winter season, the sound level and the percent time oversnow vehicles were audible remained substantially lower than oversnow vehicle sounds from the 2002-2003 winter use season. The reduced sound and audibility levels were largely explained by the fewer numbers of snowmobiles used, the change from two to four-stroke engine technology and the guided group requirements.

Cessford, G. R. (1999). Recreational noise issues and examples for protected areas in New Zealand. *Noise Control Engineering Journal, 47*(3), 97-103.

Abstract:
The New Zealand Department of Conservation manages a wide variety of recreation activities in an extensive system of protected areas. A diverse range of recreation noise issues provides challenges to management of these areas. Some basic recreational noise definitions and issues are described, and a classification of noise-generation sources is outlined. Examples of recreation noise issues are presented from an extensive survey of visitors to popular New Zealand walking tracks, where some recreation noise impacts were found to occur at very high levels. Visitors demonstrated a varied range of tolerance for noise effects in the different examples assessed, but highlighted particular noise issues related to aircraft sightseeing flights, recreational motorboating, and social noise in huts. A need for more active research and management of noise effects in New Zealand recreation settings is proposed.

Keywords:
conflict

Downing, J. M. (2004). *Noise Simulation Modeling for Airport Noise Analysis.* Paper presented at the The 33rd International Congress and Exposition on Noise Control Engineering.

Abstract:
Noise simulation modeling is now feasible for assessing the noise impacts of airports since computational capabilities have increased. The current aviation noise models use integrated exposure assumptions to calculate the overall noise exposure. However, this assumption greatly restricts the ability to model the effects of terrain, barriers, weather, and aircraft directivity. Noise simulation models, such as NMSim,

provide more accurate noise exposure calculations. Moreover, simulation modeling allows for the calculation of more noise metrics. Current models are limited to integrated type of metrics, DNL, NEF, SEL, etc. With simulated calculations, metrics such as Time Above and audibility can be directly evaluated. Moreover, spectral content is maintained, so interior noise can be estimated. Examples of the improved calculations will be demonstrated.

Downing, J. M., & Hobbs, C. M. (2005). *Challenges of Characterizing Natural Soundscapes.* Paper presented at the The 2005 Conference and Exposition on Noise Control Engineering Rio De Janeiro, Brazil

Abstract:

There are many resources and values intrinsic to natural and wilderness areas, and the natural soundscape is one of those resources. The natural soundscape is an important aspect of one's experience of the scenery and solitude. Moreover, noise intrusions can lessen one's enjoyment of the experience. For researchers, characterizing natural soundscapes presents several challenges. First, measurement strategies must include the effects of temporal and spatial variations. Second, acoustical instrumentation must be portable and rugged, measure continuous one-third octave band spectra, and have low noise floors. Third, analysis of sound data must distill the information into meaningful measures while retaining the complexity of the soundscape. Once the natural soundscape is characterized, then assessment of current or potential noise intrusions can be evaluated. This presentation will highlight these aspects with examples from soundscape measurements made at Zion National Park. [This work partially sponsored by the US National Park Service]

Downing, J. M., & Stunsick, E. J. (2000). Measurement of the natural soundscape in national parks. *The Journal of the Acoustical Society of America, 108*(5), 2497.

Entire Summary:

The National Park Service (NPS) has identified the natural soundscape in its various park units as one of the resources it has been mandated to protect. Natural soundscape is defined as the acoustic environment that would exist in the absence of human-related activity. Accordingly, the NPS has developed policies related to soundscape management, preservation, and restoration, which require information about the natural ambient sound levels in all of their properties throughout the country. As part of this process, metrics and procedures for measuring the natural soundscape and assessing non-natural intrusions have been developed. Two general types of procedures have been developed: one based on audibility considerations, the other based on acoustic energy measurements. This paper describes the work that has been carried out in developing and assessing these procedures.

Driver, B. L., Nash R.,& Haas, G. (1987). Wilderness benefits: A state-of-knowledge review. In R. C. Lucas (Ed.), Proceedings, National Wilerness Research Conference: Issues, state of knowledge, future directions (Gen. Tech. Rep. INT-220, pp. 294-319). Fort Collins, CO: USDA Forest Service.

Dunholter, P. H., Mestre, V. E., Harris, R. A., & Cohn, L. F. (1989). *Methodology for the Measurement and Analysis of Aircraft Sound Levels within National Parks* (No. Mestre Greve Associates, MGA Technical Report # 89-P07).

Description:

This is one of the best methodology papers to date.

Ellermeier, W., Mader, M., & Daniel, P. (2004). Scaling the unpleasantness of sounds according to the BTL model: Ratio-scale representation and psychoacoustical analysis. *Acta Acustica United with Acustica, 90*(1), 101-107.

Abstract:
The goal of the present study was to determine, (1) whether auditory unpleasantness is judged consistently across a wide range of acoustic stimuli, and (2) which sound features contribute to that sensation. To that effect, all possible paired comparisons on a heterogeneous set of ten environmental sounds were collected from 60 listeners. The judgments conformed with the highly restrictive BTL model [1], thus justifying a ratio-scale representation of perceived unpleasantness. The resulting scale values varied by a factor exceeding 100 (boat diesel vs. jackhammer). While they were not predicted by differences in A-weighted sound pressure level, a linear combination of the psychoacoustic parameters of roughness and sharpness accounted for more than 94% of the variance in perceived unpleasantness.

Keywords:
terry-luce model; perception; loudness; roughness; quality; attractiveness; choice; noise

Fidell, S., Silvati, L., Howe, R., Pearsons, K. S., Tabachnick, B., Knopf, R. C., et al. (1996). Effects of aircraft overflights on wilderness recreationists. *Journal of the Acoustical Society of America, 100*(5), 2909-2918.

Abstract:
On-site and telephone opinion surveys were conducted to assess outdoor recreationists' annoyance with aircraft overflights of wilderness areas. Although current technology for measuring noise exposure does not yet permit accurate and cost-effective estimates of dosage-response relationships in outdoor recreational settings, it was nonetheless possible to construct a rough relationship between estimated aircraft noise exposure and annoyance from the data of the on-site study. In the second survey, telephone interviews were administered to another sample of outdoor recreationists within 2 weeks of their return from visits to 12 wilderness areas. The prevalence of aircraft noise-induced annoyance (in any degree) among respondents in all wilderness areas ranged from 5% to 32%. The prevalence of a consequential degree of aircraft noise-induced annoyance among respondents was less than 5% in all wilderness areas combined. Noise-induced annoyance proved to be a more direct measure of the effects of aircraft overflights on recreationists than more global measures such as visit satisfaction or intent to revisit.

Fidell, S., Gramann, J., Kropf, R., & Pearsons, K. (1998). Response to "Comments on 'Effects of aircraft overflights on wilderness recreationists'" J. Acoust. Soc. Am. 104, 1726 (1998). *Journal of the Acoustical Society of America, 104*(3), 1729-1732.

Abstract:
Dr. Staples' lengthy comments [J. Acoust. Soc. Am. 104, 1726-1728 (1998)] deal less with the matters of research design or data analysis described by Fidell et al. [J. Acoust. Sec. Am. 100, 2909-2918 (1996)] than with her beliefs about the proper study and interpretation of aircraft noise effects in outdoor recreational settings. Her comments nonetheless raise several interesting issues related to the role of technical expertise in noise-related policy analyses. This response therefore concentrates on those of Staples' comments and arguments that are of general interest, while only secondarily addressing certain inaccuracies and oversimplifications in them.

Keywords:
Panel

Fidell, S., Sneddon, M., Pearsons, K., & Howe, R. (2002). Insufficiency of an environmental sound's power spectrum as a predictor of its annoyance. *Noise Control Engineering Journal, 50*(1), 12-18.

Abstract:

The annoyance of environmental noise exposure and its "acceptability" with respect to land use compatibility and other interpretive criteria are routinely assessed in terms of assorted frequency-weighted noise metrics. Although laboratory measurements have established the utility of frequency-weighting networks and more complex procedures as predictors of the judged annoyance of sounds heard under controlled listening conditions, many factors can erode the predictive utility of noise metrics in residential settings. For example, relationships between A-weighted noise levels and the prevalence of annoyance due to environmental noise exposure typically account for less than half of the variance in community survey information about the prevalence of noise-induced annoyance. The current study indicates that even under controlled listening conditions, the spectral distribution of sound energy is not a fully sufficient predictor of the annoyance of transportation noise. This finding suggests a fundamental limitation on the generality of predictions of the annoyance of environmental noise exposure that are based on acoustic information alone.

Keywords:

General transportation noise; level

Fidell, S., & Pearsons, K. (2003). Sensitivity to prospective transportation noise exposure. *Noise Control Engineering Journal, 51*(2), 106-113.

Abstract:

The Federal Interagency Committee on Noise recommends reliance on a summary relationship developed from retrospective self-reports of annoyance for purposes of assessing community response to future transportation noise. Predictions based upon this relationship are often in substantial error. As noted by Green and Fidell, error in prediction of annoyance prevalence rates from noise exposure may be attributed in part to error of measurement of exposure and in part to failure to systematically treat the influences of response bias. In the case of noise exposure that has not yet occurred, however, poor correlation between annoyance and dosage cannot be attributed to uncertainties of physical measurement. The present study was undertaken to estimate the influence of non-acoustic factors on rates of growth of annoyance under circumstances in which uncertainties of acoustic measurement are irrelevant. The prevalence rates of annoyance associated with prospective increases in noise exposure were found to be under-estimated by FICON (1992) and other summary relationships. This finding suggests that predictions of community response to anticipated changes in environmental noise could be more reliably made if they were not based exclusively on reports of adapted populations of their opinions about familiar circumstances of noise exposure.

Keywords:

ground vehicle noise; community annoyance; aircraft noise; prevalence

Fidell, S., & Silvati, L. (2004). Parsimonious alternatives to regression analysis for characterizing prevalence rates of aircraft noise annoyance. *Noise Control Engineering Journal, 52*(2), 56-68.

Abstract:

The shortcomings of a fitting function endorsed by the U.S. Federal Interagency Committee on Noise (FICON) for predicting prevalence rates of a consequential degree of annoyance in populations exposed to aircraft noise are well understood and well documented. These include (1) substantial underestimation of measured prevalence rates of aircraft noise annoyance in the exposure range of greatest practical interest; (2) the burden of analytic assumptions made in logistic regression; and (3) the limited amount of variance for which a generic (non-source specific) function for all forms of transportation noise accounts in the

relationship between cumulative noise exposure and measured prevalence rates of aircraft noise annoyance. Since the U.S. National Environmental Policy Act requires use of best-available technology for disclosure of noise impacts of major federal actions such as construction of airport infrastructure, a review was undertaken of the FICON relationship which considers additional information that has become available in the last decade. Although fitting functions more accurate and reliable than that of FICON can be identified by regression analyses of the findings of more than two dozen studies of aircraft noise annoyance, alternative (data-and theory-driven) approaches to characterizing annoyance due to aircraft noise are more readily defensible for basic policy-related purposes.

Keywords:

general transportation noise; community response; airport community; exposure

Freimund, W. A., Vaske, J. J., Donnelly, M. P., & Miller, T. A. (2002). Using video surveys to access dispersed backcountry visitors' norms. *Leisure Sciences, 24*(3-4), 349-362.

Abstract:

Image Capture Technology (ICT), or the capture and editing of photographic images using microcomputers, has been used in a variety of settings to assess social and ecological impacts. This study illustrates the application of this technology in a VHS videotape survey designed to assess visitors' norms for varying numbers of watercraft, sounds from aircraft and motorized boats, and the acceptability of floating outfitting camps. Acceptability ratings for three setting contexts (access areas, attraction sites, and wild places) within Gwaii Haanas National Park Reserve, British Columbia, were evaluated. Methodologically, use of the videotape survey proved to be a cost effective vehicle in evaluating both sight and sound impacts. More than 75% of the respondents indicated that the images served as useful reminders of their visit and helped them articulate their norms. These normative standards were consistent with other studies conducted in backcountry areas. The implications of this technology for addressing natural resource management issues are discussed.

