

Chapter 11

The Nature of Happiness: Nature Affiliation and Mental Well-Being

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Appreciating the beauty of a blossom, the loveliness of a lilac, or the grace of a gazelle are all ways in which people can, in some small measure, fill their daily lives with evolutionarily inspired epiphanies of pleasure (Buss 2000, p. 22).

It has been over 25 years since E. O. Wilson (1984) wrote *Biophilia*, in which he argued for an evolved inclination among humans to affiliate with nature. Wilson reasoned that, because our ancestors' survival and reproduction depended upon access to natural resources, selection pressures favored those who had an affinity to orient toward nature. Findings in support of Wilson's biophilia hypothesis have emerged (Kaplan and Kaplan 1989; Ulrich 1993), including evidence for human preference for savannah-like landscapes, beneficial physiological responses to natural environments relative to manufactured environments, and improvements in cognitive functioning and restorative effects on mental well-being as a result of exposure to nature (see review by Joye 2007).

Additional support for Wilson's (1984) idea that we have a deep-rooted connection to nature comes from the fact that only recently in our evolutionary history have we separated ourselves from a hunter-gatherer way of life which was immersed daily in nature (Burns 2005; Frumkin 2001; Gullone 2000; Kahn 1997; Kellert 1997; Nesse and Williams 1996). There is dissociation between human biology and modern urban life. As Gelter (2000) writes, "[t]he time-span in our habitat change from the natural world setting into the technological habitat is too short for the evolutionary processes to permit any major biological adaptations" (p. 86). Within this context, affiliating with nature is framed as a basic human need.

Unfortunately, humanity is increasingly neglecting this instinctual preference or need. In 1847, Emerson lamented that "[w]e do not know an edible root in the woods. We cannot tell our course by the stars, nor the hour of the day by the sun" (p. 249). In

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2013, some 160-odd years later, our disengagement from nature is even more pronounced, widespread, and lamentable. The World Health Organization (WHO) announced in 2009 that more than half of the world's population now lives in an urban, rather than rural, environment; WHO projects this will increase to 65% by 2030 (WHO, 2011). In Canada, for example, the 50% urbanization mark was passed in 1941, and today, more than 80% of Canadians live in urban areas (Human Resources and Skills Development Canada 2007). On average, Canadians spend almost 90% of their time indoors (Environment Canada 2005), and a Kaiser Family Foundation study (2010) reported that the average child (aged 8–18) in the United States spends over 7 h a day plugged into some form of entertainment media. Both time-criterion and nature-knowledge-criterion studies show that nature-based recreation is on the decline in many countries (Charles and Louv 2009; Pergams and Zaradic 2008). Terms such as *nature deficit disorder* (Louv 2005) and *nature starvation* (Royal Society for the Protection of Birds 2010) have been coined to reflect our increasing disconnection from nature. In a recent survey of 1,000 United Kingdom citizens, only 55% of those over the age of 35, and 37% of those under the age of 35, reported feeling “connected to the natural world” (Royal Society for the Protection of Birds 2010).

But, does this epoch of industrialization really matter? Are we, both individually and as a species, poorer because of this protracted divorce from nature? Evidence is mounting that answers these questions with a resounding “yes.” Nature affiliation and exposure to elements of the natural environment clearly, and significantly, impact our physical health and overall well-being in a positive manner.

We need the tonic of wildness. (Thoreau 1854/1989, p. 339)

In the last decade alone, several lines of inquiry have explored the relationship between physical health and engagement with, or proximity to, elements of the natural world. For example, Pretty (as cited in Mind 2007) found that *green exercise*—exercising while viewing photographs or pictures of nature—reduced blood pressure to a greater degree than did exercising in the absence of such photos or in the presence of less green rural or urban photos.

Takano et al. (2002) showed that longevity was greater among senior citizens living in areas with walkable green spaces. Five year survival rates for 3,144 Tokyo seniors, born in 1903, 1908, 1913, or 1918, were analyzed. Variables such as age, sex, marital status, socioeconomic status, and baseline physical ability were controlled. Having walkable green streets and spaces near the seniors' residences showed significant predictive value for elderly survival over the 5 years of the study. It appears that character Carrie Watts (played by actress Geraldine Page), in *The Trip to Bountiful*, justly proclaimed, “I bet I can live to a hundred if only I can get outdoors again.”

Historical data concerning over 10,000 people in Holland was analyzed by de Vries et al. (2003) to explore the relationship between green space and health. Respondent information was used only if the degree of urbanism in their neighborhood had remained constant over the time period that the data had been originally collected and if respondents had lived in their current location for over 12 months. These two exclusion criteria left 10,197 respondents from 1,155 different

neighborhoods. Three global health indicators were used: number of symptoms experienced in the past 2 weeks, perceived general health rated on a 5-point scale, and the Dutch version of Goldberg's 1972 Global Health Questionnaire. Several demographic and socioeconomic variables were controlled, as was level of urbanism. A strong relationship between health and greenness of environment was shown; people living in a greener environment, regardless of level of urbanism, reported fewer physical symptoms and greater perceived general health. Of particular note, de Vries et al. found that "assuming a causal relation between greenspace [*sic*] and health, 10% more greenspace [*sic*] in the living environment leads to a decrease in the number of symptoms that is comparable with a decrease in age by 5 years" (p. 7). A subsequent study conducted by Maas et al. (2006) involved the review of records for 250,782 Dutch citizens being treated by 104 general practitioners; the relationship between health and green space was confirmed. Maas et al. reported that "health differences in residents of urban and rural municipalities are to a large extent explained by the amount of green space" in the individuals' direct living environment (p. 591). Moreover, the relation between green space and health was found to be stronger for lower socioeconomic groups.

Similar findings emerged in a recent study by Mitchell and Popham (2008), which examined socioeconomic factors in relation to health inequalities and access to green space. In this study, mortality records for 366,348 individuals of the population of England at younger than retirement age were classified into groups based on income deprivation and exposure to green space. (Exposure to green space was calculated using England's generalized land use database.) Based on the analyses of these data, Mitchell and Popham reported that "[p]opulations that are exposed to the greenest environments also have lowest levels of health inequality related to income deprivation" (p. 1655).

There was a great joy—to be out in the air—for I had not been outside in almost a month. [...] Some part of me came alive [...] which had been starved, and died, perhaps without my knowing it (Sacks, as quoted in Frumkin 2001, p. 236).

A sizeable body of accumulated research corroborates neurologist Oliver Sacks' eloquent description of nature's restorative effect on our well-being. Ulrich (1993), whose own work is seminal in this area, provided a summary of the proposed theoretical platform for the restorative capacity of our biophilic responses. Maller et al. (2005) provided a summary of substantiating research findings, including stress reduction after urban park or wilderness excursions; reduction in feelings of anger and aggression after viewing color photographs of nature scenes, as well as subsequent to viewing urban scenes with salient natural elements such as trees and other vegetation; and decreased postoperative anxiety among patients exposed to nature pictures depicting an open water view.

The Kaplans' influential work (Kaplan 1993, 2001, 1995; Kaplan and Kaplan 1989), based on attention restoration theory (ART), has linked exposure to nature with restoration of stress and attentional fatigue, resulting in improved cognitive functioning and well-being. This body of work has provided additional empirical support for nature's restorative effect. For example, office workers with a window

view encompassing natural elements reported higher job satisfaction and fewer physical ailments than did office workers with a window view of urban scenes lacking natural elements (Kaplan 1993). Other researchers have also reported a positive effect on individuals' cognitive functioning when tasks are performed in rooms with windows affording views of nature (see Chalquist 2009). Ulrich (as cited in Chalquist 2009) found that the introduction of flowers and plants into a workplace increased cognitive functioning, resulting in a reported "15% rise in innovative ideas and more creative, flexible problem-solving than that of the control group without greenery nearby" (p. 2).

Professionals in a variety of disciplines are beginning to investigate ways of utilizing these research findings by building exposure to nature into components of treatment plans for an array of diagnoses. For example, building on the Kaplan's work with ART and exposure to nature, Taylor et al. (2001) explored the benefits of "greening" play areas as part of a treatment plan for children diagnosed with attention deficit disorder (ADD) or attention deficit/hyperactivity disorder (ADHD). In this study consisting of 96 parents of children aged 7–12 years diagnosed with ADD/ADHD, contact with nature was systematically related to a decrease in the children's attention deficit symptoms—"the 'greener' a child's play area, the less severe his or her attention deficit symptoms" (p. 54). Kuo and Taylor (2004) replicated these findings in a national study of 452 parents/guardians of children aged 5–18 years who had been diagnosed with ADHD. Regardless of age, gender, income, community type, and geographic region, findings were consistent: "green outdoor activities reduced [ADD/ADHD] symptoms significantly more than did activities conducted in other settings, even when activities were matched across settings" (p. 1580).

Therapeutic gardening, formalized as horticulture therapy, is used in a number of treatment settings, including community based programs, geriatric programs, prisons, developmental disabilities programs, and special education (Mattson, as cited in Frumkin 2001). One such setting is the healing garden at the Swedish University of Agricultural Sciences' Alnarp campus (Grahn et al. 2007; Stigsdotter and Grahn 2003), designed specifically for use in a treatment program for individuals who have been unable to work or study for over 2 years due to "burnout" or depression. The treatment program runs 8 weeks, during which time patients interact with the therapeutic team (consisting of a horticultural therapist, a landscape architect, an occupational therapist, a physical therapist, a physician, and a psychotherapist) while working and spending time in the garden 3 h and 30 min a day, 4 days a week.