Keywords:

image capture technology; norms; evaluative standards; crowding norms; standards; preferences

Fleming, G., Roof, C.J., & Read, D.R. (1998). *Draft Guidelines for the Measurement and Assessment of Low-Level Ambient Noise.* DTS-34-FA865-LR1. Cambridge, Mass.: U.S. Department of Transportation, Federal Aviation Administration, John A. Volpe National Transportation Center, Acoustics Facility.

Abstract:

(Introduction) The Federal Aviation Administration's Office of Environment and Energy (FAA/AEE), with the assistance of the Acoustics Facility at the United States Department of Transportation's John A. Volpe National Transportation Systems Center (U.S. DOT/Volpe Center) is conducting research in support of the National Parks Overflight Rule (National Rule).4 A major element of the research program for the National Rule is the development of an ambient noise* measurement protocol, a detailed methodology for characterizing ambient noise in low-level environments such as the National Parks. It is expected that ambient noise will be a key component in the noise impact criteria established for the National Rule.

Keywords:

a-weighted; acoustic energy; acoustically unique categories; ambient noise; audibility; backcountry; commercial tour and sightseeing aircraft; day-night average sound level; decibel; detestability; dose-response; equivalent sound level; frontcountry; low-level noise; maximum sound level; natural quiet; noise; nosie dose; noticeability; offset calibration; technique

Graham, O. J. (1999). Measuring the effects of commercial jet boats on the Dart River on the experiences of recreationists in natural settings. *Noise Control Engineering Journal, 47*(3), 104-106.

Abstract:

Commercial jet boat activity on the Dart River in New Zealand can produce noise levels that potentially impact the recreational experience of hikers on adjacent tracks. A survey of recreationists using two tracks near the Dart river was undertaken during summer of 1997/98. The purpose of the survey was to determine the degree to which recreationists are disturbed by existing jet boat movements and to assess their opinions about the potential impacts of increased operations. Preliminary analysis of the survey results suggests that noise is a primary annoying feature of jet boat activity and that any significant increase in commercial jet boat activity would drastically increase annoyance.

Gramann, J. H. (1999). The effect of mechanical noise and natural sound on visitor experiences in units of the National Park Service. *Social Science Research Review, 1*(1), 1-16.

Abstract:

This paper reviews research on the effects of mechanical noise and natural sound on visitor experiences in national parks. Three approaches to studying noise impacts are described. Most noise research to date has addressed the impact of air tour overflights on visitor experiences. These impacts are localized, with significant percentages of visitors in some parks reporting interference with natural sounds from aircraft noise. Research has also shown that unthreatening natural environments can have significant stress-reducing effects for many people. However, it is unclear if these effects are due to hearing the sounds of nature or to a combination of hearing and seeing nature.

Keywords:

Hatfield, J., Job, R. F. S., Hede, A. J., Carter, N. L., Peploe, P., Taylor, R., et al. (2002). Human response to environmental noise: The role of perceived control. *International Journal of Behavioral Medicine, 9*(4), 341-359.

Abstract:

Negative impacts of noise exposure on health and performance may result in part from "learned helplessness," the syndrome of deficits typically produced by exposure to uncontrollable events. People may perceive environmental noise to be uncontrollable, and several effects of noise exposure appear to parallel "learned helplessness" deficits. In the present socioacoustic survey (N = 1,015), perceived control over aircraft noise correlated negatively with some effects of noise (though not others). Furthermore, these effects were better predicted by perceived control than by noise level. These observational data support the claim that "learned helplessness" contributes to the effects of noise exposure.

Keywords:

learned helplessness; uncontrollability; noise disturbance; sleep disturbance; effects of noise
road traffic noise; learned helplessness; aircraft noise; mental-health; animal-models; sleep; performance; stress; depression; behavior

Harrison, R. T., Clark, R. N., & Stankey, G. H. (1980). *Predicting Impact of Noise on Recreationists* San Dimas Forest Service, U.S. Department of Agriculture.

Preface:

Efficient and effective forest management depends upon managers having adequate information about impacts of natural resources. One of the most difficult impacts to asses is sound. The impact of a sound depends upon both the physical properties of the sound and the characteristics of the receiver (in our case, the human "listener"). The Project Record addresses the problem of quantifying the impact of sound on the forest recreation experience.

Hartig, T., Mang, M., & Evans, G. W. (1991). Restorative Effects of Natural-Environment Experiences. *Environment and Behavior, 23*(1), 3-26.

Abstract:

This paper reports on the results of a quasi-experimental field study and true experiment exploring the utility of different theoretical models of the restorative experience of natural environments. The quasi-experimental field study compared the restorative abilities of wilderness backpacking and nonwilderness vacation conditions, as well as a control condition. The true experiment compared the urban environment, natural environment, and passive relaxation conditions. Convergent self-report and performance results obtained from participants in both studies showed that greater restorative effects arise from experiences in nature. The authors also discuss implications for theory, methodology, and design.

Keywords:

stress

Hartig, T., Evans, G. W., Jamner, L. D., Davis, D. S., & Garling, T. (2003). Tracking restoration in natural and urban field settings. *Journal of Environmental Psychology, 23*(2), 109-123.

Abstract:

We compared psychophysiological stress recovery and directed attention restoration in natural and urban field settings using repeated measures of ambulatory blood pressure, emotion, and attention collected from 112 randomly assigned young adults. To vary restoration needs, we had half of the subjects begin the environmental treatment directly after driving to the field site. The other half completed attentionally demanding tasks just before the treatment. After the drive or the tasks, sitting in a room with tree views promoted more rapid decline in diastolic blood pressure than sitting in a viewless room. Subsequently walking in a nature reserve initially fostered blood pressure change that indicated greater stress reduction than afforded by walking in the urban surroundings. Performance on an attentional test improved slightly from the pretest to the midpoint of the walk in the nature reserve, while it declined in the urban setting. This opened a performance gap that persisted after the walk. Positive affect increased and anger decreased in the nature reserve by the end of the walk; the opposite pattern emerged in the urban environment. The task manipulation affected emotional self-reports. We discuss implications of the results for theories about restorative environments and environmental health promotion measures.

Keywords:

stress recovery; blood-pressure; intervention; environments; experiences; reactivity; promotion; attention

Hempton, G. (2005). One Square Inch of Silence Retrieved February 15, 2006, from http://www.onesquareinch.org/index.php

Introduction:

"One Square Inch of Silence is the quietest place in the United States. Located in the Hoh Rain Forest at Olympic National Park, it is approximately three miles from the Visitor's Center above Mt. Tom Creek Meadows. Hiking time from the parking lot at the Visitor's Center to the site is approximately two hours along a gentle path lined by ancient trees and ferns. The exact location is marked by a small red-colored stone place on top of a moss-covered log at 47° 51.959N, 123° 52.221W, 678 feet above sea level.
One Square Inch of Silence was designated on Earth Day 2005 (April 22, 2005) to protect and manage the natural soundscape in Olympic Park's backcountry wilderness. The logic is simple; if a loud noise, such as the passing of an aircraft, can impact many square miles, then a natural place, if maintained in a 100% noise-free condition, will also impact many square miles around it. It is predicted that protecting a single square inch of land from noise pollution will benefit large areas of the park"

Hempton, G. (2006). Public Comment on Draft NPS Management Policy.

Comment:

"The currently proposed Soundscape Management section is inadequate. A complete revision is submitted”

Hu, S. F. (1999). Integrated multimedia approach to the utilization of an Everglades vegetation database. *Photogrammetric Engineering and Remote Sensing, 65*(2), 193-198.

Abstract:

An approach for integrating multimedia data with a geographic information system (GIS) database was developed for an area corresponding to the U.S. Geological Survey (USGS) Long Pine Key and Pa-Hay-Okee Lookout Tower 1:24,000-scale topographic quadrangles in Everglades National Park. The multimedia database contains descriptive text, ground photographs, digital video clips, and audio segments highlighting the characteristics of Everglades plant communities, individual species, and invasive exotics, as well as plant-animal interactions, hurricane damage, and post-fire vegetation succession. It is linked to a GIS database that includes detailed vegetation maps, SPOT panchromatic imagery and scanned National Aerial Photography Program (NAPP) 1:40,000-scale color-infrared (CIR) aerial photographs. The integrated multimedia approach was implemented in two steps: (1) an interactive multimedia system designed to manipulate multimedia information such as hypertext, hyperlinks, scanned photographs, digital video, and sound was developed in a Microsoft Visual Basic programming environment; and (2) a GIS application program to manipulate spatial data was constructed using Visual Basic and Environmental Systems Research Institute (ESRI) MapObjects software. The interactive multimedia approach provides a unique way to represent geographic features and associated information on interrelationships between flora, fauna, and human activities in Everglades National Park.

Hunt, M. (1999). Management of the environmental noise effects associated with sightseeing aircraft in the Milford Sound area, New Zealand. *Noise Control Engineering Journal, 47*(4), 133-141.

Abstract:

Visitors to National Parks in New Zealand have strong expectations about their rights to enjoy recreational opportunities in natural areas free from perceived adverse effects of aircraft overflying and aircraft related sound. These factors influence their responses to surveys of annoyance and level of satisfaction with the outdoor experience. This paper considers the methods available for managing conflicts between users of the natural environment and the air-tourism industry. The two issues described in the paper are: 1) controlling total noise emitted from an aerodrome in Fiordland National Park, based on the method recommended by NZ Standard (NZS6805: 1992), and 2) a model for investigating aircraft overflying noise impacts over the main walking tracks in the hilly terrain of the Milford Track located in Fiordland National Park.

Jensen, M., & Thompson, H. (2004). Natural Sounds: An Endangered Species *The George Wright Forum 21*(1), 10-13.

Abstract:

(Introduction) Only in designated wilderness areas of the United States are there management goals and objectives such that natural sounds are preserved. While the criteria for listing under the Endangered Species Act are not directly applicable to natural sounds, the policy behind the act—to protect threatened and endangered species—is directly relevant. Much like the populations of plants and animals we now see on the endangered species list, the opportunity to hear natural sounds in wilderness areas has considerably diminished over the years. Designated wilderness areas collectively comprise probably less than 3% of the landmass of the country. In protected wilderness areas exceptions exist so that values such as solitude and the opportunity to experience areas untrammeled by people, and to engage in primitive and unconfined forms of recreation, are management goals that are not always met. Without considerable focus of management agencies on these declining resources, they will be lost.

Job, R. F. S., & Hatfield, J. (2001). The impact of soundscape, enviroscape, and psychscape on reaction to noise: Implications for evaluation and regulation of noise effects. *Noise Control Engineering Journal, 49*(3), 120-124.

Abstract:

Community reaction to noise is an important outcome of noise exposure and regulations are often based on predicting what noise exposure is likely to result in more than 10% of the population being "highly annoyed" or "seriously affected" (in terms of reaction). These predictions are generally based on dose-response curves which do not directly account for the impact on reaction of various features of the noise (e.g. its tonality), of the acoustical environment in which it occurs (soundscape; e.g. the presence of background noise), of the physical environment in which it occurs (enviroscape; e.g. air pollution), or of the psychology of the individual hearing it (psychscape; e.g. attitude to the noise source). A socioacoustic survey conducted in the vicinity of Sydney Airport (N = 1015) confirmed the influence of soundscape (i.e. neighborhood traffic rating, annoyance with traffic noise), and enviroscape (i.e. neighbourhood parks and playgrounds rating) on reaction. Although, self-reported occurrence of stressful life events was not significantly associated with reaction, other measures of psychscape do demonstrate an association. Direct measurement of reaction is suggested as a sensible and efficient approach to accounting for the roles of soundscape, enviroscape and psychscape when evaluating and regulating reaction to existing noise.

Keywords:

subjective reactions; residential areas; traffic noise; annoyance

Kariel, H. G. (1990). Factors Affecting Response to Noise in Outdoor Recreational Enrivonments *The Canadian Geographer 34*(2), 142-149.

Summary:

Research conducted by Kariel (1990) suggested that simply investigating sound levels alone may not get at the true nature of annoyance with those sounds. Kariel suggested that understanding the physical characteristics and their socio psychological characteristics along with sound levels may be a better way in predicting whether sounds will be deemed as annoying, pleasing, or acceptable. For example, high pitched sounds are usually deemed more annoying than low pitch sounds, and rhythmic sounds such as an engine are generally considered more annoying than continuous sounds. However, because many sensory experiences occur along with sound, it is important to consider the larger context of the setting. Because many people tend to visit natural areas to get away, enjoy nature, and relax, sounds that interfere with these goals may also be deemed as annoying (Kariel, 1990).

Komanoff, C., & Shaw, H. (2000). *Drowning in Noise: Noise Cost of Jet Skis in America: A Report for the Noise Pollution Clearinghouse*. Retrieved February 15, 2006, from www.nonoise.org

Context of Report:

“People don't like noise and will pay to avoid it; witness the reduced market value of houses near airport runways and highways. In this report, we estimate, in quantitative terms, just how annoyed beachgoers in the United States are by the sound of jet skis (1) operated nearby. We do this through a quantitative model that estimates the monetary value of the "disamenity" (lost enjoyment) that jet ski noise introduces into beach environments in America. Our results, expressed in dollars, are what beachgoers would pay to rid lake, bay, river and ocean beaches of jet ski noise - if there were an entity that would take their money and turn off the noise. We present two types of estimates: the "annoyance" cost of jet ski noise itself, and the effectiveness of possible strategies to reduce this cost. Other social and environmental costs of jet skis, such as water and air pollution, harm to swimmers and wildlife, etc., are discussed in Section 9, but only summarily; our subject here is jet ski noise and its cost to beachgoers”

Krause, B. (1999). *Loss of Natural Soundscapes Within the Americas.* Paper presented at the FICAN Symposium on Preservation of Natural Quiet Acoustical Society of America Session 3aNS, 3 November 1999, 0840hrs.

Abstract:

Species-specific creature voices within an undisturbed ecosystem evolve to perform within the acoustic parameters of that habitat and especially within the symbiotic structure imposed by the spectral content of other species voices occupying the same biome. The result is a rich integrated texture of sound spread over both the audible (human) and inaudible spectrum with changing patterns given season, weather, and time of day. With over 30 years experience recording in the field, the author documents the loss of natural soundscapes within the Americas with observations demonstrated by field recordings and graphics.

Krause, B. (2002). *Wild Soundscapes: Discovering the Voice of the Natural World:* Wilderness Press.

Reviews:

" Bernie Krause introduces us to a world of great freshness, beauty, and fragility. Wild Soundscapes will seduce the ear, instruct the mind, nourish (and in many ways sadden) the heart. An important book based on a lifetime of intense outdoor experience." --Malcolm Margolin,
author The Ohlone Way publisher Bay Nature Magazine & News from Native California

"Bernie has admirably produced not only a comprehensive technical manual to the art of nature recording, but also a heartfelt guide to understanding and appreciating natural soundscapes, a threatened heritage in our modern world." --Lang Elliott, author of numerous books and recordings of natural sound

Krause, B., & Gage, S. (2003). *SEKI Natural Soundscape Vital Signs Pilot Program Report* (No. V.7 draft).

Abstract:

Using the sound signatures of four representative sites within Sequoia National Park to test for evidence of habitat health, the biophonies and geophonies were recorded at selected times during each of the four seasons beginning in October, 1991 and ending in August, 1992, and analyzed with respect to frequency niches, temporal expression of sound, and spatial techniques. It was the objective of this pilot study to determine if there was sufficient information and the ability to analyze the data as indicators of habitat health and relative dynamic equilibrium. Indications support the thesis that organism vocalizations within a given landscape at dynamic equilibrium will exhibit patterns of clear discrimination between frequency niches and/or temporal slots. The clearer the patterns, the more stable the system.

Krog, N. H., & Engdahl, B. (1999). Aircraft noise in recreational areas: Effects on visitors' experience and well-being. *Noise Control Engineering Journal, 47*(4), 147-149.

Abstract:

The 1998 transition of Norway's main airport from Fornebu to Gardermoen north of Oslo provided a unique opportunity to survey users of nearby recreational areas about the impact of changes in aircraft operations and noise. Both airports are situated near important recreational areas, and the potential impact of aircraft noise is significant. Preliminary results from a telephone survey and a field study both conducted prior to the transition are reported. Parallel investigations will be conducted after the transition is completed.

Krog, N. H., & Engdahl, B. (2004). Annoyance with aircraft noise in local recreational areas, contingent on changes in exposure and other context variables. *Journal of the Acoustical Society of America, 116*(1), 323-333.

Abstract:

Few socioacoustic studies have examined the effect of noise on outdoor recreationists. The areas studied have been mountain and wilderness areas that people typically travel for a distance to visit. In this article we examine the reactions to aircraft noise in local recreational areas experiencing either decreased (1930 survey respondents), or increased noise exposure (1001 survey respondents). Field studies were conducted before and after the relocation the main airport of Norway in 1998 in one area near each airport. The relationship between individual noise exposure (L-Aeq for the aircraft events, percentage of time aircraft were audible, and L-Asel) for the aircraft events. The analyses included the "situation" in which data were collected (before or after the relocation), and variables describing the recreational context. A strong effect of the "situation" was found in both cases, but the size of the effect was influenced by the choice of exposure variable in one of the study areas. Other context variables were also influencing annoyance. The effect of the situation (before/after a change in exposure) on the dose-response relationship may be influenced by the initial noise levels, the amount of change, and the time elapsed since the change at the time of the second survey. Further research should investigate the significance of these variables.

Keywords:

wilderness recreationists; overflights

Krog, N. H., & Engdahl, B. (2005). Annoyance with aircraft noise in local recreational areas and the recreationists' noise situation at home. *Journal of the Acoustical Society of America, 117*(1), 221-231.

Abstract:

Few socioacoustic studies have examined the effect of noise on outdoor recreationists. Most studies concentrate on one setting of the everyday life of a noise-exposed population, which mainly has been the residential setting. This article relates annoyance with aircraft noise in outdoor recreational areas to the recreationists' noise situation at home. In conjunction with the relocation of the main airport of Norway in 1998, field studies were conducted before and after the change in one area near the old airport (1930 survey respondents), and one area near the new airport (1001 survey respondents). Multivariate linear regression analyses of the relationship between annoyance and aircraft noise exposure (L-Aeq for the aircraft events) in the recreational areas were conducted, controlled for noise annoyance at home, or aircraft noise exposure at home, the situation (before/ after the change), context- and demographic variables. People more highly annoyed at home tended to be more annoyed than others while in the recreational areas. A significant effect of aircraft noise exposure at home on annoyance in the recreational setting was not found. More research is warranted regarding the relationship between noise exposure at home and outdoor recreational demands.

Keywords:

transportation noise; community response; exposure; overflights; variables

Kyle, G. T., Mowen, A. J., & Tarrant, M. (2004). Linking place preferences with place meaning: An examination of the relationship between place motivation and place attachment. *Journal of Environmental Psychology, 24*(4), 439-454.

Abstract:

Using data collected from residents surrounding a large urban park setting, we examined the relationship between their motivation to visit the park and their attachment to the setting. Based on the literature suggesting that natural environments provide humans with a variety of desired psychological, social, and physiological outcomes, we hypothesized that these outcomes would motivate respondents to interact with the park environment and facilitate the development of their attachment to the setting. Our data were analyzed using covariance structure analysis. The results of this analysis offered partial support for our hypothesized model. Using multidimensional conceptualizations of motivation and place attachment, we observed that not all dimensions of motivation had a significant effect on the dimensions of place attachment. The valence of the significant predictors, however, was consistent with our hypotheses and prior literature.

Keywords:

physical-activity; environmental perception; recreation experiences; identity processes; favorite places; fit indexes; sense; community; covariance; landscape

Lawson, S. R., Manning, R. E., Valliere, W. A., & Wang, B. (2003). Proactive monitoring and adaptive management of social carrying capacity in Arches National Park: an application of computer simulation modeling. *Journal of Environmental Management, 68*(3), 305-313.

Abstract:

Public visits to parks and protected areas continue to increase and may threaten the integrity of natural and cultural resources and the quality of the visitor experience. Scientists and managers have adopted the concept of carrying capacity to address the impacts of visitor use. In the context of outdoor recreation, the social component of carrying capacity refers to the level of visitor use that can be accommodated in parks and protected areas without diminishing the quality of the visitor experience to an unacceptable degree. This study expands and illustrates the use of computer simulation modeling as a tool for proactive monitoring and adaptive management of social carrying capacity at Arches National Park. A travel simulation model of daily visitor use throughout the Park's road and trail network and at selected attraction sites was developed, and simulations were conducted to estimate a daily social carrying capacity for Delicate Arch, an attraction site in Arches National Park, and for the Park as a whole. Further, a series of simulations were conducted to estimate the effect of a mandatory shuttle bus system on daily social carrying capacity of Delicate Arch to illustrate how computer simulation modeling can be used as a tool to facilitate adaptive management of social carrying capacity.

Keywords:

crowding; norms; limits of acceptable change; protected area management; indicators of quality; standards of quality; transportation planning

Lawson, S. R., & Manning, R. E. (2003). Research to Guide Management of Backcountry Camping at Isle Royale National Park: Part I – Descriptive Research. *Journal of Park and Recreation Administration, 21*(3), 22-42.

Abstract:

This paper is the first in a sequence of two papers that report on descriptive and prescriptive research undertaken at Isle Royale National Park to support development of a new wilderness management plan at the Park. The present paper reports on the first phase of study aimed at developing descriptive information on backcountry camping at Isle Royale. This information includes the relationship between number and spatiotemporal distribution of camping groups and amount of campsite sharing,

as well as the potential effectiveness of alternative management practices designed to reduce campsite sharing. A computer simulation model of backcountry camping was developed for this purpose. The second paper reports on the prescriptive phase of the research that focused on visitor preferences among alternative management scenarios designed to reduce campsite sharing. Findings from the first, descriptive phase of research were used to identify a set of feasible, realistic management scenarios that could be incorporated into the second, prescriptive phase of research.
The study results suggest that under the Park's current management approach, an average of about 9% of groups are required to share campsites per night during July and August, with 24% sharing during the busiest two weeks of this period. Further, the results suggest that the Park would need to reduce visitor use during July and August by nearly 25% to ensure that an average of no more than 5% of groups share campsites per night. The model estimates that by instituting a fixed itinerary system, the Park could issue approximately 30% more permits than they did during the 2001 visitor use season, while at the same time virtually eliminating campsite sharing. The results of several other management simulations are presented and discussed in the paper, including campsite construction and spatial and temporal redistribution of visitor use. The computer simulation model developed in this study provides park managers with a tool to assess the effectiveness and consequences of management alternatives in a manner that may be more cost-effective, less labor-intensive, more comprehensive, and less politically risky than on-the ground, trial-and-error approaches. Further, the research presented in this sequence of papers provides a model for integrating descriptive and prescriptive research findings into the planning and management of parks and wilderness.

Keywords:
Isle Royale National Park, simulation modeling, wilderness, wilderness management, backcountry camping, indicators and standards of quality, carrying capacity

Lawson, S. R., & Manning, R. E. (2003). Research To Guide Management Of Backcountry Camping At Isle Royale National Park: Part II – Prescriptive Research. *Journal of Park and Recreation Administration 21*(3), 43-56.

Abstract:

This paper is the second in a sequence of two papers that report on descriptive and prescriptive research undertaken at Isle Royale National Park to support development of a new wilderness management plan at the Park. The first paper reports on the initial phase of study aimed at developing descriptive information on backcountry camping at Isle Royale using computer simulation modeling. The present paper reports on the second phase of research. In this study, management alternatives identified in the first phase of research were incorporated into prescriptive research designed to help managers evaluate the public's acceptance of consequences associated with these alternatives. A number of prescriptive questions associated with managing backcountry camping at Isle Royale National Park are examined in this study. For example, do visitors consider the costs to visitor freedoms and spontaneity associated with a fixed itinerary system to outweigh the benefits of increasing opportunities to camp out of sight and sound of other groups? Is it in the public's interest to limit backcountry camping use in order to improve visitors' chances of finding a vacant campsite each night of a trip? If so, to what extent should use be limited to achieve a greater degree of camping solitude? Study findings suggest that visitors may be willing to forfeit some campsite solitude in order to avoid restrictive limits on visitor use, regulated backcountry camping experiences, and/or the construction of a large number of new campsites in the Park. For example, study results suggest that among four management alternatives evaluated, visitors would be most likely to support those that would not require visitors to follow fixed itineraries or involve building additional campsites, even though visitors may have to share campsites with other groups. These and related findings offer important insights into the relative importance of campsite solitude and the tradeoffs (e.g., reductions in visitor use, more regulation, additional campsite development) that visitors are (or are not) willing to make to achieve it. In this way, the results of the study assist managers in reaching "informed judgements" concerning how to manage backcountry camping at Isle Royale National Park. Further, the research presented in this sequence of papers provides a model for integrating descriptive and prescriptive research findings into the planning and management of parks and wilderness.