In his biophilia hypothesis, Wilson (1984) also suggested that we have an innate urge to affiliate with other forms of life; indeed, the subtitle of *Biophilia* is *The Human Bond with Other Species*. This bond between humans and animals is recognized by therapists and counselors in the emerging field of Animal-Assisted Therapy (AAT), wherein animals or pets are an integral part of the therapy program and help to engage the client in the therapeutic process (Fine, as cited in Wesley et al. 2009; Walsh 2009). Several studies have demonstrated that AAT enhances both the therapeutic relationship and positive therapy outcomes when used with diverse populations in a variety of therapy settings, such as psychiatric inpatients, substance

abuse populations in residential group therapy, and couples and family therapy (Hooker et al. 2002; Marr et al. 2000; Walsh 2009; Wesley et al. 2009).

A few counseling psychologists, most notably George Burns (1998, 2009) and Ronen Berger (Berger and McLeod 2006), are incorporating elements of nature into their therapy work with clients who are struggling with issues involving relationship difficulties, chronic pain, autism, and depression.

[As] psychologists we have heard but little about gardens, about foliage, about forests and farmland. ... Perhaps this resource for enhancing health, happiness, and wholeness has been neglected long enough. (Kaplan and Kaplan 1989, p. 189)

Most of the research thus far presented has focused on the reduction of dysfunction—be it stress, anxiety, anger, depression, substance abuse, or inattention. Mental health, however, is more than the absence of mental illness (Keyes 2005); therefore, we now expand our focus to look at not just the restorative, but also the additive, effects of nature. In line with this, nature affiliation has recently emerged as an interest within positive psychology. For example, in their classification of character strengths, Park et al. (2006) describe *appreciating beauty and excellence* as being related to nature involvement; Keltner and Haidt (2003, see also Shiota et al. 2007) include nature among the most common elicitors of the experience of awe; in their introduction to positive psychology, Gable and Haidt (2005) referred to *exposure to green spaces* (p. 104) as a potential means of boosting well-being; and Fredrickson (2009) lists *find nearby nature* as Tool 6 in her tool kit of proven strategies to increase one's level of positivity (p. 177). Nonetheless, the role of nature affiliation in positive functioning is often overlooked (Herzog and Strevey 2008). We next examine evidence for such a role.

Measures of Nature Affiliation

Nature affiliation has been viewed as a *trait*, that is, as a stable disposition capturing important differences between persons. This trait has been defined as “individuals’ experiential sense of oneness with the natural world” (Mayer and Frantz 2004, p. 504). Nature affiliation has also been characterized as “dynamic, changing from day to day and moment to moment as a function of experiences with nature” (Weinstein et al. 2009, p. 1316) and can thus be conceptualized as a *state*. The recent development of reliable and valid measures of both trait and state conceptualizations of nature affiliation has significantly aided research on nature affiliation and positive indices of well-being.

The 14-item Connectedness to Nature Scale, developed by Mayer and Frantz (2004), assesses nature affiliation as a relatively stable disposition or trait. Items (e.g., “I often feel a sense of oneness with the natural world around me”; “Like a tree can be part of a forest, I feel embedded within the broader natural world”) assess a sense of oneness with the natural world and are rated on 5-point scales with endpoints 1 = *strongly disagree* and 5 = *strongly agree*. Total scores are calculated by summing across items after reverse-scoring oppositely worded items; higher scores

denote greater nature affiliation. Mayer and Frantz reported a coefficient α of 0.84 and demonstrated that factor analysis consistently yielded a one-factor solution. Mayer and Frantz validated their measure in a series of five studies with both community members and university students by establishing a nomological web of positive and negative correlates (e.g., time spent outdoors, degree of environmental concern, endorsement of consumerism, and other explicit and implicit measures of nature connectedness). Scores on the scale are not related to social desirability, and no gender difference has emerged. The entire scale is included in the appendix of the article by Mayer and Frantz.

Recently, Mayer et al. (2009) created a 13-item version of the Connectedness to Nature Scale in order to assess the acute state of nature affiliation, which has proven to have good internal stability (coefficient $\alpha=0.91$). Items (e.g., “Right now I’m feeling a sense of oneness with the natural world around me”; “At the moment, I’m feeling that the natural world is a community to which I belong”) are rated on a 7-point scale with endpoints 1 (*strongly disagree*) and 7 (*strongly agree*). The state version was validated among three samples of undergraduate psychology students by evidencing positive associations with environmental self-awareness, private self-awareness, ability to reflect, and attentional capacity; and a negative association with public self-awareness. The state version of the Connectedness to Nature Scale is available in the article by Mayer et al. (2009).

The Nature Relatedness Scale is a 21-item scale developed by Nisbet et al. (2009), in order to assess individual differences in people’s “appreciation for and understanding of our interconnectedness with all other living things on the earth” (p. 4). Items (e.g., “I enjoy digging in the earth and getting dirt on my hands”; “I don’t often go out in nature”) are rated on a scale with endpoints 1 = *disagree strongly* and 5 = *agree strongly*. While factor analysis has suggested a 3-factor structure (i.e., internalized identification with nature, nature-related worldview, and familiarity with the natural world), an overall score is calculated by summing across all items, with higher scores denoting greater nature relatedness. The scale has good internal stability (coefficient α of 0.87) and good test-retest stability (0.85). The scale was validated by Nisbet et al. with undergraduate psychology students against related measures (e.g., ecology scales) and behaviors (e.g., buying organic food, choosing fair trade products, owning a pet, adopting vegetarianism, belonging to an environmental organization, participating in nature activities). Scores correlate positively with measures of extraversion, agreeableness, conscientiousness, and openness, as well as with measures of humanitarianism, love of animals, and considering future consequences of behavior. Among public and private sector executives, scores were shown to correlate positively with experience-sampling measures of time spent outdoors and in nature. This scale has been made available to researchers through contact with the scale developers.

Leary et al. (2008) devised a 16-item Allo-Inclusive Identity Scale, adopted from Aron et al.’s (1992) Inclusion of Other in the Self Scale (see also Schultz 2001, for a briefer such adoption). Eight items address the extent to which nature is incorporated into one’s identity, and eight items address the extent to which other people are incorporated into one’s identity (the latter scale is not discussed further here).

Items (e.g., “The connection between you and the Earth”; “The connection between you and a tree”) are rated by choosing one of seven diagrams depicting increasing degrees of overlap between a circle labeled *you* and one labeled *other*. Leary et al. reported a coefficient $\alpha > 0.75$ for the Nature subscale and generated preliminary evidence of the subscale’s validity (e.g., significant correlations with kindness, spirituality, and ecological concern; independence from socially desirable responding). The Allo-Inclusive Identity Scale is available within Leary et al.’s chapter.

Clayton (2003) described the content and validation of the Environmental Identity Scale, devised to assess the incorporation of the natural environment into one’s identity. This scale is composed of 24 items, such as “I really enjoy camping and hiking outdoors” and “Living near wildlife is important to me; I would not want to live in a city all the time.” Clayton established the internal reliability of the scale (coefficient $\alpha > 0.90$ across three studies) and showed that scores on the scale correlate positively with proenvironmental behaviors and choices and with measures of ecocentrism and the value of *universalism*. Scale items appear in the appendix of Clayton’s chapter.

Finally, Diessner et al. (2008) constructed the Engagement with Beauty Scale, which is composed of a 4-item Natural Beauty subscale in addition to Moral Beauty and Artistic Beauty subscales (the latter two subscales are not discussed further here). Items (e.g., “I notice beauty in one or more aspects of nature”; “When perceiving beauty in nature I feel changes in my body, such as a lump in my throat, an expansion in my chest, faster heart beat, or other bodily responses”) are rated on a 5-point scale with endpoints 1 (*very unlike me*) to 7 (*very much like me*). As employed with a sample of undergraduate students, the subscale has adequate internal reliability ($\alpha = 0.80$) and test-retest reliability ($r = 0.79$) and is inversely associated with materialistic values while directly related to both spiritual transcendence and gratitude (Diessner et al.). Items comprising the Natural Beauty subscale are presented in the appendix of Diessner et al.’s article.

Nature Affiliation and Well-Being

The pursuit of ‘the good life’ is through our broadest valuational experience of nature. (Kellert 1993, p. 60)

Commensurate with the development of reliable and valid measures of nature affiliation, the last decade has seen an increase in both correlational and experimental research linking nature affiliation with well-being. The correlational approach to examining nature involvement and well-being assesses the association between individual differences in nature affiliation and aspects of well-being (e.g., life satisfaction; positive affect; psychological, emotional, and social well-being.) A significant correlation between trait nature affiliation and life satisfaction was demonstrated in a study by Mayer and Frantz (2004) aimed at validating their dispositional Connectedness to Nature Scale. Diessner et al.’s (2008) Natural Beauty subscale of the Engagement with Beauty Scale was shown to correlate, among

undergraduate students, with a measure of life satisfaction. However, Leary et al. (2008) did not find that life satisfaction correlated significantly with scores on the Allo-Inclusive Identity—Nature scale.

State (but not trait) nature affiliation was significantly associated with positive affect in three studies conducted by Mayer et al. (2009); in the second of these studies, state nature affiliation was also significantly inversely associated with negative affect. In one of their two studies, Nisbet et al. (2009) demonstrated a positive correlation between Nature Relatedness scores and scores on an extraversion measure (which includes a tendency toward positive affect).