Keywords:
Wilderness management, Isle Royale National Park, computer simulation modeling, stated choice analysis, crowding, carrying capacity

Lawson, S. R. (2006). Computer Simulation as a Tool for Planning and Management of Visitor Use in Protected Natural Areas *Journal of Sustainable Tourism, 14*.

Abstract:
The United Nations Environment Programme's Principles on Implementation of Sustainable Tourism suggest that implementing sustainable tourism must include monitoring visitor use of protected natural areas and directing it to areas where the environmental and social impacts of tourism are minimized. Thus, sustainable tourism management requires information about the spatial and temporal flow of visitor use in protected natural areas to help identify potential tourism-related threats to the natural and cultural resources of an area and the quality of visitors' experiences. Recent research has identified at least four ways in which simulation modeling of visitor use can facilitate more informed planning and management of sustainable tourism in protected natural areas, including 1) describing existing visitor use flows; 2) monitoring the condition of "hard to measure" indicator variables; 3) testing the effectiveness of alternative visitor use management practices; and 4) guiding the design of research on public attitudes. The purpose of this paper is to demonstrate, using findings from studies conducted in the Inyo National Forest and Isle Royale National Park, USA, each of these four potential contributions of computer simulation to sustainable tourism management and planning. The paper concludes with an assessment of the limitations of existing applications of computer simulation to nature-based tourism and recommendations for future research.

Keywords: Protected natural areas management, computer simulation modeling, Inyo National Forest, Isle Royale National Park, nature-based tourism planning, carrying capacity

Lynch, E., & Schirokauer, D. (2005). *Muir Woods National Monument Soundscape Monitoring Project Summer 2005, DRAFT*.

Methods:
A sound monitoring system capable of collecting sound pressure level data and digital recordings (.wav files) was set up in two locations at MUWO. The Spectra system (see Appendix V for equipment list) recorded ten-second high-quality digital audio clips (.wav files) once every two minutes. It also collected Leq data for one-third octave-bands (20-20,000 Hz) and dBA every second. The data gathered from this device was analyzed later to determine sound sources and to generate graphs or tables of hourly and daily acoustic metrics. The metrics computed included: Leq, L10, L50, L90, and Lx. These metrics describe the percentage of time that sound at each site exceeded a certain decibel level. For instance, the L50 metric describes the sound level exceeded 50% of the time during a given measurement period. When the study at Muir Woods is completed, we will have metrics for each hour, day, and the entire measurement period. Using these metrics we will also derive seasonal estimates of these metrics.

Lynch, E., Joyce, D., & Fristrup, K. 2011. An assessment of noise audibility and sound levels in U. S. National Parks. *Landscape Ecology.*

Methods:

Throughout the United States, opportunities to experience noise-free intervals are disappearing. Rapidly increasing energy development, infrastructure expansion, and urbanization continue to fragment the acoustical landscape. Within this context, the National Park Service endeavors to protect acoustical resources because they are essential to park ecology and central to the visitor experience. The Park Service monitors acoustical resources in order to determine current conditions, and forecast the effects of potential management decisions. By community noise standards, background sound levels in parks are relatively low. By wilderness criteria, levels of noise audibility are remarkably high. A large percentage of the noise sources measured in national parks (such as highways or commercial jet traffic) originates outside park boundaries and beyond the management jurisdiction of NPS. Many parks have adopted noise mitigation plans, but the regional and national scales of most noise sources call for conservation and management efforts on similar scales.

Mace, B. L., Bell, P. A., & Loomis, R. J. (1999). Aesthetic, affective, and cognitive effects of noise on natural landscape assessment. *Society & Natural Resources, 12*(3), 225-242.

Abstract:

Research has shown that helicopter noise from tourist flights is very common in some national parks and wilderness areas. At Grand Canyon National Park, aircraft noise has been found to be as high as 76 dB(A) with as many as 43 noise events in a 20-minute period. The present study examined the influence of 40 dB(A) ol 80 dB(A) helicopter noise on assessment of a popular Grand Canyon vista in a laboratory simulation. Participants (44 female and 36 male undergraduates) viewed 68 slides of scenic vistas and assessed them on naturalness, preference, and scenic beauty and evaluated dimensions of freedom, annoyance, solitude, and tranquility. Compared to a control condition of background natural sounds (e.g., birds, brooks), noise conditions negatively impacted all dependent measures. Although the effects were most pronounced at the 80-dB level, even the 40-dB helicopter noise negatively impacted all dependent variables. Results suggest that helicopter noise interferes with the quality of the visitor experience and even affects the perceived aesthetic quality of landscapes.

Keywords:

landscape assessment; natural environments; noise; outdoor recreation vigilance performance; aircraft overflights; environments; preferences; quality; sensitivity; personality

Mace, B. L., Bell, P. A., Loomis, R. J., & Haas, G. E. (2003). Source attribution of helicopter noise in pristine national park landscapes. . *Journal of Park and Recreation Administration, 21*(3), 97-119.

Abstract:

Aircraft overflight noise from helicopter tours is frequently encountered in such national parks as Grand Canyon, Hawaii Volcanoes, Haleakala, and Bryce Canyon. Noise is an environmental stressor and is associated with a variety of physiological and psychological effects, some of which are long-lasting. Psychologically, attributing a stressor to a nonhostile origin (e.g., a helicopter rescue mission) could mitigate stress effects. In this study, 200 undergraduates rated National Park scenes while exposed to either natural sounds (birds, brooks, wind), helicopter noise attributed to tourist overflights, helicopter noise attributed to backcountry maintenance operations, or helicopter noise attributed to the rescue of a back country hiker. Regardless of the source, 60 decibel (dB(A)) helicopter noise resulted in lower ratings of scenic beauty, solitude, tranquility, freedom, naturalness, and preference, and higher ratings of annoyance. These effects occurred across all types of scenery. Results suggest that park management-related overflight noise is just as disturbing as tourist aircraft noise, and that the impact of this noise is substantial across demographic variables and across types of vistas.

Keywords: Helicopter Noise, Sound Management, Aircraft Overflights, National Parks

Mace, B. L., Bell, P. A., & Loomis, R. J. (2004). Visibility and natural quiet in national parks and wilderness areas - Psychological considerations. *Environment and Behavior, 36*(1), 5-31.

Abstract:

For over a century, authorities have recognized cultural and psychological benefits of preserving national parks and wilderness areas. Yet, with increases in visitation and mechanized travel, air and noise pollution are intruding more and more into preserved natural areas. Psychological research shows that humans can detect very low levels of these pollutants in natural and laboratory settings, that air and noise pollution detract from the enjoyment of the visitor experience, and that people place a high value on naturally quiet, pollution-free settings. This article discusses how psychological research is essential for a more complete understanding of the value and the influence of both visibility and quiet surroundings with a focus on applied, field-based research in national parks and wilderness areas. The article concludes with recommendations for future directions in research in these areas and argues that implications of psychological research results should be addressed in the natural resource policy-making process.

Keywords:

visibility; noise effects; recreation; environmental stress; air-pollution; chronic noise; stress; annoyance; exposure; environments; valuation; pressure; benefits; quality

Makarewicz, R., & Wojciechowska, H. (2003). Noise duration for a single overflight. *Journal of the Acoustical Society of America, 114*(1), 218-224.

Abstract:

Overflights in national parks and preserves interfere with communication and sounds of nature. The percentage of time that an aircraft is audible, P, can be used as a noise metric. To calculate P the overflight time for a single aircraft, tau, has to be known. The method of tau calculation is based on the assumption that an aircraft is a point source and the noise propagation is governed by geometrical spreading, air absorption, and refraction. The atmosphere is characterized by the effective sound speed gradient. Analytical formulas for tau are derived for down- and crosswind flights.

Keywords:

outdoor sound-propagation; temperature-gradients; aircraft overflights; refractive shadow; ray; predictions; atmosphere; turbulence; impedance; inversion

Manning, R., Lawson, S., Newman, P., Budruk, M., Valliere, W., Laven, D., et al. (2004). Visitor Perceptions of Recreation-related Resource Impacts. In R. Buckley (Ed.), *Environmental Impacts of Ecotourism* (pp. 261-273). Griffith University, Australia: CABI Publishing.

Abstract:

All forms of tourism have impacts on the natural environment. The impacts of ecotourism tend to be concentrated in areas of highest conservation value, hence the need to manage and minimize these. The book considers impacts of particular activities, such as hiking and camping, off-road vehicles, and recreational boats, and impacts specific to certain ecosystems (e.g. marine environments, polar coasts, mountain environments.) It incorporates reviews of better-studied impacts by well-known experts; and case studies of recent research and less well-known issues.

Manning, R. E., Lime, D. W., Freimund, W. A., & Pitt, D. G. (1996). Crowding norms at frontcountry sites: A visual approach to setting standards of quality. *Leisure Sciences, 18*(1), 39-59.

Abstract:

Indicators and standards of quality have emerged as key variables in defining and managing carrying capacity. Moreover, normative theory has been found useful when applied to rite difficult task of setting standards of quality. However, the traditional numerical approach to measuring crowding and related norms has several al potential shortcomings when applied to relatively high-use areas such as frontcountry attraction sites. This study applies a visual approach to measuring crowding norms in addition to the traditional numerical approach. The study is focused on Delicate Arch, a primary visitor attraction in Arches National Park, Utah. Image capture technology was used to develop a series of 16 photographs illustrating a range of people at one time at Delicate Arch. A random sample of 473 visitors was asked to I ate the acceptability of each photograph as part of a survey conducted in the summer and fall of 1993. A strong relationship was found between the number of people in the photographs and acceptability ratings. Moreover, there was considerable consensus among the sample regarding acceptability ratings of each photograph, and respondent evaluations of actual use conditions experienced were generally congruent with the social norm developed. These findings suggest an empirically rational basis for setting a standard of quality for crowding at Delicate Arch. However, the normative standards developed from the visual and traditional numerical approaches were found to differ substantially. The theoretical and empirical literature on norms suggests that the visual approach may provide a more valid measure of crowding norms in relatively high-use areas.

Keywords:

crowding norms, standards of quality, carrying capacity, frontcountry, image capture technology

Manning, R. E., Lime, D. W., & Hof, M. (1996). Social carrying capacity of natural areas: Theory and application in the US National Parks. *Natural Areas Journal, 16*(2), 118-127.

Abstract:

Concern over increasing visitor use of natural areas such as national parks has focused attention on the concept of carrying capacity. Research and management experience suggests that carrying capacity has both biological and social components. Moreover, carrying capacity might be addressed most effectively through identification of indicators and standards of quality. Monitoring of indicator variables would ensure that standards of quality are not violated. Using this approach, the U.S. National Park Service recently designed a carrying capacity-related planning framework called Visitor Experience and Resource Protection (VERP). This planning framework was pilot-tested at Arches National Park through a program of social science research, Based on this research, a series of indicators and standards of quality were identified, a long-term monitoring program is being implemented, and management actions are being undertaken. The VERP process is now being refined and may serve as a model for the rest of the U.S. National Park System and related natural areas.

Keywords:

encounter norms; backcountry

Marin, L. D., Newman, P., Manning, R. , Vaske, J. J. and Stack, D. (2011). Motivation and Acceptability Norms of Human-Caused Sound in Muir Woods National Monument. *Leisure Sciences*, 33(2), 147—161

Abstract:

Acceptability of sound, natural or human-caused, was predicted to vary by an individual's motivation for quiet at Muir Woods National Monument. This study used a dose-response methodology where visitors (n = 157; response rate = 54%) listened to five audio recordings varying in the percentage of time that human-caused sound was louder than natural sound (percent time above). Visitors then rated the acceptability (pleasing to annoying) of each recording. Cluster analysis was used to segment individuals into three

homogenous groups based on their motivations (i.e., low, moderate, and high motivation for quiet) for visiting the park. Results indicated that as percent time above natural sound increased, visitor ratings of human-caused sound decreased. Reactions to human-caused sound also decreased as motivation for quiet increased. Consensus regarding the acceptability of sound was greatest when the percent time above natural sound was lowest (i.e., quietest sounds). Recommendations are offered for setting standards to meet soundscape objectives.