The majority of correlational studies examining individual differences in nature affiliation and well-being have focused upon positive affect and life satisfaction. These studies, as presented above, have yielded mixed results. This mixed pattern of findings may be understandable in terms of the differences drawn by some theorists concerning hedonic versus eudaimonic aspects of well-being (Kashdan et al. 2008; Keyes and Annas 2009; Waterman 2008). Hedonic well-being refers to attaining pleasure or feeling well and is measured with indices of life satisfaction and positive affect. Eudaimonic well-being refers to functioning well in either the private or public domain (Keyes and Annas 2009). Eudaimonia is concerned with how one lives one's life and thus focuses on concepts such as meaning, growth, and social relatedness; it is measured, in part, with indices of psychological and social well-being (Keyes and Annas 2009). It may be that aspects of well-being beyond hedonic positive affect and life satisfaction are most associated with nature affiliation. It is also possible that nature affiliation relates to some aspects of hedonic functioning (e.g., awe and vitality) more than others.

Howell et al. (2011) conducted two studies examining associations among various measures of nature affiliation and Keyes' (2005) comprehensive measure of well-being, which assesses emotional well-being via ratings of positive affect and ratings of life satisfaction (e.g., Diener et al. 1999); psychological well-being via ratings of self-acceptance, positive relations with others, personal growth, purpose in life, environmental mastery and autonomy (Ryff 1989); and social well-being via ratings of social acceptance, social actualization, social contribution, social coherence, and social integration (Keyes 1998). In a first study with Canadian undergraduate psychology students, correlations between the Connectedness to Nature Scale and both psychological and social well-being were significant (albeit small in magnitude), whereas no relationship emerged with emotional well-being. In a second study with Canadian undergraduate psychology students, all three forms of well-being were significantly associated with three measures of nature affiliation: the Connectedness to Nature Scale, the Nature Relatedness Scale, and the Allo-Inclusive Identity—Nature scale.

Additional findings have emerged for the relationship between nature affiliation and eudaimonic aspects of well-being, such as personal growth, engagement, and meaning. Herzog and Strevey (2008) measured undergraduate students' self-reported degree of contact with nature and correlated it with numerous indices of well-being. They showed that contact with nature was associated with positive affect and with the personal growth subscale of Ryff's (1989) psychological well-being scales. In

research expanding on their previous work, Nisbet et al. (2011) had undergraduate students (study 1) and government and business executives (study 2) complete the Nature Relatedness Scale, as well as measures of positive affect, life satisfaction, and psychological well-being. Nature relatedness was not significantly associated with life satisfaction, but was significantly associated with positive affect, autonomy, personal growth, and purpose in life. And in research conducted by Peterson et al. (2007), engagement and meaning aspects of well-being were reliable correlates of the character strength of appreciating beauty.

Famed naturalist John Muir (1901) encouraged us to “[c]limb the mountains and get their good tidings. Nature’s peace will flow into you as sunshine flows into trees. The winds will blow their own freshness into you, and the storms their energy...” (p. 56). Recent research provides empirical support for Muir’s notion that relating to nature is associated with greater feelings of vitality. Ryan et al. (2010) conducted (in addition to three experiments described below) two correlational studies examining associations between outdoor activity and subjective vitality. In study 4, undergraduate students completed a diary study in which they logged, on a daily basis, their level of vitality; they also recorded whether they spent more than 20 min outside, whether they exercised for more than 20 min, and whether they engaged in social interaction for more than 20 min. Participants were also paged at random times to record whether or not the activity they were engaged in took place outside, took place in a natural or artificial setting, involved social activity, or involved physical activity. Regardless of the influence of exercise and social activity, results showed that for diary measures, greater vitality was associated with spending more than 20 min outdoors. Similarly, paging measures revealed that, controlling for social, physical, and outdoor activity, behaviors involving nature predicted greater vitality. In study 5, undergraduate students completed a 4-day experience-sampling procedure in which they were paged randomly six times per day and recorded the number of people they were interacting with, the extent of their physical activity, whether they were indoors or outdoors, the presence of natural and non-natural environmental elements, and their subjective vitality. As in study 4, results showed that participants experienced greater vitality if they were exposed to nature and that simply being outdoors was not predictive of vitality if this did not involve contact with nature.

It appears that the cognitive aspect of relating to nature also has a vitalizing effect. In study 3 by Nisbet et al. (2011), students enrolled in a university course related to the environment were contrasted with students enrolled in non-environment-related courses. Results revealed that students in classes pertaining to the environment reported higher levels of vitality than did students in other courses. This higher level of vitality was accounted for by students maintaining a stronger sense of connectedness to nature (compared to other students) during a time period of stressful school exams and weather that was less amenable to outdoor activity.

Overall, correlational studies suggest reliable relationships between nature affiliation and eudaimonic aspects of well-being; however, vitality may be a specific aspect of emotional well-being that also correlates with nature affiliation. As we explore further on, another aspect of emotional well-being, awe, also appears to correlate with nature affiliation.

The experimental approach to studying associations between nature affiliation and well-being involves manipulating exposure to nature (e.g., via nature video clips or slides, plant-filled rooms, visualization involving nature settings, virtual experiences of nature, and, of course, actual experiences in real nature settings) and examining the resulting impact on indices of well-being. In addition to examining direct effects on well-being, mediator variables are also often examined and identified. A mediator variable helps to clarify the relationship between a manipulated or predictor variable and an outcome variable. For example, in study 3 by Nisbet et al. (2011) described above, environmental courses (predictor variable) led to an increased sense of nature relatedness (mediator), which resulted in higher levels of vitality (outcome variable). Therefore, increased nature relatedness mediated the relationship between environmental education and higher levels of vitality.

In recent years, several experimental studies have explored nature's effect on people's well-being. Mayer et al. (2009) conducted three experiments in which they manipulated participants' immersion in nature and then had the participants complete scales of positive and negative affect along with the state version of the Connectedness to Nature Scale. In study 1, psychology undergraduate students were randomly assigned to spend 15 min in either a nature preserve or in an urban setting. In study 2, undergraduate psychology students were randomly assigned to spend 10 min in a nature setting or to watch a 10-min video clip of either the same setting experienced by those in the first group or a 10-min video clip of an urban setting. In study 3, undergraduate psychology students were randomly assigned to either a nature walk or to watch a video clip of the same walk. In all three of these studies, the nature condition had no effect on negative affect, but participants' positive affect was boosted compared to those in the control conditions. Moreover, in all three of these studies, state nature affiliation was shown to mediate the effect of nature immersion on well-being: immersion in nature influenced positive affect via its effects on state nature affiliation.

Berman et al. (2008) randomly assigned undergraduate students to spend 50 min walking in either a park or a downtown, urban setting, before and after which they completed (among other measures) a self-report of positive affect. Mood was shown to increase for participants in the nature-walk condition but not for those in the urban-walk condition. This boosting of positive affect following immersion in nature held true in an experiment conducted by Valtchanov et al. (2010), in which undergraduate psychology students were randomly assigned to either a virtual experience of nature or to a virtual experience of abstract paintings immediately after a stress-induction experience. (The virtual experience of nature was an interactive computer-generated forest, of which its 1,600 m² could be explored using a head-mounted display and a wireless mouse. The experience was enhanced with somatosensory stimulation via a rumble platform which shook with each "step" a participant took and olfactory stimulation via a forest-scented air freshener.) Positive affect and skin conductance (among other measures) were assessed prior to and following the experience. Results showed that the computer-generated nature immersion significantly reduced participants' skin conductance and elevated their

positive affect relative to participants in the control condition. Similar findings emerged in a replication of this research by Valtchanov and Ellard (2010).

Participants' levels of a variety of positive emotions were boosted in Saraglou et al. (2008) experiment that involved exposing psychology undergraduate students to film clips of varying subject matter and emotional content. Students who had viewed nature-oriented clips (e.g., childbirth, panoramic views of natural landscapes) reported higher levels of ecstasy, respect, and wonder compared to students who had viewed clips that were humorous or neutral in content. In a quasi-experiment conducted by Han (2009), Taiwanese children whose classroom was beautified with several plants were compared to a second group of children whose classroom had not been modified with the addition of plants. Although no difference between these two groups of children emerged on a specific measure of well-being, after two and a half months, the children in the "plant" classroom reported greater feelings of preference, comfort, and friendliness in relation to their classroom setting.

It has been shown that exposure to nature can also increase one's endorsement of intrinsic goals such as closeness and community (which are associated with greater well-being), decrease one's endorsement of extrinsic goals such as fame and fortune (the pursuit of which are associated with lower well-being), and cause an increase in generous behavior toward others. Weinstein et al. (2009) evidenced these beneficial effects in a series of four experiments. In studies 1 and 2, adults were randomly assigned to look at a series of four slides (for 2 min each) depicting either nature scenes or manufactured environments while following instructions to encourage immersion in the materials. A measure of intrinsic versus extrinsic aspirations was completed both before viewing the slides and after. In study 3, adult participants randomly assigned to view either nature or non-nature slides completed self-report measures of intrinsic and extrinsic aspirations, then engaged in a behavioral decision task in which their distribution of funds could be coded as reflecting an intrinsic aspiration (valuing another person) or an extrinsic aspiration (valuing money). In study 4, students were exposed to a 5-min period of relaxation in either a plant-laden or plant-free laboratory prior to completing self-report and behavioral measures of intrinsic and extrinsic aspirations. In all four studies, participants in the nature conditions endorsed more intrinsic and less extrinsic values, and these well-being effects on goal aspirations were mediated by state Connectedness to Nature scores. In study 1, results showed that degree of immersion in the materials interacted with the conditions in predicting change in aspirations, such that those who were exposed to nature slides and who experienced high immersion in the materials reported higher intrinsic aspirations and lower extrinsic aspirations than those in the non-nature conditions. In both studies 3 and 4, individuals immersed in nature behaved more generously toward others relative to individuals not immersed in the nature conditions. Indeed, Thomas Fuller's assertion in 1732 that "he that plants trees loves others beside himself" (p. 89) appears to hold true even today and even with less active involvement in nature.

In conjunction with their correlational research (described previously in this chapter), Ryan et al. (2010) conducted a series of three experiments examining the impact of experiences in nature on subjective vitality. In study 1, undergraduate

students imagined themselves in situations depicted in a subset of 8 of 64 total vignettes that varied randomly along three independent dimensions: physical activity versus no physical activity, social activity versus solitary activity, and indoor activity versus outdoor activity. For each vignette, participants rated the extent to which vitality was experienced. Results showed that vitality was impacted by all three of the dimensions varied in the vignettes—higher vitality was felt in relation to vignettes involving physical activity, the outdoors, and the presence of others. Importantly, these findings suggest that outdoor activity singly is related to vitality. In study 2, undergraduate students were randomly assigned to walk for 15 min either indoors or outdoors. Measures of vitality taken before and immediately after the walk revealed that vitality increased following the outdoors walk but not following the indoors walk. And in study 3, undergraduate students completed the measure of vitality before and after imagining themselves in either an outdoor natural setting or an outdoor manufactured environment. Results showed that vitality increased for those students exposed to imagined natural scenes but decreased for those exposed to imagined scenes of manufactured settings.

As demonstrated by these experimental research findings, nature affiliation and exposure to elements of the natural world affects our well-being in several ways: by boosting our positive affect; by eliciting feelings of ecstasy, respect, and wonder; by fostering feelings of comfort and friendliness; by heightening our intrinsic aspirations and generosity; and by increasing our vitality. An overall pattern is evident in both the correlational and experimental research: exposure to nature is, quite simply, good for us.

Expanded Relationships

We may achieve our most fulfilling and enriching humanity by celebrating our secular as well as spiritual bonds with other life and creation. (Kellert 2002, p. 50)

Given that relationships between nature affiliation and well-being have begun to be established, the natural next step for research is to expand the study of mediators and moderators of this relationship.

It is possible that nature affiliation and well-being are mediated by meaning and/or purpose in life. Historical and literary figures have often credited nature with providing a sense of cohesiveness, meaning, and purpose to their lives. Many of Admiral Bird's diary entries from his winter 1934 Antarctic expedition speak to how the power of this natural environment awakened a sense of purpose in his life: "Here were imponderable processes and forces of the cosmos, harmonious and soundless. [...] It was enough to catch that rhythm, momentarily to be myself a part of it. [...] The conviction came that [...] there must be a purpose in the whole and that man was part of that whole and not an accidental off-shoot" (as cited in Storr 1988, p. 36). Thomas Merton reflected that "[o]ne has to be alone, under the sky, before everything falls into place and one finds his own place in the midst of it all.

We have to have the humility to realize ourselves as part of nature” (1968/1989, p. 294). And Kalnin (2008) wrote that “there are times when the beauty and tranquility of places allow us to see the world and our part in it from a completely different perspective” (p. 15).

Scientists, philosophers, therapists, and researchers have echoed, and have provided empirical support for, these sentiments. For example, Vernon (2008) proposed that “there are ways of living in the world that make more sense than others; there are patterns to be discerned in nature that express deep order: that it is not just facts that count but values” (p. 31). Berger and McLeod (2006) advised that the use of nature analogies and embedding clients’ experiences “in a larger natural story of life” can help clients bestow and extract meaning to guide them through change (p. 91). Kaplan and Kaplan (1989) discuss how the deepest instances of nature affiliation elicit “reflections on one’s life, on one’s priorities and possibilities, on one’s actions and one’s goals” (p. 197). As described previously, Peterson et al. (2007) showed that *appreciating beauty and excellence* was associated with a greater sense of meaning, and Nisbet et al. (2011) showed that purpose in life was a correlate of nature affiliation. It may be that those who are highly nature affiliated derive a sense of meaningful existence and/or purpose in life from their closeness with nature, and that this, in turn, boosts well-being. This parallels recent research in another domain, religiosity, which has shown that purpose in life mediates the association between religious beliefs and well-being (Byron and Miller-Perrin 2009; Steger and Frazier 2005).

To be directly in touch with cranes, grebes, wolves, cougars, and other fauna and flora within their natural habitats is to be directly in touch with historically evolved reality and nature and human origins—an ultimate spiritual or religious experience, laced with deep emotional and aesthetic valences, including a sense of tragedy and loss (Donnelley 2002, p. 169).

Norenzayan and Shariff (2007) found that individuals primed with concepts of God behaved in a more prosocial way (i.e., allocating more money to strangers in an anonymous economic game) than individuals in the control condition. This parallels Weinstein et al.’s (2009) findings described previously that individuals immersed in nature behaved more generously than did their control counterparts. Tendencies toward, and concepts of, religiosity, spirituality, and nature affiliation are commonly intertwined. Indeed, validated measures of spirituality commonly include items relating to nature. Examples include Gomez and Fisher’s (2003) Spiritual Well-Being Questionnaire (e.g., items pertaining to “developing connection with nature” and “developing oneness with nature”), Underwood and Teresi’s (2002) Daily Spiritual Experience Scale (e.g., “I am spiritually touched by the beauty of creation”), and Delaney’s (2005) Spirituality Scale (e.g., “I believe that nature should be respected”).

This intertwining of spirituality and nature appears to be true even for those individuals who eschew a belief system involving a deity, such as architect Frank Lloyd Wright, who once quipped that he believed in God, just that he spelled it “nature,” or Vincent Van Gogh who wrote that he turned to painting the stars when he was in

need of religion. Caldwell-Harris et al. (2008) found that atheists agreed with statements which measured aspects of spirituality construed as “respect for nature” to the same extent as did Catholics and Buddhists. Furthermore, approximately one-third of the atheists endorsed the term *spirituality* in relation to an appreciation of nature, and nature was the most frequently cited source of wonderment. Douglas Todd (2008), asserting that “spirituality and nature are inextricably linked in the public’s mind,” noted that “many of those who [...] attend religious institutions [...] take frequent breaks from the pews to venture out into the great outdoors” (p. 19). “Thus biophilia may be difficult to tease apart from what some people call a relationship with ‘spirit’ or ‘God’” (Soulé 1993, p. 444).

In the Saraglou et al. (2008) research described previously, spirituality was also assessed as a function of nature immersion. Specifically, in a second experiment with psychology undergraduate students randomly assigned to watch a video clip of either childbirth, nature, humor, or one of neutral content, those in the childbirth and nature conditions scored higher on a measure of spirituality than did those in the remaining two conditions. In a qualitative study of participants’ perceptions of a wilderness experience (Fox, as cited in Heintzman 2003), “nature inspired spiritual experiences that were connected to self and nature, wonderment, awe, and natural beauty” (p. 29). This relationship between nature and spirituality has also emerged in other research areas. In Shiota et al.’s (2007) research on awe, participants were asked to think of either a recent time when they were in a natural setting they felt was beautiful (nature condition) or a recent time when they felt pride (accomplishment condition). Participants in the nature condition, as compared to the accomplishment condition, gave higher ratings to statements such as “I felt the presence of something greater than myself.” Additionally, Diessner et al.’s (2008) research on appreciating beauty evidenced significant associations between nature affiliation and spirituality.

Future research could further examine the relationship between hope, spirituality, religiosity, nature affiliation, and well-being. The thread of hope arises from, and is interwoven with, both spirituality and nature. Robert Lifton (as cited in Scioli 2007) includes seeking salvation in spiritual beliefs and bonding with the eternal cycles of nature as ways to increase hope. Kalnin (2008) links nature, hope, and spirituality in that “[n]ature expands to embrace infinite possibilities. Ideas about spirituality do the same” (p. 15). Studies have established connections between spirituality and well-being (see Gomez and Fisher 2005), between hope and well-being (see Snyder 2002), between hope and spirituality (Vailant, as cited in Scioli 2007), and, as described in this chapter, between nature and both well-being and spirituality. However, to date, much of the scientific study on the relationship between nature and spirituality is correlational and refers to nature in the context of wilderness experiences, where solitude and escape from hectic daily life play a significant role (Heintzman 2003). For example, Brayley and Fox (as cited in Heintzman 2003) found that close to 46% of backpackers visiting one Canadian national park reported that “the opportunity to reflect on spiritual values” played an important part in their decision to spend time in the backcountry (p. 27). In the future, experimental research could test the hypothesis that exposure to nature in

an everyday context (e.g., indoor plants) will increase self-reports of spirituality, religiosity, and hope, and, in turn, increase well-being.