Keywords:

soundscape, norms, motivation, Muir Woods National Monument

Marquis-Favre, C., Premat, E., & Aubree, D. (2005). Noise and its effects - A review on qualitative aspects of sound. Part II: Noise and annoyance. *Acta Acustica United with Acustica, 91*(4), 626-642.

Abstract:

Psychoacoustics has gradually developed following contributions at the end of the XIXth century and at the beginning of the XXth century from physicists such as Helmholtz, Holder and Campbell, and also from psychophysicists such as Sanford, Thurstone and Stevens. During the last decade this area has attracted considerable interest from the whole acoustic community due to the pressure from governments which have become more aware of noise effects and of people's desire to be less exposed to noise. For several years the need to take human perception into account has been shown in many studies, the objectives of which have been to understand physical phenomena and to quantify noise. Due to the multi-disciplinary nature of studies dealing with the qualitative aspects of sounds, research is spread over various disciplines and so a review of this subject has been necessary to many acousticians. The aim of this review is to provide the different persons involved in acoustics with a synthesis of the "tools" used in psychoacoustics for the subjective assessment of noise. This review is, of course, not exhaustive but presents studies which may act as starting points for anyone wishing to go more deeply into a particular aspect. The present paper sums up the principal effects of noise on human health and gives a presentation of some physical and psychoacoustic ratings used for describing the quantitative and qualitative aspects of noise.

Marquis-Favre, C., Premat, E., Aubree, D., & Vallet, M. (2005). Noise and its effects- A review on qualitative aspects of sound. Part 1: Notions and acoustic ratings. *Acta Acustica United with Acustica, 91*(4), 613-625.

Abstract:

The first part of this review has presented the principal effects of noise on human health and some physical and psychoacoustic ratings used to describe the quantitative and qualitative aspects of noise. This second part presents several factors leading to annoyance, some scaling techniques of annoyance and of qualitative aspects of noise generating annoyance, and finally, the case of annoyance caused by combined noise sources. The aim of this review, divided into two parts, is to provide the different persons involved in acoustics with a broad view and a non exhaustive list of different studies which have been carried out in the area of noise scaling.

Keywords:

ground vehicle noise; road traffic noise; aircraft noise; residential areas; transportation noise; community response; scaling loudness;

social survey; exposure; noisiness

Maher, R. C. (2004). White Paper: Obtaining Long-Term Soundscape Inventories in the U.S. National Park System (pp. 12): Montana State University-Boseman.

Abstract:

This paper outlines a research project for long-term soundscape inventories in the U.S. National Park System. The natural sonic environment of parks and wilderness areas is not well understood in a scientific sense, especially over long periods of time (days, months and years). Even in the National Park System—

arguably the most studied natural sound environment—most existing studies have been associated with regulatory surveys of specific noise intrusions, rather than comprehensive analyses of the natural cycles and trends of the biological and ecological systems comprising the park soundscape. The proposed research includes proof-of-concept development of economical monitoring hardware using recent advances in portable low-power electronics, and creation of new analysis software suitable for off-line audio data processing.

Menge, C., & Ross, J. (2000). Measurement and modeling of snowmobile noise and audibility at Yellowstone and Grand Teton National Parks. *The Journal of the Acoustical Society of America, 108*(5), 2497.

Entire Summary:

The U.S. National Park Service is concerned about the effect that noise from snowmobiles and other over-snow vehicles has on the natural soundscapes in the National Parks. This paper addresses the measurements and modeling performed to assess both the total area in the parks where snowmobile noise would be audible and the noise intrusiveness as a function of distance from the trails. The work was performed in support of an Environmental Impact Statement that evaluated seven operational transportation alternatives in the two parks. The modeling approach computed both A-weighted sound levels and audibility continuous time histories of snowvehicle noise at several distances from the trails. Acoustical input to the model included 1/3-oct band levels for ambient conditions, vehicle source levels, and propagation of sound over a snow-covered surface. Consequently, distances to the onset of audibility detection, areas of the parks affected, and statistics on received sound levels were calculated. The paper presents both the modeling approach and examples of results.

Miedema, H. M. E., & Vos, H. (1999). Demographic and attitudinal factors that modify annoyance from transportation noise. *Journal of the Acoustical Society of America, 105*(6), 3336-3344.

Abstract:

The effect of demographic variables (sex, age, education level, occupational status, size of household, homeownership, dependency on the noise source, and use of the noise: source) and two attitudinal variables (noise sensitivity and fear of the noise source) on noise annoyance is investigated. It is found that fear and noise sensitivity have a large impact on annoyance (DNL equivalent equal to [at most] 19 and 11 dB, respectively). Demographic factors are much less important. Noise annoyance is not related to gender, but age has an effect (DNL equivalent equal to 5 dB). The effects of the other demographic factors on noise annoyance are (very) small, i.e., the equivalent DNL difference is equal to 1-2 dB, and, in the case of dependency, 3 dB. The results are based on analyses of the original data from various previous field surveys of response to noise from transportation sources (number of cases depending on the variable between 15 000 and 42 000).

Keywords:

residential areas; aircraft noise; exposure

Miedema, H. M. E., & Vos, H. (1998). Exposure-response Relationships for Transportation Noise *Acoustical Society of America 104*(6), 3432-3445.

Abstract:

This article presents synthesis curves for the relationship between DNL and percentage highly annoyed for three transportation noise sources. The results are based on all 21 datasets examined by Schultz @J. Acoust. Soc. Am. 64, 377–405 ~1978!# and Fidell et al. @J. Acoust. Soc. Am. 89, 221–233 ~1991!# for which acceptable DNL and percentage highly annoyed measure could be derived, augmented with 34 datasets. Separate, nonidentical curves were found for aircraft, road traffic, and railway noise. A difference between sources was found using data for all studies combined and for only those studies in which respondents evaluated two sources. The latter outcome strengthens the conclusion that the differences between sources cannot be explained by differences in study methodology

Miedema, H. M. E., & Vos, H. (2003). Noise sensitivity and reactions to noise and other environmental conditions. *Journal of the Acoustical Society of America, 113*(3), 1492-1504.

Abstract:

This article integrates findings from the literature and new results regarding noise sensitivity. The new results are based on analyses of 28 combined datasets (N = 23038), and separate analyses of a large aircraft noise study (N = 10 939). Three topics regarding noise sensitivity are discussed, namely, its relationship with noise exposure, its working mechanism, and the scope of its influence. (1) A previous review found that noise sensitivity has no relationship with noise exposure. The current analyses give consistent results, and show that there is at, most a very weak, positive relationship. (2) It was observed earlier that noise sensitivity alters the effect of noise exposure on noise annoyance, and does not (only) have an additive effect. The current analyses confirm this, and show that the relation of the annoyance score with the noise exposure is relatively flat for nonsensitives while it is steeper for sensitives. (3) Previous studies showed that noise sensitivity also influences reactions other than noise annoyance. The current analyses of the aircraft noise study extend these results, but also indicate that noise sensitivity has relatively little influence on reactions to nonenvironmental conditions.

Keywords:

transportation noise; individual-differences; negative affectivity; residential areas; traffic noise; annoyance; susceptibility

Miller, R. L. (1996). Federal regulations and other activities in noise control. *Noise Control Engineering Journal, 44*(3), 149-152.

Abstract:

Following the elimination of funding for the U.S. Environmental Protection Agency's Office of Noise Abatement and Control in the early 1980s, a coordinated Federal approach to noise control largely disappeared, Instead, governmental agencies were left to deal with their noise problems on their own, usually meaning that they responded only to specific legislation, political pressures, or litigation, Agency coordination, when it did occur, was effected by Executive Order, That is not all bad news. This paper briefly reviews Federal regulations controlling the world of transportation noise over the past 25 years, but focuses to a greater extent on the ongoing efforts of government to influence the noise environments of our communities into the next century. The paper summarizes the actions of the Federal Aviation Administration, the National Aeronautics and Space Administration, and the Department of Defense as they confront issues of aircraft noise and airspace management; the National Park Service as it struggles to resolve conflicting mandates to preserve natural quiet and solitude while providing access to and public enjoyment of National Parks and Forests; the Federal Railroad Administration and the Federal Transit Administration in their endeavors to control noise from transit, high-speed rail, and mag-lev systems; and the Federal Highway Administration as it develops better tools to assess and control the noise impacts of traffic.

Keywords: Noise, national parks

Miller, N. P. (1999). The effects of aircraft overflights on visitors to US National Parks. *Noise Control Engineering Journal, 47*(3), 112-117.

Abstract:

Aircraft overflights of U.S, National Parks have become a source of sound intrusion into otherwise undisturbed natural environments. Public and park management concern about the potential noise impacts of overflights have motivated several studies of the benefits and impacts of aircraft flights over National Parks. The methods and results of two of the studies are summarized in this paper. Dose-Response studies conducted in Grand Canyon, Hawaii Volcanoes, and Haleakala National Parks are described. A Cognitive Survey conducted at a site in White Sands National Monument is the second study for which methods and results are presented. An approach is suggested for using Dose-Response studies to assess relative aircraft overflight impact on visitors.

Miller, N. P., & Miller, S. M. (2005). Managing our soundscapes (Interview).

Abstract:

Nicholas P. Miller is interviewed about "managing our soundscape".

Miller, N. (2002, August 19-21). *Transportation Noise and Recreation Lands.* Paper presented at the The 2002 International Congress and Exposition on Noise Control Engineering Dearborn, MI, USA.

Abstract:

An active and widely distributed transportation system is virtually a requirement for and a hallmark of countries that have a vigorous economy. As this conference demonstrates, one of the products of such a system is noise, and it is most certainly true that the prevalent type of noise experienced by the populations of these countries is the noise produced by transportation vehicles. A further result is that the sounds of transportation vehicles can be heard almost everywhere. The question addressed by this plenary lecture is: do these countries that value and use multiple types of transportation vehicles and systems also wish to preserve opportunities for their populations to experience natural outdoor environments that are essentially free of human produced sounds? The combinations of technical complexities and political challenge may make such a preservation goal unachievable.

Miller, N. P. (2003). *Transportation Noise and the Value of Natural Quiet.* Paper presented at the 2003 George Wright Society National Park Service Joint Conference.

Introductory Paragraph:

"The transportation system in the U.S. creates noise, and since the 1970s analysis and mitigation of this noise where people live has become a routine part of the transportation planning process. This analysis generally focuses on specific projects for specific transportation modes. It is, in the author's experience, rare that a systems approach has been applied to examine multimodal trade-offs in transportation performance and environmental effects. The focused analyses aid in limiting the most significant effects of noise in the immediate vicinity of the source, and feasibility considerations always play a role in determining the area over which noise effects are examined and mitigated. The result is that there has been little or no real attention given by either government agencies or the acoustics community in the U.S. to the summed effects of all sources of noise over wide areas of the country."

National Parks Overflights Act of 1997, 105th Congress, 1st Sess. (1997).

Comment:

This is a bill to regulate flights over national parks, and for other purposes

National Parks Air Tour Management Act of 2000 (P.L. 106-181) (2000).

Comment:

Prohibits a commercial air tour operator from conducting commercial air tour operations over a national park or tribal lands, except in accordance with this Act, conditions prescribed for that operator by the FAA Administrator, and any commercial air tour management plan for the park or tribal lands.

NPS. (1995). *Report to Congress. Report on Effects of Aircraft Overflights on the National Park System*. Retrieved. from http://www.nonoise.org/library/npreport/intro.htm#top.

Abstract:

Public Law 100-91 directed the NPS and the U.S. Forest Service to study the effects of aircraft overflights and report to Congress on the results. The Forest Service reported on work conducted earlier (USDA, 1992); this report presents the results of further studies conducted by the NPS.

NPS. (2000). *Directors's Order #47: Soundscape Preservation and Noise Management* Retrieved. from http://www.nps.gov/policy/DOrders/DOrder47.html.

Purpose and Background:

"The purpose of this Director's Order is to articulate National Park Service operational policies that will require, to the fullest extent practicable, the protection, maintenance, or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise sources."