It is also possible that the relationship between nature affiliation and well-being is mediated by the extent to which important basic psychological needs are met through contact with nature (see also Clayton 2003). Kellert (1997) speculated that involvement with nature may satisfy needs similar to those of competence, autonomy, and relatedness; these are the very needs underscored in self-determination theory (e.g., Deci and Ryan 2000). Regarding competency needs, outdoor educational and therapy programs capitalize on the unlimited opportunities nature provides for individuals to “learn to demonstrate personal competencies” through activities such as wilderness camping adventures (Newes and Bandoroff 2004, p. 9). Urban nature experiences also lend themselves to helping fulfill individuals’ competency needs, through activities such as outdoor or container gardening (Hunter 2006). Competency, as a result of learning about the world in general, is readily fostered by nature experiences. For example, educator David Sobel uses local nature excursions to teach children a myriad of skills (Sobel 1998). One class trip to the local nature area involved activities such as a hike along the stream bed—this not only helped the children learn mapmaking skills and reinforced fundamental concepts of topographic maps, it also provided them with “the thrill of posing a question and working directly to find the answer.” As Louv (2005) advised, when heading outdoors with children, we need to encourage them to “pay attention,” rather than warn them to “be careful.” Interacting with nature also contributes indirectly to fulfilling our competency needs, in that the feelings of vitality nature inspires in us spill over into other areas of our lives, prompting us to “roll up our sleeves” and tackle new projects—resulting in expanded opportunities for accomplishment.

Although “the complexity and interdependence of contemporary life often thwarts the realization of personal distinctiveness, [t]he natural world continues to afford opportunities for people to achieve feelings of autonomy and individuality” (Kellert 1997, p. 130). This view is echoed by Ridder (2005), who suggested that while many people struggle with the values imposed on them by society, and come to feel that their lifestyle is “excessively mediated by external influences rather than priorities determined by personal values, beliefs, and experience of life” (p. 7), nature is associated with spontaneity, self-organizing processes, and freedom. This *nature-inspired autonomy* (Ridder 2005, p. 1) is of symbolic significance for people, as illustrated by the portrayal of nature in literature as inspiring “downtrodden citizens to seek personal freedom” from authoritarian societies (Drew, as cited in Ridder 2005, p. 5). Experimental evidence has emerged that links the experience of nature with increased autonomy. In studies conducted by Weinstein et al. (2009) described previously, the more participants were immersed in nature contexts, the more autonomous they felt.

Regarding relatedness needs, nature affiliation and well-being may be mediated by a greater sense of social connectedness. In writings describing his mostly solitary life at Walden Pond, Thoreau (1854/1989) several times refers to this sense of social connectedness that nature provides: “the most sweet and tender, the most important and encouraging society may be found in any natural object, even for the poor

misanthrope and most melancholy man”; “I enjoy the friendship of the seasons”; “I was suddenly sensible of such sweet and beneficent society in Nature [...] an infinite and unaccountable friendliness all at once like an atmosphere sustaining me” (p. 202–203). Lending scientific credence to these literary references are findings from Shiota et al.’s (2007) study that participants in the *nature* condition gave higher ratings to such statements as “I felt connected with the world around me.” Robert Sommer (2003) presented a variety of evidence from several studies demonstrating how tree planting programs in urban areas can enhance social connectedness by building “local identity, turning a street of strangers into a community. [...] Trees create a canopy over residential streets, putting a ‘roof’ over a neighborhood, forming natural bridges that unite two sides of a street” (p. 182).

Our bonds with animals, particularly our pets, also help to fulfill our social relatedness needs. In an edited book by Podberscek et al. (2000), numerous authors explored evidence of how animals can be highly significant social companions to people of all ages in a diverse array of cultures and countries. The role that pets play in meeting individual’s social relatedness needs was also examined in a study by Epley et al. (2008), in which participants selected three traits that best described their pet (or a pet they knew) subsequent to viewing a short video clip that induced feelings of either social disconnection, fear, or neutrality. Individuals in the social disconnection condition were more likely to attribute humanlike mental states or traits to pets than were individuals in the other conditions. Many people find that the companionship of nonhuman animals enriches their lives. As Epley et al. demonstrated, this natural connection may be heightened for individuals who feel socially disconnected. Heeding the words of Richard Nelson, that our isolation from the natural community has created for us a “profound and imperiling loneliness” (Nelson 1993, p. 221), further research is needed regarding the hypothesis that feeling connected to the natural world may help to fulfill individuals’ relatedness needs, in addition to needs of competency and autonomy. Of particular focus could be socially marginalized individuals and those who are socially introverted.

Finally, nature affiliation and well-being may be mediated by improved physical functioning. As described earlier, there is evidence from large-scale cohort studies that exposure to green spaces is associated with many indicators of physical health (de Vries et al. 2003; Maas et al. 2006; Mitchell and Popham 2008; Takano et al. 2002). Perhaps exposure to public parks and tree-lined streets (with concomitant increases in nature affiliation) improves physical health, which, in turn, boosts mental well-being.

Some people walk in the rain, others just get wet. (Miller n.d.)

There may also be variables (called moderators) that strengthen or weaken the relationship between nature affiliation and well-being. One such variable is the extent to which nature affiliation is shared within one’s immediate social group. The relationship between nature affiliation and well-being may be stronger among those surrounded by others who value nature. For example, Sagiv and Schwartz (2000) found that psychology students value *universalism* (which includes unity with nature)

to a greater degree than do business students and that well-being was higher among psychology students when their valuing of universalism exceeded their valuing of power. This well-being finding did not hold true for business students, who tended to value power over universalism.

Cultures may also differ on the degree to which they value nature involvement. Despite conceptualizations of nature affiliation being cross-culturally ubiquitous, the tendency to affiliate with nature requires cultivation (Wilson 1984); certain cultures may foster nature affiliation more than others. For example, rooted deeply in the cultures of Norway and Sweden is the concept of *friluftsliv*, a word that translates to *free-air life* meaning “a philosophical lifestyle based on experiences of the freedom in nature and spiritual connectedness with the landscape” (Gelter 2000, p. 78); *friluftsliv* stems from “the self-image of Scandinavians as nature loving people” (Sandell and Sorlin, as cited in Gelter 2000, p. 79). It is possible that it is only among those nations highly valuing nature that robust associations between nature affiliation and well-being would emerge. “Thus,” as Kellert (1997) suggests, “the different aspects of biophilia are best viewed as products of ‘biocultural’ evolution—inborn tendencies shaped by the mediating influence of learning, culture, and experience” (p. 4).

A final potential moderator that we examine concerns mindfulness. It is possible that involvement in nature is conducive toward well-being mostly among those who are highly mindful. Mindfulness is “the tendency to be highly aware of one’s internal and external experiences in the context of an accepting, nonjudgmental stance toward those experiences” (Cardaciotto et al. 2008, p. 205). Mindfulness enhances the richness and vitality of moment-to-moment experiences (Brown and Ryan 2003; see also Brown et al. 2007) and thus allows the full experience of nature to be attended to and appreciated. The enhanced sensory impact of experiences in nature fostered by mindfulness may strengthen the impact of nature on well-being. For example, Wilson (1984) wrote, in describing the state of mind of a naturalist, “He goes alone into a field or woodland and closes his mind to everything but that time and place, so that life around him presses in on all the senses and small details grow in significance” (p. 103). Attention toward, and awareness of, such detail may enrich the experience of nature, thereby enhancing well-being.

Nisbet et al. (2009) showed that openness to experience (a correlate of mindfulness; Brown and Ryan 2003) is associated with nature affiliation, Mayer et al. (2009) showed that attentional capacity (a facet of mindfulness) is related to trait nature connectedness, Herzog and Strevey (2008) showed that contact with nature predicted higher attentiveness, and Leary et al. (2008) showed that internal state awareness is related to nature affiliation. As stated by Leary et al., “Perhaps high internal state awareness is associated with greater sensitivity to one’s feelings of connection, appreciation, and awe with respect to animals and nature” (p. 142). In the most direct test of the association between mindfulness and nature affiliation, Howell et al. (2011) established mindfulness as a significant correlate of nature affiliation.

Where to From Here?

“Viewed as an amenity, nature may be readily replaced by some greater technological achievement. Viewed as an essential bond between humans and other living things, the natural environment has no substitutes” (Kaplan and Kaplan 1989, p. 203).

Anthropologist Richard Nelson (as cited in Kahn 1997) described our society as being alienated from nature due to our viewing the natural world from “a great distance of mind” (p. 13). As the rate and spread of industrialization and urbanization increases, this distance is extending from the mental to the physical, with our experiences of nature increasingly mediated by technology such as 3D-IMAX movies, virtual nature walks, and nature shows on high-definition television. Interactive technical-nature experiences are also now possible. For example, an online telegarden, developed at the University of Southern California, was active from 1995 to 2005; in its first year alone, over 9,000 people remotely accessed this live garden, planting and cultivating it (see <http://www.telegarden.org/tg/> for archival videos). One can even hunt and kill live animals from one’s living room by telehunting, although public outcry has caused some jurisdictions to ban this practice (Associated Press 2007). Consumer-level robotic pets are now readily available (Engber 2008).

Researchers have begun to study how these technologically mediated experiences of nature differ from experiences of direct exposure to the natural world in their effect on our health and well-being (Kahn et al. 2005, 2006; Levi and Kocher 1999; Melson et al. 2005; Valtchanov et al. 2010; Valtchanov and Ellard 2010). One recent study by Kahn et al. (2008) involved 90 participants working on four low-level stress tasks in one of three conditions: a room with a high-definition plasma screen real-time view of nature, a room with the same view of nature but through a glass window, or a windowless room. Participants’ physiological reactions (e.g., heart rates) were measured and harmonized with coding of the frequency and duration with which each participant looked at either the plasma window, the glass window, or the blank wall. Results showed that while heart-rate recovery was faster in the glass window condition compared to the blank wall, there was no difference in heart-rate recovery time between the plasma window and the blank wall condition. Although participants glanced at the plasma window and the glass window the same number of times, the glass window held participants’ attention for a significantly longer period of time than did the plasma window. Furthermore, no relationship was found between heart-rate recovery time and duration of viewing the plasma window; but for participants viewing the glass window, the more time a participant looked at the glass window, the faster was their heart-rate recovery time.