Newman, P., Marion, J. L., & Cahill, K. (2001). Integrating Resource, Social, and Managerial Indicators of Quality into Carrying Capacity Decision-Making. *The George Wright Forum 18*(3), 28-40.

Introductory Paragraph:

As use of national parks, wilderness, and related areas continues to rise and visitors and types of activities continue to diversify, we are challenged to balance recreation use and preservation. This challenge forces managers and researchers to address both ecological and social issues when making management decisions. In park and wilderness management, integrating social and resource indicators is essential to meet park mandates that require the protection of both experiential and resource conditions. This paper addresses the challenges we face in integrating social and resource data and describes a current study in Yosemite National Park designed to accomplish such an objective. This study will develop and apply conjoint, or "tradeoff," analysis that quantitatively integrates resource, social, and managerial indicators of quality. The study will also utilize a GIS framework to integrate resource, social, and managerial indicators of quality into carrying capacity decision-making. The capabilities and advantages of these integrative techniques are outlined.

Newman, P., Manning, R., Dennis, D., & McKonly, W. (2005). Informing Carrying Capacity Decision Making in Yosemite National Park, USA Using Stated Choice Modeling. *Journal of Park and Recreation Administration, 23*(1), 75-89.

Executive Summary:

Recreation experiences have social, ecological, and managerial dimensions. Park and protected area managers are forced to make trade-offs among these dimensions causing management to be more complex. This study evaluates how visitors to Yosemite National Park wilderness make tradeoffs among indicators of quality that represent social, ecological and managerial dimensions of the recreation experience.
It is likely that most visitors want unimpeded access to parks but also want areas protected from excessive resource impacts, want to avoid undesirable levels of crowding and congestion, and "heavy handed" management restrictions. However, these desires often conflict, and tradeoffs must be made. Understanding visitors' preferences and acceptable tradeoffs will aid managers in deciding how best to mitigate recreational impacts while not hindering, to an unacceptable degree, the freedoms and other qualities often associated with experiences in parks and protected areas. The study was conducted in the summer of 2001 and employed a paired comparison questionnaire in which respondents reported their preferences between alternative wilderness settings. Results from this study were programmed into Excel to create a wilderness management alternative predictive model that enables managers to understand the relationships among various levels of standards of quality. Results suggest signs of human use at campsites

was the most important indicator of those used in the study. Moreover, Yosemite wilderness visitors were willing to tolerate increases in certain forms of regulation in order to obtain a high quality recreation experience. Findings can be used to help formulate standards of quality, and evaluate and predict visitor support for potential management alternatives. The examples in this paper illustrate how the evaluation of relative tradeoffs among social, ecological, and managerial setting attributes provide contextual, multi-dimensional information for protected area management decision making

Keywords:

Yosemite National Park, trade-offs, wilderness experiences, Carrying Capacity Decision-Making, predictive models

Newman, P., Pilcher, E., & Manning, R. (2005). *Muir Woods National Monument-Draft Phase I Soundscape Report*.

Summary:

This study specifically addressed the following objectives: 1) Identify the sounds visitors are hearing at specific nodal points in MUWO; 2) Understand the emotions, feelings, or thoughts visitors associate with hearing specific sounds; 3) Create a reliable study instrument that will contribute to the understanding of visitors preferences for soundscape settings in National Parks; 4) Provide information that will inform the formulation of indicators and standards of quality for soundscapes in MUWO. The results indicated that unknown people and groups talking were heard by more than 70% of visitors, and were rated negatively and heard frequently. These sounds represent a first priority for management to consider. In other words, these sounds had negative perceptions and were heard by the majority of visitors. Water and wind were the most pleasing sounds that most visitors (>75%) heard. Birdsong was heard by >50% of visitors and was also rated very positively. These latter natural sounds represent components of the natural soundscape. This is important information because it provides empirical evidence that people appreciate hearing natural sounds.

Ouis, D. (2001). Annoyance from road traffic noise: A review. *Journal of Environmental Psychology, 21*(1), 101-120.

Abstract:

In this paper the negative effects resulting from exposure to road traffic noise on people's well being is reviewed in the light of the latest published finding;. Annoyance is particularly focused on, which is considered to be one of the first and most widespread reactions to environmental noise. The nonauditory effects of noise on humans are viewed as being generally stress-related, following observations that noise exposures engender physiological reactions typical to those of stress. First, a short presentation is made of what noise in general is. Subsequently, in order to assess some subjective judgments of noise, some of the important noise descriptors, which are often used to quantify various aspects of road traffic noise are introduced. In general terms, it is found from the present review that the continuous exposure of people to road traffic noise leads to suffering from various kinds of discomfort, thus reducing appreciably the number of their well-being elements. Drawing such a conclusion is hindered by difficulties when nonacoustical factors, for instance socio-economic situation, age and gender, are also taken into account along with the usual acoustical factors of road traffic noise. One of people's first and direct reactions to noise is in terms of annoyance. The results of several decades of research on this topic have permitted lately the establishment of a more or less quantitative relationship between the objective quantities characterizing road traffic noise and the human subjective reaction to it; as expressed by annoyance. These findings are important at both the society and the individual level, in as much as they may help in regulating in a more efficient way the planning of road traffic activity in order to secure at least the minimum of comfort to the affected population.

Keywords:

residential areas; sleep disturbance; transportation noise; environmental noise; social surveys; sensitivity; performance;

exposure; events; cities

Pedersen, E., & Waye, K. P. (2004). Perception and annoyance due to wind turbine noise - a dose-response relationship. *Journal of the Acoustical Society of America, 116*(6), 3460-3470.

Abstract:

Installed global wind power increased by 26% during, 2003, with U.S and Europe accounting for 90% of the cumulative, capacity. Little is known about wind turbines' impact on people living in their vicinity. The aims of this study were to evaluate the prevalence of annoyance due to wind turbine noise and to study dose-response relationships. Interrelationships between noise annoyance and sound characteristics, as well as the influence of subjective variables such as attitude and noise sensitivity, were also assessed. A cross-sectional study was performed in Sweden in 2000. Responses were obtained through questionnaires (n=351; response rate 68.4%), and doses were calculated as A-weighted sound pressure levels for each respondent. A statistically significant dose-response relationship was found, showing higher proportion of people reporting perception and annoyance than expected from the present dose-response relationships for transportation noise. The unexpected high proportion of annoyance could be due to visual interference, influencing noise annoyance, as well as the presence of intrusive sound characteristics., The respondents' attitude to the visual impact of wind turbines on the landscape scenery was found to influence noise annoyance.

Keywords:

transportation noise; exposure

Pilcher, E. J., Newman, P., & Manning, R. E. (2008). Understanding and managing experiential aspects of soundscapes at Muir Woods National Monument. *Environmental Management, 43(*3), 425-435.

Abstract:

Abstract Research has found that human-caused noise can detract from the quality of the visitor experience in national parks and related areas. Moreover, impacts to the visitor experience can be managed by formulating indicators and standards of quality as suggested in park and outdoor recreation management frameworks, such as Visitor Experience and Resource Protection (VERP), as developed by the U.S. National Park Service. The research reported in this article supports the formulation of indicators and standards of quality for human-caused noise at Muir Woods National Monument, California. Phase I identified potential indicators of quality for the soundscape of Muir Woods. A visitor ‘‘listening exercise’’ was conducted, where respondents identified natural and human caused sounds heard in the park and rated the degree to which each sound was ‘‘pleasing’’ or ‘‘annoying.’’ Certain visitor-caused sounds such as groups talking were heard by most respondents and were rated as annoying, suggesting that these sounds may be a good indicator of quality. Loud groups were heard by few people but were rated as highly annoying, whereas wind and water were heard by most visitors and were rated as highly pleasing. Phase II measured standards of quality for visitor-caused noise. Visitors were presented with a series of 30-second audio clips representing increasing amounts of visitor-caused sound in the park. Respondents were asked to rate the acceptability of each audio clip on a survey. Findings suggest a threshold at which visitor-caused sound is judged to be unacceptable, and is therefore considered as noise. A parallel program of sound monitoring in the park found that current levels of visitor-caused sound sometimes violate this threshold. Study findings provide an empirical basis to help formulate noise-related indicators and standards of quality in parks and related areas.

Keywords:

Soundscapes - Noise - Visitor-caused noise - Indicators and standards - Muir Woods National Monument

Plotkin, K. J. (2001, 2001 August 27-30). *The Role of Aircraft Noise Simulation Models.* Paper presented at the The 2001 International Congress and Exhibition on Noise Control Engineering The Hague, The Netherlands.

Abstract:

Noise simulation models, which compute detailed time histories of noise at a given point, have usually been considered to be specialized research tools. There are, however, situations where the detail provided by simulation can be important, and advances in computing power have made simulation practical for a wider range of problems than in the past. This paper describes the structure of noise simulation models, their advantage in complex situations, and the evolution of one such model from research aid to working analysis tool. Examples of practical applications are given.

Preis, A., & Golebiewski, R. (2004). Noise annoyance perception as a function of distance from a moving source. *Noise Control Engineering Journal, 52*(1), 20-25.

Abstract:

Noise produced by a source located farther from a listener is often assessed as less annoying than a noise produced by an identical source that is located closer. While this statement seems trivial, providing a satisfactory explanation of this phenomenon is not easy. Geometrical spreading is not the only factor that causes the decrease in annoyance. Ground effect, atmospheric turbulence, and air absorption, must also be considered. Occurrence of these phenomena change not only the sound level of the stimulus but also its spectral content. To test the influence of the spectral content alone, subjects were asked to assess annoyance of train noise produced by sources located at different distances, with the same sound exposure level. For 8 pairs of stimuli (out of 12), the same sound exposure level meant the same calculated loudness values. However, the annoyance judgments of a moving train cannot be merely explained on the basis of the spectral content and sound level of the noise source. Even for artificially equalized sound exposure level or loudness there are differences in the time patterns of train noise recorded at different distances. To determine the extent to which spectral and time characteristics of train noise contribute to annoyance, the results of a subjective experiment were compared not only with spectral characteristics of the stimulus (sound exposure level versus frequency and loudness pattern), but also with the time characteristics (time patterns of the stimuli and the autocorrelation functions of the stimuli). It seems that the low frequency components play a decisive role in annoyance judgment. The results are discussed with respect to existing noise annoyance models.

Keywords:

sound-propagation; auditory distance; model

Riddel, M., & Schwer, R. K. (2001). Grand Canyon visitors: The challenges of regulatory schemes for balancing alternative interests. *Natural Resources Journal, 41*(1), 153-169.

Abstract:

The failure of the price system when faced with public goods and externalities is cited as the rationale for government intervention in the market. When government agencies step in to guide market forces, however, they may also fail, resulting in more resources being expended than necessary to achieve the desired outcome implied social losses from inefficient regulation have led many policy analysts to question the desirability of command and control approaches and suggest a move toward incentive-based strategies for environmental regulation. In this article, we suggest targeting initial regulatory reform to situations in which environmental externalities are reversible. Using a case study of the Federal Aviation Agency's recent rulemaking surrounding commercial air tour limitations in the Grand Canyon National Park (GCNP), we provide an example of government failure resulting from command and control approaches to environmental regulation. We make a clear case that the costs of the proposed regulation outweigh the benefits to ground visitors to the GCNP. We suggest two different incentive-based strategies that could provide the same level of noise reduction achieved by the proposed quota system. Finally, we argue that because of the non-cumulative nature of noise externalities, the GCNP is an ideal setting in which to test the efficacy of incentive based strategies for environmental control.

Roof, C. J., Kim, B., Fleming, G. G., Burstein, J., & Lee, C. S. Y. (2002). *Noise and Air Quality Implications of Alternative Transportation Systems: Zion and Acadia National Park Case Studies* Cambridge U.S. Department of Transportation Research and Special Programs Administration

Abstract:

(Introduction) The U.S. Department of Transportation, John A. Volpe National Transportation Systems Center's (Volpe Center) Environmental Measurement and Modeling Division prepared this letter report in support of Project Plan Agreement (PPA) HW-21M with the Federal Highway Administration (FHWA). The PPA provides for National Park Service (NPS) Transportation Program Support. The report presents the results of a technical study of the noise and air quality benefits associated with the introduction of visitor shuttle buses in place of a percentage of visitor personal occupancy vehicles (POVs) in both Zion National Park (Zion) and Acadia National Park (Acadia).The primary objective of this study was to quantify the air quality and noise benefit associated with the replacement of a certain percentage of POVs with tour buses in both Zion and Acadia. A secondary objective was to develop the methodology, including the analytical tools to facilitate similar studies in other parks.