Findings from these studies are consistent with other similar studies (for a review, see Kahn et al. 2009) in suggesting that while virtual nature can offer us some of the benefits and enjoyments of affiliating with actual nature, there may be inherent negative consequences to increasingly replacing exposure to the live, natural world with technologically mediated experiences. Winston Churchill admonished that “[n]ature will not be admired by proxy,” and Kahn et al. (2008) caution that “it is important to address the issue of whether such adaptations are not just different but

impoverished from the standpoint of human functioning and flourishing, and whether such technological systems and resulting interactions are shifting the very baseline of what we can recognize as impoverishment” (p. 198).

We cannot stop the progression of urbanization or technological innovation, nor should we necessarily want to impede them. For example, Valtchanov et al. (2010; see also Valtchanov and Ellard 2010) suggest that computer-generated virtual-reality nature may assist researchers in developing methods and environments with possible therapeutic applications in scenarios where access to real nature is limited. And many of the advances in technology and urban living over the last hundred years have increased our lifespan (e.g., advanced medical diagnostics), improved communication (e.g., telephones and email), and improved the quality of life for many individuals (e.g., teleworking from home). However, “quality of life isn’t measured only by what we gain, but also by what we trade it for” (Louv 2005, p. 59). We need to recognize the limitations of technology, as Kahn et al.’s (2008) and others’ research demonstrates. We need, as Canadian wildlife artist and environmentalist Robert Bateman (2000) wrote, “a new definition of Progress, one that is more elegant and sophisticated, one that values our heritage, both natural and human” (p. ix).

GPI Atlantic, a Canadian research organization, is currently working on defining progress in just such a balanced and expanded way with the development of their Genuine Progress Index (GPI Atlantic 2007). GPI measures sustainability, quality of life, and well-being and is put forth as an alternative to the commonly used measure of Gross Domestic Product (GDP). Six main categories make up the GPI: living standards, population health, time use, community vitality, education quality, and environmental quality. Another similar measure to replace GDP is Gross National Happiness (GNH). GNH has been the national priority of the kingdom of Bhutan since 1972; Bhutan’s GNH program includes reserving at least 60% of its lands as natural forest. GPI Atlantic shared its research and measurement tool with the government of Bhutan at an international conference in 2004 on “Operationalizing Gross National Happiness” (Kavanagh 2004). This GNH measure of progress is also receiving interest in France, the United Kingdom, and the United States; a grassroots group in Vermont has established an organization called “Gross National Happiness USA” with a mandate of raising awareness of alternative measures of progress.

What these new measures of progress have in common is the recognition that our physical health and mental well-being are impacted by the environment in which we live. As presented previously in this chapter, population-based research has evidenced a positive relationship between green space and physical health and longevity (de Vries et al. 2003; Maas et al. 2006; Mitchell and Popham 2008; Takano et al. 2002). Evidence continues to mount in this area, with the research scope of focus broadening to include various indicators of mental well-being. For example, Grahn and Stigsdotter (as cited in Mind 2007) found an “inverse relationship between proximity of open green spaces in urban areas and levels of stress” (p. 3), and Wells and Evans (as cited in Chalquist 2009) reported that “the impact of life stress [was] lower among children [living] in the midst of natural features of the landscape than among those with little nature nearby” (p. 6). The MIND Institute

(Mind 2007) has stated that “inequality of access to green space should be addressed as a human rights, social justice and discrimination issue” (p. 31). Bolstering this recommendation are not only findings (presented earlier) that the relation between green space and health is stronger for lower socioeconomic groups (Maas et al. 2006; Mitchell and Popham 2008), but also findings pertaining to the effect that green space in impoverished, inner city neighborhoods has on social interaction, crime, and individuals’ mental outlook. In studies utilizing data collected at two large public housing developments in Chicago (located in some of the poorest neighborhoods in the United States), it was found the following: that there was proportionately more social activity in green spaces surrounding individual buildings than in barren spaces that surrounded some of the buildings, regardless of the location of the spaces (Sullivan et al. 2004); that the greener a building’s surroundings, the fewer the crimes—both property and violent—recorded by police for that building, even when controlling for varying number of apartments in the buildings (Kuo and Sullivan 2001); and that “residents living in buildings without trees and grass reported more procrastination in facing their major issues, and assessed their issues as more severe, less soluble, and more long-standing than did their counterparts living in greener surroundings” (Kuo 2001, p. 5).

In light of these findings, Sullivan et al. (2004) recommend that “guidelines for developing and maintaining green neighborhood spaces” be included in public housing development designs and that government agencies responsible for public housing “actively promote neighborhood greening efforts” (p. 697). Psychologists Diener et al. (2008) have urged business leaders and government officials to develop national well-being accounts that will “help determine where, what type, and how much nature is necessary for optimal functioning of society” (p. 47). These national well-being accounts could be published as a set of guidelines for *Daily Nature Exposure*, analogous to publications such as *Canada’s Food Guide* (a guideline for daily food consumption based on recommended daily allowances of vitamins and minerals.) Evidence continues to mount that “[r]egular contact with nature may be as important to our psychological and social health as the regular consumption of fruit and vegetables is to our physical health” (Kuo 2001, p. 29).

To date, research in the nature–well-being area has focused on visual stimuli comprising the natural world. Research is needed on the effects of exposure to poly-sensory experiences of nature, of infusing our auditory and tactile senses with the sounds and feels of nature as well as her rich sights. There may be effective mood-enhancing experiences in simple actions such as smelling the fragrance of a lilac bush, walking barefoot in the grass, or listening to the sounds of birds chirping to greet the morning. Musician Murray Schafer said that “[t]he world is as alive with sound as it is with anything, yet most of us automatically tune out much of what we hear. Focusing on sound is another excellent way to connect us with the present. Any step we take to increase our awareness brings us more in tune with the totality of creation” (as cited in Kalnin 2008, p. 134). Taking this as a starting point, future research could include combining mindfulness training with exposure to various modal experiences of nature (via touch, sound, smell, cognition) under experimentally controlled conditions, in order to examine not only the effect of each modal experience

of nature on various indicators of well-being but also to assess the moderating influence of mindfulness. Of assistance in this area of research will be utilizing tools and measures such as the Sensual Awareness Inventory (as Burns 2005, suggests), modified versions of instruments developed to measure immersion in present environments (such as those that Weinstein et al. 2009, used), well-being measures, and the various nature affiliation scales presented in this chapter.

Longitudinal experimental studies are needed to assess the long-term effects of exposure to nature, as well as the effects of prolonged immersion in, or contact with, elements of the natural world. Consistent with the review of Lyubomirsky et al. (2005), affiliation with nature, promoted through greater involvement in nature, may complement other *intentional activities*, such as gratitude expression, shown to be conducive to the cultivation of well-being. “The key for long lasting changes to well-being is to engage in activities that provide small and frequent [well-being] boosts” (Mochon et al. 2008, p. 641). Taken alongside experimental evidence of the positive effects for well-being of immersion in nature, the ready availability of experiences in nature suggests that such activity, occurring frequently across large numbers of individuals, may have modest but important consequences for well-being.

To that end, we suggest that connecting with nature in a variety of ways can enrich the journey along each of the three paths to happiness proposed by Seligman (2002): the pleasant life, the engaged life, and the meaningful life. Research is needed to develop, test, and validate a detailed Nature Immersion Therapy aimed at enriching individuals’ levels of well-being. The foundation for this work could be existing therapy plans built upon the numerous validated positive psychology interventions for increasing well-being (e.g., *Positive Psychotherapy* developed by Seligman et al. 2006; *Happiness 101: A How-to Guide in Positive Psychology for People who are Depressed, Languishing, or Flourishing* developed by Lambert 2009), as well resources specific to connecting to nature developed by researchers in other fields (e.g., *Nature as a Guide: Using Nature in Counseling, Therapy, and Education* developed by Nebbe 1991; *Coyote’s Guide to Connecting with Nature: For Kids of All Ages and Their Mentors* developed by Young et al. 2008).

In every walk with nature one receives far more than he seeks. (Muir 1918 p.128)

We are not born *tabula rasa*; we are a product of our evolutionary past and carry the seeds of many innate tendencies—including biophilia. We must not, for the benefit of ourselves as individuals and as a species, allow these biophilic seeds to lie fallow within us. Rather, we must nourish and cultivate this tendency in order to become complete and flourishing. There is much research yet to be done in this area of nature affiliation and well-being.

May the sun bring you new energy by day,
 May the moon softly restore you by night,
 May the rain wash away your worries,
 May the breeze blow new strength into your being,
 May you walk gently through the world and know its beauty all the days of your life.

Apache Blessing

References

- Aron, A., Aron, E. N., & Smollen, D. (1992). Inclusion of other in the self scale and the structure of interpersonal closeness. *Journal of Personality and Social Psychology*, *63*, 596–612.
- Associated Press. (2007). *Should killing be merely a mouse click away?* Retrieved June 27, 2010, from http://www.nytimes.com/2007/03/11/sports/othersports/11hunt.html?_r=1&en=37373e4c91554cd6&ex=1331269200&partner=rssnyt&emc=rss&pagewanted=print
- Bateman, R. (2000). *Thinking like a mountain*. Toronto: Penguin.
- Berger, R., & McLeod, J. (2006). Incorporating nature into therapy: A framework for practice. *Journal of Systemic Therapies*, *25*, 80–94.
- Berman, M. C., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological Science*, *19*, 1207–1212.
- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*, 822–848.
- Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007). Mindfulness: Theoretical foundations and evidence for its salutary effects. *Psychological Inquiry*, *18*, 211–237.
- Burns, G. W. (1998). *Nature-guided therapy: Brief integrative strategies for health and well-being*. Philadelphia: Brunner/Mazel.
- Burns, G. W. (2005). Naturally happy, naturally healthy: The role of the natural environment in well-being. In F. A. Huppert, N. Baylis, & B. Keverne (Eds.), *The science of well-being* (pp. 405–431). New York: Oxford University Press.
- Burns, G. W. (2009). Can you be happy in pain? Applying positive psychology, mindfulness, and hypnosis to chronic pain management. In G. W. Burns (Ed.), *Happiness, healing, enhancement: Your casebook collection for applying positive psychology in therapy* (pp. 202–213). Hoboken: Wiley.
- Buss, D. M. (2000). The evolution of happiness. *American Psychologist*, *55*, 15–23.
- Byron, K., & Miller-Perrin, C. (2009). The value of life purpose: Purpose as a mediator of faith and well-being. *Journal of Positive Psychology*, *41*, 64–70.
- Caldwell-Harris, C. L., Wilson, A., LoTempio, E., & Beit-Hallahmi, B. (2008) *Exploring the Atheist personality: Well-being, awe, and magical thinking in Atheists, Buddhists, and Christians*. Unpublished manuscript.
- Cardaciotto, L., Herbert, J. D., Forman, E. M., Moitra, E., & Farrow, V. (2008). The assessment of present-moment awareness and acceptance: The Philadelphia mindfulness scale. *Assessment*, *15*, 204–223.
- Chalquist, C. (2009). A look at the ecotherapy research evidence. *Ecopsychology*, *1*, 1–11.
- Charles, C., & Louv, R. (2009, September). Children's nature deficit: What we know—and don't know. *Children & Nature Network*, 2009, 1–32.
- Clayton, S. (2003). Environmental identity: A conceptual and an operational definition. In S. Clayton & S. Opatow (Eds.), *Identity and the natural environment: The psychological significance of nature* (pp. 45–66). Cambridge, MA: MIT Press.
- De Vries, S., Verheij, R. A., Groenewegen, P. P., & Spreeuwenberg, P. (2003). Natural environments—healthy environments? An exploratory analysis of the relationship between greenspace and health. *Environment and Planning*, *35*, 1717–1731.
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*, 227–268.
- Delaney, C. (2005). The spirituality scale: Development and psychometric testing of a holistic instrument to assess the human spiritual dimension. *Journal of Holistic Nursing*, *23*, 145–167.
- Diener, E., Suh, E. M., Lucas, R. E., & Smith, H. L. (1999). Subjective well-being: Three decades of progress. *Psychological Bulletin*, *125*, 276–302.
- Diener, E., Kesebir, P., & Lucas, R. (2008). Benefits of accounts of well-being—for societies and for psychological science. *Applied Psychology: An International Review*, *57*, 37–53.

- Joye, Y. (2007). Architectural lessons from environmental psychology: The case of biophilic architecture. *Review of General Psychology, 11*, 305–328.
- Kahn, P. H. (1997). Developmental psychology and the biophilia hypothesis: Children's affiliation with nature. *Developmental Review, 17*, 1–61.
- Kahn, P.H. Jr., Friedman, B., Alexander, I.S., Freier, N.G., & Collett, S. L. (2005). The distant gardener: What conversations in the Telegarden reveal about human-telebotonic interaction. *IEEE International Workshop on Robot and Human Interactive Communication*. ROMAN 2005. DOI: 10.1109/ROMAN.2005.1513749
- Kahn, P. H., Jr., Friedman, B., Perez-Granados, D. R., & Freier, N. G. (2006). Robotic pets in the lives of preschool children. *Interaction Studies, 7*, 405–436.
- Kahn, P. H., Jr., Friedman, B., Gill, B., Hagman, J., Severson, R. L., Freier, N. G., Feldman, E. N., Carrere, S., & Stolyar, A. (2008). A plasma display window? The shifting baseline problem in a technologically mediated natural world. *Journal of Environmental Psychology, 28*, 192–199.
- Kahn, P. H., Jr., Severson, R. L., & Ruckert, J. H. (2009). The human relation with nature and technological nature. *Current Directions in Psychological Science, 18*, 37–42.
- Kaiser Family Foundation. (2010). Generation M2: Media in the lives of 8-18-year olds [Brochure]. Menlo Park, California: Author
- Kalnin, J. (2008). *The spirituality of nature*. Kelowna: Northstone Wood Lake Publishing Inc.
- Kaplan, R. (1993). The role of nature in the context of the workplace. *Landscape and Urban Planning, 26*, 193–201.
- Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology, 15*, 169–182.
- Kaplan, R. (2001). The nature of the view from home: Psychological benefits. *Environment and Behavior, 33*, 507–542.
- Kaplan, R., & Kaplan, S. (1989). *The experience of nature: A psychological perspective*. New York: Cambridge University Press.
- Kashdan, T. B., Biswas-Diener, R., & King, L. A. (2008). Reconsidering happiness: The costs of distinguishing between hedonics and eudaimonia. *Journal of Positive Psychology, 3*, 410–422.
- Kavanagh, P. (2004). *Happiness and progress: Measuring human well-being in Bhutan and Canada*. The International Development Research Centre. Retrieved June 6, 2010, from http://www.idrc.ca/en/ev-61364-201-1-DO_TOPIC.html
- Kellert, S. R. (1993). The biological basis for human values of nature. In S. R. Kellert & E. O. Wilson (Eds.), *The biophilia hypothesis* (pp. 42–69). Washington, DC: Island Press.
- Kellert, S. R. (1997). *Kinship to mastery: Biophilia in human evolution and development*. Washington, DC: Island Press.
- Kellert, S. R. (2002). Values, ethics, and spiritual and scientific relations to nature. In S. R. Kellert & T. J. Farnham (Eds.), *The good in humanity: Connecting science, religion, and spirituality with the natural world* (pp. 49–64). Washington, DC: Island Press.
- Keltner, D., & Haidt, J. (2003). Approaching awe, a moral, spiritual, and aesthetic emotion. *Cognition and Emotion, 17*, 297–314.
- Keyes, C. L. M. (1998). Social well-being. *Social Psychology Quarterly, 61*, 121–140.
- Keyes, C. L. M. (2005). Mental illness and/or mental health? Investigating the axioms of the complete state model of health. *Journal of Consulting and Clinical Psychology, 73*, 539–548.
- Keyes, C. L. M., & Annas, J. (2009). Feeling good and functioning well: Distinctive concepts in ancient philosophy and contemporary science. *Journal of Positive Psychology, 4*, 197–201.
- Kuo, F. E. (2001). Coping with poverty: Impacts of environment and attention in the inner city. *Environment and Behavior, 33*, 5–34.
- Kuo, F. E., & Sullivan, W. C. (2001). Environment and crime in the inner city. Does vegetation reduce crime? *Environment and Behavior, 33*, 343–367.
- Kuo, F. E., & Taylor, A. F. (2004). A potential natural treatment for attention-deficit/hyperactivity disorder: Evidence from a national study. *American Journal of Public Health, 94*, 1580–1586.
- Lambert, L. (2009). *Happiness 101: A how-to guide in positive psychology for people who are depressed, languishing, or flourishing*. Bloomington: Xlibris Corporation.