Ruddell, E. J., & Gramann, J. H. (1994). Goal Orientation, Norms, and Noise-Induced Conflict among Recreation Area Users. *Leisure Sciences, 16*(2), 93-104.

Abstract:

This study evaluated Jacob and Schreyer's (1980) theory of recreation conflict using data from a survey of winter visitors to Padre Island National Seashore, Texas. Jacob and Schreyer defined interpersonal conflict as goal interference attributed to the behavior of another and proposed that variations in the standards of appropriate behavior for a setting were a major source of such interference. However, their theory did not address the possibility that some goals may be more vulnerable to interference from physically obtrusive behavior than others. In this study, visitors motivated by the goal to be with people who were considerate and respectful of others were more likely to perceive interference from loud radios than were visitors motivated by the goal to be with friends and other people like themselves. We concluded from this that the more that goal achievement rests on factors beyond the direct control of the actor, the greater the actor's vulnerability to goal interference. Visitors whose individual norms for radio volumes were equal to or less tolerant than the social norm were more likely to experience interference from radios whose loudness exceeded the social norm, supporting the role of normative violations in recreation conflict. Finally, although the potential for conflicts between recreation activities was high at this site, non-activity-based behavior, such as littering, drunkenness, and rowdiness, was rated as a more serious source of interference by visitors.

Keywords:

recreation conflict; goal interference; setting norms; noise skiers

Schwer, R. K., Gazel, R., & Daneshvary, R. (2000). Air-tour impacts - The Grand Canyon case. *Annals of Tourism Research, 27*(3), 611-623.

Abstract:

The economic impact of Grand Canyon air-tour operators on the southern Nevada economy is estimated using a regional impact model. Based on information collected from surveys of Grand Canyon air-tour operators and Grand Canyon tourists, it is estimated that 480,618 tourists to Las Vegas took a Grand Canyon tour in 1996. After accounting for direct and indirect expenditures, the Grand Canyon air tours contribute $504 million to the southern Nevada economy. If Grand Canyon air tours were eliminated, southern Nevada would suffer an estimated loss of $249 million - the lost revenues of the operators and the lost expenditures of tourists who would not visit southern Nevada without the Grand Canyon air tour. Keywords: Grand Canyon, economic impact, tour operator.

Keywords:

Grand Canyon; economic impact; tour operator estimating economic-impacts

Schomer, P. D., & Wagner, L. R. (1996). On the contribution of noticeability of environmental sounds to noise annoyance. *Noise Control Engineering Journal, 44*(6), 294-305.

Abstract:

The purpose of this paper is to study noticeability of sounds as a function of sound level and sound character, Noticing an event should be a prerequisite for annoyance; one should need to notice an event for it to be annoying and for it to contribute to an overall impression of annoyance, This noticeability should be a function of the character of the sound, For example, for the same A-weighted sound exposure, a helicopter may be much more noticeable than a fixed-wing aircraft because of the impulsive blade-slap sound. This study was performed ill situ, in respondents' homes; there were no artificial sounds or tape recordings, Clusters of subjects were chosen and an outdoor sound monitor was used to measure single-event A-weighted sound exposure level (ASEL) and record the times at which they occurred, The three sources studied were helicopters, fixed-wing aircraft, and trains, For the same ASEL, helicopter sounds were not found to generate any greater annoyance per event than did the other two sounds, Rate of response was used as the main indicator of noticeability, The rate of response function for helicopter sounds grew at 3 times the rate of response functions found for airplanes at Los Angeles airport and trains at Aberdeen Proving Ground. Thus, this paper shows that sound noticeability may be a significant variable for predicting human response to noise, The character of the sound is a key ingredient to noticeability, Helicopters, with their distinct sound character, appear to be more noticeable than other sounds for the same A-weighted sound exposure level.

Keywords:

level

Sheikh, P. A., & Uhl, C. (2004). Airplane noise: a pervasive disturbance in Pennsylvania Parks, USA. *Journal of Sound and Vibration, 274*(1-2), 411-420.

Abstract:

Before creating legislation and restrictions on aircraft noise and overflights in state and national parks, it is important to quantify and document aircraft use over these areas. The objective of this study was to record the number of aircraft overflights and the audible duration of aircraft noise in state parks in Central Pennsylvania, USA. In addition, the hypothesis that the audible duration of aircraft noise in state parks is related to the density of the number of surrounding skyways and airports was tested.

Keywords:

aircraft noise; overflights; behavior

Shelby, B., Vaske, J. J., & Donnelly, M. P. (1996). Norms, standards, and natural resources. *Leisure Sciences, 18*(2), 103-123.

Abstract:

The normative approach in natural resource management illustrates the progress that has been made in advancing theory and application in outdoor recreation research. This article integrates findings from a number of different studies to highlight the utility of the normative approach and provide an example of how efforts focused on a particular theoretical approach can enhance the quality of scientific research. Findings from both social and ecological impact studies are examined. Topics include norms for encounters, ecological impacts, aesthetic impacts, and instream flows. A number of considerations for future research are presented, including the definition of norms, norm salience, norm consensus, question construction, and statistics for measuring norms.

Keywords:

norms; standards; natural resources backcountry encounter norms; wilderness campsites; ecological impacts; management; river; perceptions; settings; area

Staples, S. L. (1998). Comment on "Effects of aircraft overflights on wilderness recreationists" J. Acoust. Soc. Am. 100, 2909-2918 (1996). *Journal of the Acoustical Society of America, 104*(3), 1726-1728.

Abstract:

A psychologist outside the acoustics community considers the findings of Fidell et al. concerning the effects of aircraft overflights on wilderness recreationists [J. Acoust. Sec. Am. 100, 2009-2918 (1996)] in terms of other findings regarding visitor response to aircraft noise in wilderness areas and in light of current decision making about what actions are necessary to protect natural quiet in national parks. The limitations of a one-dimensional dose-response method that relies on annoyance as a global measure of the effect of park noise on visitors are discussed.

Stokes, J. B., Leese, D. J., & Montgomery, S. L. (1999). Citizens get relief from recreational noise: The case in the skies from Hawaii. *Noise Control Engineering Journal, 47*(4), 142-146.

Abstract:

Due to the exponential growth of large-scale, commercial, fixed-wing aircraft and helicopter tourism in the state of Hawaii since the late 1980s, native wildlife habitat has been degraded, and hikers and others seeking tranquility in wilderness areas throughout the state have been greatly disturbed. Aviation activity results in an unacceptable degree of noise pollution over or near Hawaii Volcanoes National Park on the island of Hawaii, and Haleakala National Park on the island of Maul, The same is true of state lands with wilderness character such as the Na Pali Coast, Waimea Canyon, and Koke'e State parks on the island of Kauai and Kula, and Kahikinui State forests on the island of Maul, In all these locations, noise intrusions occur continuously throughout the day, often for sustained periods of over one hour. The problem is particularly acute at Haleakala, where sound is amplified due to the park's unique geologic configuration (a small erosional depression, high above the clouds) that concentrates and amplifies aviation noise. The: bulk of Haleakala and Hawaii Volcanoes National Parks are part of the federal wilderness system, Both parks are International Biosphere Reserves designated by the United Nations; aviation noise is inconsistent with such designation.

Stowkowski, P. A. and C. B. LaPointe (2000). Environmental and social effects of ATVs and ORVs. Burlington Vermont: School of Natural Resources, University of Vermont.

Summary:

This report provides an annotated bibliography of published research related to the environmental and social effects of ATVs on public and private lands. Citations were gathered in a comprehensive literature review of published research reports and peer-reviewed scholarly writing, and from a review of internet sources. Key findings from the research are synthesized and evaluated, and suggestions for future research are provided.

A wide variety of environmental and social impacts are documented in the research literature, including those related to soil erosion and trail degradation; vegetation; water and air quality; noise; wildlife and fish; and social conflicts among different types of recreation user groups.

Sutherland, L. C. (1999). Natural quiet: An endangered environment: How to measure, evaluate, and preserve it. *Noise Control Engineering Journal, 47*(3), 82-86.

Abstract:

Natural quiet is defined and reasons for its endangerment in the United States are discussed. Factors involved in evaluating natural acoustical environments are reviewed and measurement issues in natural settings are discussed. Existing and potential methods for preserving natural quiet are described.

Sutton, S. (2001). Visitor Perceptions of Aircraft Activity and Crowding at Franz Josef and Fox Glaciers *Science For Conservation 94*, 27.

Abstract:

Both Franz Josef and Fox Glaciers are popular tourist destinations on the West Coast of New Zealand, with total visitor numbers of 175 000 per annum, a figure that is anticipated to increase in line with current tourism trends. While people enjoy visiting the glacier viewing spots in the main glacier valleys and on the valley sides, many also make use of the scenic air flights. Scenic air flights have long been an integral part of the visitor experience, and this activity appears to be increasing significantly as well. There are impacts that can arise from visitor activities, and this paper focuses on two of these: the social impacts of annoyance at aircraft activity (generally assumed to be the problem of noise), and the issue of crowding. Research methods have been developed to study crowding, but there is little existing methodology for measuring public reaction to the presence of aircraft. In order to address this anomaly, a questionnaire was designed to explore visitor perceptions at the glacier valleys, and 3 282 valid responses were gathered. The results of analysis of the questionnaires indicate that crowding occurs only during the periods of highest visitation in the main valleys. Annoyance at aircraft activity also occurs to a significant degree only when the number of aircraft using the glacier valley reaches or exceeds 18 per hour. Visitors to the valley-sides, however, are much more sensitive to the numbers of other visitors and to air traffic, even though they may also be some of the people tolerant of much higher levels of activity in the main valleys. The results support the continued use of self administered questionnaire methods of impact assessment using Likert scales. Visitor expectations appear to influence the extent to which social impacts become manifest. Management decisions need to be made as to which visitor experience will be used as the main focus for the area, and from this information, acceptable limits to visitor numbers or aircraft activity can then be set.

Tarrant, M. A., Haas, G. E., & Manfredo, M. J. (1995). Factors Affecting Visitor Evaluations of Aircraft Overflights of Wilderness Areas. *Society & Natural Resources, 8*(4), 351-360.

Abstract:

The effect of visitor characteristics (recreation motives, past experience, attitudes, and tolerance toward encountering aircraft overflights) and dose (number, proximity, type, and estimated noise levels of overflights) on visitor evaluations of aircraft overflights in wilderness areas was examined. Using an off-site mail-back survey, we sampled 439 visitors to four wilderness areas in Wyoming. Results show that (1) more than one-third of visitors were "not at all" annoyed by overflights; (2) overflights had a greater effect on visitor solitude and tranquility than on annoyance; (3) visitor evaluations of overflights appear to be multidimensional, consisting of dimensions related to annoyance, solitude, and tranquility; and (4) both visitor characteristics (especially, attitudes and recreation motives) and dose measures (in particular estimates of audibility) were strongly related to evaluations. Findings suggest future wilderness overflight studies should employ a multidimensional evaluative measure of satisfaction as rite dependent variable and include wilderness visitor characteristics as an independent variable. Implications for wilderness policy are discussed

Keywords: aircraft overflights; dose measures; dose-response model; wilderness management; wilderness visitor characteristics, noise annoyance

Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress Recovery During Exposure to Natural and Urban Environments. *Journal of Environmental Psychology, 11*(3), 201-230.