- Leary, M. R., Tipsord, J. M., & Tate, E. B. (2008). Allo-inclusive identity: Incorporating the social and natural worlds into one's sense of self. In H. A. Wayment & J. J. Bauer (Eds.), *Transcending self-interest: Psychological explorations of the quiet ego* (pp. 137–147). Washington, DC: APA.
- Levi, D., & Kocher, S. (1999). Virtual nature: The future effects of information technology on our relationship to nature. *Environment and Behavior, 31*, 203–226.
- Louv, R. (2005). *Last child in the woods: Saving our children from nature-deficit disorder*. Chapel Hill: Algonquin Books.
- Lyubomirsky, S., Sheldon, K. M., & Schkade, D. (2005). Pursuing happiness: The architecture of sustainable change. *Review of General Psychology, 9*, 111–131.
- Maas, J., Verheij, R. A., Groenewegen, P. P., de Vries, S., & Spreeuwenberg, P. (2006). Green space, urbanity, and health: How strong is the relation? *Journal of Epidemiology and Community Health, 60*, 587–592.
- Maller, C., Townsend, M., Pryor, A., Brown, P., & St. Leger, L. (2005). Healthy nature, healthy people: 'Contact with nature' as an upstream promotion intervention for populations. *Health Promotion International, 21*, 45–54.
- Marr, C. A., French, L., Thompson, D., Drum, L., Greening, G., Mormon, J., Henderson, I., & Hughes, C. W. (2000). Animal-assisted therapy in psychiatric rehabilitation. *Anthrozoos, 13*, 43–47.
- Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology, 24*, 504–515.
- Mayer, F. S., Frantz, C. M., Bruehlman-Senecal, E., & Dolliver, K. (2009). Why is nature beneficial? The role of connectedness to nature. *Environment and Behavior, 41*, 607–643.
- Melson, G. F., Kahn, P. H. Jr., Beck, A. M., Friedman, B., Roberts, T., & Garrett, E. (2005, 2–7 April). Robots as dogs? Children's interactions with robotic dog Aibo and a live Australian Shepherd. In *CHI, conference, Portland*. <http://www.chi2005.org/>
- Merton, T. (1968/1989). *Conjectures of a guilty bystander*. New York: Doubleday.
- Miller, R. Retrieved July 20, 2011, from http://thinkexist.com/quotation/some_people_walk_in_the_rain-others_just_get_wet/224618.html
- Miller, R. (n.d). BrainyQuote.com. Retrieved August 25, 2012, from <http://www.brainyquote.com/quotes/r/rogermille107155.html>
- Mind. (2007). *Ecotherapy: The green agenda for mental health*. London: Author
- Mitchell, R., & Popham, F. (2008). Effect of exposure to natural environment on health inequalities: An observational population study. *The Lancet, 372*, 1655–1660.
- Mochon, D., Norton, M. I., & Ariely, D. (2008). Getting off the hedonic treadmill, one step at a time: The impact of regular religious practice and exercise on well-being. *Journal of Economic Psychology, 29*, 632–642.
- Muir, J. (1901/2006). *Our national parks*. New York: Cosimo, Inc.
- Muir, J. (1918). *Steep trails*. Boston, MA: Houghton Mifflin.
- Nebbe, L. L. (1991). *Nature as a guide: Using nature in counseling, therapy, and education*. Minneapolis: Educational Media Corporation.
- Nelson, R. (1993). Searching for the lost arrow: Physical and spiritual ecology in the hunter's world. In S. R. Kellert & E. O. Wilson (Eds.), *The biophilia hypothesis* (pp. 201–228). Washington, DC: Island Press.
- Nesse, R. M., & Williams, G. C. (1996). *Evolution and healing: The new science of Darwinian medicine*. London: Phoenix.
- Newes, S., & Bandoroff, S. (2004). What is adventure therapy? In S. Bandoroff & S. Newes (Eds.), *Coming of age: The evolving field of adventure therapy* (pp. 1–30). Boulder: Association for Experimental Education.
- Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2009). The nature relatedness scale: Linking individuals' connection with nature to environmental concern and behavior. *Environment and Behavior, 41*, 715–740.
- Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2011). Happiness is in our nature: Exploring nature relatedness as a contributor to subjective well-being. *Journal of Happiness Studies, 12*, 303–322.

- Norenzayan, A., & Shariff, A. F. (2007). God is watching you: Priming god concepts increases prosocial behavior in an anonymous economic game. *Psychological Science*, *18*, 803–809.
- Park, N., Peterson, C., & Seligman, M. E. P. (2006). Character strengths in fifty-four nations and the fifty US states. *Journal of Positive Psychology*, *1*, 118–129.
- Pergams, O. R. W., & Zaradic, P. A. (2008). Evidence for a fundamental and pervasive shift away from nature-based recreation. *Proceedings of the National Academy of Sciences of the United States of America*, *105*, 2295–3000.
- Peterson, C., Ruch, W., Beermann, U., Park, N., & Seligman, M. E. P. (2007). Strengths of character, orientations to happiness, and life satisfaction. *Journal of Positive Psychology*, *2*, 149–156.
- Podbersek, A. L., Paul, E. S., & Serpell, J. A. (2000). *Companion animals and us: Exploring the relationships between people and pets*. Cambridge: Cambridge University Press.
- Ridder, B. (2005). Reorienting environmentalism to nature-inspired-autonomy. *Griffith Journal of the Environment*, *1*, 1–26.
- Royal Society for the protection of Birds. (2010, January 7). ‘Nature stravation’ threatens the well-being of young people. Retrieved from <http://www.rspb.org.uk/news/details.aspx?id=tcm:9-238307#credits>
- Ryan, R. M., Weinstein, N., Bernstein, J., Brown, K. W., Mistretta, L., & Gagne, M. (2010). Vitalizing effects of being outdoors and in nature. *Journal of Environmental Psychology*, *30*, 159–168.
- Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology*, *57*, 1069–1081.
- Sagiv, L., & Schwartz, S. H. (2000). Value priorities and subjective well-being: Direct relations and congruity effects. *European Journal of Social Psychology*, *30*, 177–198.
- Saraglou, V., Buxant, C., & Tilquin, J. (2008). Positive emotions as leading to religion and spirituality. *Journal of Positive Psychology*, *3*, 165–173.
- Schultz, P. W. (2001). The structure of environmental concern: Concern for self, other people, and the biosphere. *Journal of Environmental Psychology*, *21*, 327–339.
- Scioli, A. (2007). Hope and spirituality in the age of anxiety. In R. J. Estes (Ed.), *Advancing quality of life in a turbulent world* (pp. 135–152). Dordrecht: Springer.
- Seligman, M. E. P. (2002). *Authentic happiness*. New York: Free Press.
- Seligman, M. E. P., Rashid, T., & Parks, A. C. (2006). Positive psychotherapy. *American Psychologist*, *61*, 774–788.
- Shiota, M. N., Keltner, D., & Mossman, A. (2007). The nature of awe: Elicitors, appraisals, and effects on self-concept. *Cognition and Emotion*, *21*, 944–963.
- Snyder, C. R. (2002). Hope theory: Rainbows in the mind. *Psychological Inquiry*, *13*, 249–275.
- Sobel, D. (1998). Beyond ecophobia. *Yes!* Retrieved July 1, 2010, from <http://www.yesmagazine.org/issues/education-for-life/803>
- Sommer, R. (2003). Trees and human identity. In S. Clayton & S. Opatow (Eds.), *Identity and the natural environment: The psychological significance of nature* (pp. 179–204). Cambridge, MA: MIT Press.
- Soulé, M. E. (1993). Biophilia: Unanswered questions. In S. R. Kellert & E. O. Wilson (Eds.), *The biophilia hypothesis* (pp. 441–455). Washington, DC: Island Press.
- Steger, M. F., & Frazier, P. (2005). Meaning in life: One link in the chain from religiousness to well-being. *Journal of Counseling Psychology*, *52*, 574–582.
- Stigsdotter, U. A., & Grahn, P. (2003). Experiencing a garden: A healing garden for people suffering from burnout diseases. *Journal of Therapeutic Horticulture*, *14*, 38–49.
- Storr, A. (1988). *Solitude: A return to the self*. New York: Ballantine Books.
- Sullivan, W. C., Kuo, F. E., & Depooter, S. F. (2004). The fruit of urban nature: Vital neighborhood spaces. *Environment and Behavior*, *36*, 678–700.
- Takano, T., Nakamura, K., & Watanabe, W. (2002). Urban residential environments and senior citizen's longevity in megacity areas: The importance of walkable green spaces. *Journal of Epidemiology and Community Health*, *56*, 913–918.
- Taylor, A. F., Kuo, F., & Sullivan, W. C. (2001). Coping with ADD: The surprising connection to green play settings. *Environment and Behavior*, *33*, 54–77.

- Thoreau, H. D. (1854/1989). *Walden and other writings by Henry David Thoreau*. New York: Bantam Books.
- Todd, D. (2008). *Cascadia-the elusive Utopia: Exploring the spirit of the Pacific Northwest*. Vancouver: Ronsdale Press.
- Ulrich, R. (1993). Biophilia, biophobia, and natural landscapes. In S. Kellert & E. O. Wilson (Eds.), *The biophilia hypothesis* (pp. 73–137). Washington, DC: Island Press.
- Underwood, L. G., & Teresi, J. A. (2002). The daily spiritual experience scale: Development, theoretical description, reliability, exploratory factor analysis, and preliminary construct validity using health-related data. *Annals of Behavioral Medicine, 24*, 22–33.
- Valtchanov, D., & Ellard, C. (2010). Physiological and affective responses to immersion to virtual reality: Effects of nature and urban settings. *Journal of CyberTherapy and Rehabilitation, 3*, 359–373.
- Valtchanov, D., Barton, K. R., & Ellard, C. (2010). Restorative effects of virtual nature settings. *Cyberpsychology, Behavior, and Social Networking, 13*, 503–512.
- Vernon, M. (2008). *Well-being*. Durham: Acumen Publishing.
- Walsh, F. (2009). Human-animal bonds II: The role of pets in family systems and family therapy. *Family Process, 48*, 481–499.
- Waterman, A. S. (2008). Reconsidering happiness: A eudaimonist's perspective. *Journal of Positive Psychology, 3*, 234–252.
- Weinstein, N., Przybylski, A. K., & Ryan, R. M. (2009). Can nature make us more caring? Effects decline time spent in nature of immersion in nature on intrinsic aspirations and generosity. *Personality and Social Psychology Bulletin, 35*, 1315–1329.
- Wesley, M. C., Minatrea, N. B., & Watson, J. C. (2009). Animal-assisted therapy in the treatment of substance dependence. *Anthrozoos, 22*, 137–148.
- Wilson, E. O. (1984). *Biophilia*. Cambridge, MA: Harvard University Press.
- World Health Organization (2009). Retrieved July 20, 2011, from http://www.who.int/gho/urban_health/situation_trends/urban_population_growth_text/en/index.html
- World Health Organization. (2011, July 20). Global Health Observatory (GHO). Retrieved from http://www.who.int/gho/urban_health/situation_trends/urban_population_growth_text/en/index.html
- Young, J., McGown, E., Haas, E., & Yu, K. (2008). *Coyote's guide to connecting with nature: For kids of all ages and their mentors*. Duvall: Wilderness Awareness School.