Abstract:

Different conceptual perspectives converge to predict that if individuals are stressed, an encounter with most unthreatening natural environments will have a stress reducing or restorative influence, whereas many urban environments will hamper recuperation. Hypotheses regarding emotional, attentional and physiological aspects of stress reducing influences of nature are derived from a psycho-evolutionary theory. To investigate these hypotheses, 120 subjects first viewed a stressful movie, and then were exposed to color/sound videotapes of one of six different natural and urban settings. Data concerning stress recovery during the environmental presentations were obtained from self-ratings of affective states and a battery of physiological measures: heart period, muscle tension, skin conductance and pulse transit time, a non-invasive measure that correlates with systolic blood pressure. Findings from the physiological and verbal measures converged to indicate that recovery was faster and more complete when subjects were exposed to natural rather than urban environments. The pattern of physiological findings raised the possibility that responses to nature had a salient parasympathetic nervous system component; however, there was no evidence of pronounced parasympathetic involvement in responses to the urban settings. There were directional differences in cardiac responses to the natural vs. urban settings, suggesting that attention/intake was higher during the natural exposures. However, both the stressor film and the nature settings elicited high levels of involuntary or automatic attention, which contradicts the notion that restorative influences of nature stem from involuntary attention or fascination. Findings were consistent with the predictions of the psycho-evolutionary theory that restorative influences of nature involve a shift towards a more positively-toned emotional state, positive changes in physiological activity levels, and that these changes are accompanied by sustained attention/intake. Content differences in terms of natural vs human-made properties appeared decisive in accounting for the differences in recuperation and perceptual intake.

Keywords:

preferences; surgery; window; fear

Vastfjall, D. (2002). Influences of current mood and noise sensitivity on judgments of noise annoyance. *Journal of Psychology, 136*(4), 357-370.

Abstract:

Noise annoyance is one of the most studied reactions to auditory events. Previous research has demonstrated that annoyance reactions may be mediated by individual characteristics such as personality, attitudes, and noise sensitivity (traits). Transient temporary states such as an individual's current mood have been studied to a lesser extent. The author studied annoyance reactions to an everyday noise in participants who either were slightly annoyed or in a neutral affective state. The results showed that current mood had an overall effect on judgments of annoyance and on a participant's preference for sound. In addition, a participant's current mood interacted with noise sensitivity. These results indicate that both individual noise sensitivity (traits) and transient moods (states) are important for human auditory perception and evaluation.

Keywords:

mood; noise annoyance; noise sensitivity
traffic noise; sound-quality; personality; model; information; congruent; consumer; emotion; memory

Vitterso, J., Chipeniuk, R., Skar, M., & Vistad, O. I. (2004). Recreational conflict is affective: The case of cross-country skiers and snowmobiles. *Leisure Sciences, 26*(3), 227-243.

Abstract:

The authors conducted a field experiment to test the assumption that subjective feelings are important in recreation conflict. During a weekend, cross-country skiers in a popular recreation area were assigned randomly to an experimental group who were exposed to an operating snowmobile, and a control group who were not exposed. Both groups completed a self-report questionnaire to provide information on their subjective experiences during their outing. The experimental group answered the questions five to ten minutes after encountering a snowmobile. Participants were not informed about the connection between the snowmobile and the investigation, and the questions regarding effects were answered before any clues were given about snowmobiles being an issue. Results showed that relative to the control group, skiers who encountered a snowmobile had their affective quality significantly reduced. Moreover, encountering a single snowmobile had an effect on participants' beliefs about the extent to which noise from snowmobiles disturbed the quality of ski-touring in general.

Keywords:

recreational conflict; emotions; priming; snow mobile negative affect; spontaneous attention; outdoor recreation; feeling good; noise; mood; activation; perception; cognition; emotion

Voorhees, P. H., & Krey, L. (1999). Prevalence and severity of overflights on US National Parks: Results of the 1998 survey of national park superintendents. *Noise Control Engineering Journal, 47*(3), 107-111.

Abstract:

As tourism draws more and more people to America's national parks, demands on the natural resources increase. In 1992, park visits peaked at 275 million people, Every one of these visitors experienced the parks from the ground. Many returned from their visits awed by the solitude and the sounds of nature. For most of these visitors, this experience is unavailable in modern daily life. The resource of natural quiet in the parks is being slowly eroded and overflights from aircraft of all types are a significant factor in this erosion. This study was designed to assess this level of erosion over time. Data for this paper were obtained from a survey of National Park Service superintendents, Data have been collected from 284 National Park Service (NPS) sites, The results of this survey were compared to results from the National Park and Conservation Association's 1996 National Park Overflights Survey. A comparison of the two data sets reveals that overflights by military aircraft and private general aviation flights remain the most problematic, but commercial air tour overflights hold a unique place as a problem in the eyes of park managers. Those parks that reported air tour overflights in 1996 also reported air tours in 1998, Few parks reported high altitude commercial carriers and NPS flights as a major concern to management. While some parks have mitigated the impacts of overflights by meeting with the responsible agency or individuals, most parks reporting concerns in 1996 also reported concerns in the 1998 survey. The 1998 survey also gathered data regarding overflight altitude and frequency. Almost all parks with some type of overflight reported incidents of flights below 500 ft above ground level. Many parks reported expansion of local airports and a concern for future overflight problems. Although many parks are attempting to mitigate aircraft noise, the problem continues in our national parks, essentially unabated.

Wallenius, M. A. (2004). The interaction of noise stress and personal project stress on subjective health. *Journal of Environmental Psychology, 24*(2), 167-177.

Abstract:

Noise is only one of the many stressors people have to cope with in their everyday lives. This study examined the interactive effects of noise stress and personal project stress on subjective health. A questionnaire was conducted among adult inhabitants living in noisy and not-noisy residential environments. The respondents (n = 147) filled in the revised version of Little's Personal Project Inventory, the EPI scale of neuroticism, the Somatic Symptom Checklist, rated their general health status, and answered questions concerning noise annoyance and disturbed daily activities. The results reveal an interactive effect of noise stress and personal project stress on self-rated general health and somatic symptoms as adaptive costs of coping with multiple stressors. Especially annoyance due to noise inside the house as well as disturbed daily activities providing restoration or demanding concentration (e.g. sleeping, relaxing, reading or studying) interact with personal project stress. The relations between the variables are independent of neurotic trait. The results also highlight the threshold value of stress. Noise annoyance and disturbed daily activities are related to poorer general health and more numerous somatic symptoms most strongly at high level of personal project stress.

Keywords:

environmental noise; life events; annoyance; performance; community; exposure; reactivity; psychology; challenge; variables

Wardman, M., & Bristow, A. L. (2004). Traffic related noise and air quality valuations: evidence from stated preference residential choice models. *Transportation Research Part D-Transport and Environment, 9*(1), 1-27.

Abstract:

This paper looks at estimated valuations of changes in traffic related noise levels and air quality and contributes to the body of knowledge and to methodology in this area. There are several novel aspects of this research. Firstly, there have been relatively few stated preference studies of the monetary valuations of traffic related noise and air quality. A feature of this analysis is the examination of variations in values according to the size and sign of the environmental change, the currently experienced level of the attribute and various socio-economic factors. Secondly, the important issue of presentation is addressed, with two different methods used in the valuation of air quality and links made between valuations and physical measures. Thirdly, the results from stated preference and the contingent valuation method are compared. Finally, we bring together evidence from other studies and compare them with the findings obtained here.

Keywords:

stated preference; traffic noise; air quality; valuation; appraisal; willingness-to-pay; contingent valuation; environmental valuation; public-goods; pollution; values; benefits; scotland; impacts; demand

Waye, K. P., & Ohrstrom, E. (2002). Psycho-acoustic characters of relevance for annoyance of wind turbine noise. *Journal of Sound and Vibration, 250*(1), 65-73.

Abstract:

The knowledge of annoyance and perception of wind turbine noise is limited, although some previous studies have found that the relationship between the equivalent noise level and annoyance was weak. The hypothesis for this study was that different sound characters in the noise not fully described by the equivalent noise level, are of importance for annoyance and noise perception. In total, 25 subjects were exposed to five different wind turbine noises at the level of 40 dB L-Aeq. Subjective ratings of annoyance, relative annoyance and for how long they were aware of the noises were carried out after 10 min exposures. This was followed by 3 min exposures where perception and annoyance of 14 psycho-acoustic descriptors were evaluated. The results showed that the rating of annoyance, relative annoyance and awareness was different between the wind turbine noises, although they had the same equivalent noise level. A psycho-acoustic profile was obtained for each noise, which subjectively described the most and the least annoying sound parameters. None of the psycho-acoustic parameters, sharpness, loudness, roughness, fluctuation strength or modulation could explain the differences in annoyance response.

Yang, W., & Kang, J. (2005). Acoustic comfort evaluation in urban open public spaces. *Applied Acoustics, 66*(2), 211-229.

Abstract:

This paper presents the results of an intensive questionnaire survey and objective measurements on soundscape, aiming at the evaluation of acoustic comfort in urban open public spaces. From summer 2001 to spring 2002, 9200 interviews were made for four seasons in 14 urban open public spaces across Europe. The results suggest that the subjective evaluation of the sound level generally relates well with the mean L-eq, especially when the sound level is below a certain level, which is 73 dBA on the basis of this study. However. considerable differences have been found between the subjective evaluation of the sound level and the acoustic comfort evaluation: people tend to show more tolerance in terms of acoustic comfort evaluation. The background sound level has been found to be an important index in evaluating soundscape in urban open public spaces - a lower background level tends to make people feel quieter. Analyses of individual sound elements show that the acoustic comfort evaluation is greatly affected by the sound source type - introducing a pleasant sound can considerably improve the acoustic comfort, even when its sound level is rather high. No significant difference was found among different age groups in terms of subjective evaluation of a sound level. whereas in terms of acoustic comfort, there were significant differences.

Keywords:

urban open public spaces; acoustic comfort; soundscape noise sensitivity; environment; annoyance

Zimmer, K., & Ellermeier, W. (2003). Deriving ratio-scale measures of sound quality from preference judgments. *Noise Control Engineering Journal, 51*(4), 210-215.

Abstract:

One of the major goals of sound-quality research has been to develop automated, objective metrics of perceptual attributes. These metrics must be validated against subjective measures of the attributes that they claim to capture. To that end, typically, verbal reports are collected on complex psychophysical attributes from observers directly. That procedure, however, involves the risk of accumulating data of unknown validity, dimensionality, and unit. Rather than getting at the dimensions of interest directly, this paper advocates asking all but very simple judgments of preference from observers. Such data are then used to model the listeners' decision strategies when comparing auditory events. Once a valid decision model has been established, psychophysical scale values can be derived. Two approaches, the Bradley-Terry-Luce model, and the representation of paired comparisons by 'preference trees' are elaborated, and illustrated with examples from sound-quality research. It is demonstrated that these 'indirect' approaches offer the advantage of (a) an explicitly stated theory about the observer's decision strategy, (b) built-in

checks of the consistency of judgments, and (c) statistical tests to validate if the attempt at scale construction succeeded. In that way, these indirect methods (d) reveal the dimensional structure behind psychoacoustical judgments, and (e) provide the opportunity to discover 'new,' i.e. as yet undetected, auditory attributes.

Zimmer, K., Ellermeier, W., & Schmid, C. (2004). Using probabilistic choice models to investigate auditory unpleasantness. *Acta Acustica United with Acustica, 90*(6), 1019-1028.

Abstract:

The potential of probabilistic choice models (the Bradley-Terry-Luce model, or preference trees) in scaling the perceived unpleasantness of sounds was evaluated. To that effect, 74 subjects made pair-wise comparisons of the unpleasantness of twelve binaurally-recorded, environmental sounds presented over headphones. The stimuli varied in their psychoacoustic characteristics and half of them were of technical, half of natural origin. A more sophisticated model than previously tested, namely a preference tree, was identified to account well for the structure underlying the data, indicating (1) that subjects changed criteria, when evaluating different sound pairs, and that (2) these criterion changes combined in a lawful way, so that it was possible to measure unpleasantness on a ratio-scale level across the entire set of sounds investigated. Contrary to expectation, sound origin (technical or natural) did not influence the unpleasantness judgments. Instead, the sounds could be grouped according to their (non-acoustical) intrusiveness, and loudness. A subsequent multiple-regression analysis showed that in the sub-groups of soft and loud sounds, a combination of sharpness (S-mean) and roughness (R-mean), the differing in magnitude for the two groups, explained the unpleasantness-scale values very well (r(corr)(2) = 0.91). Direct magnitude estimates of unknown scale type, collected from the same listeners covered a much smaller range of ratios, and were roughly linear with the logarithm of the ratio scale derived from the preference tree. The advantage of the choice-theory modeling in providing information on the structure underlying the judgments is discussed.

Keywords:

environmental sounds; roughness; quality; parameters; perception; noise