

education & communication

Tribal Lands Provide Forest Management Laboratory for Mainstream University Students

Serra J. Hoagland, Ronald Miller, Kristen M. Waring, and Orlando Carroll

Northern Arizona University (NAU) faculty and Bureau of Indian Affairs (BIA) foresters initiated a partnership to expose NAU School of Forestry (SoF) graduate students to tribal forest management practices by incorporating field trips to the 1.68-million acre Fort Apache Indian Reservation as part of their silviculture curriculum. Tribal field trips were contrasted and coconvened with field trips to national forests to allow students to gain a unique perspective of the specific differences, challenges, and diversity of management and silvicultural practices ongoing in Indian Country. Field trips were intended to educate students beyond the dominant paradigm of forest management and to consider the broad diversity of management and forest types that exist on tribal lands. This article presents perspectives from the White Mountain Apache Tribe, BIA Fort Apache Agency staff, and faculty and graduate students in the SoF on the value of incorporating tribal lands as part of graduate students' forestry curriculum.

Keywords: Indian forest management, forestry education

Forest science education in the United States focuses on teaching a mixture of both technical and professional skills to students (Sample et al. 2015), often in a traditional classroom or field setting. However, forestry education also has the opportunity to provide experienced-based learning by exposing students to forestry concepts not normally covered in forestry curricula. Exposing university students to Indian forestry practices can provide them with a better understanding of the role that tribal vision and culture plays in guiding forest practices and the overall importance of natural resources to tribal communities.

Indian forestry has a unique mission that has been recognized since the first Chief Forester for the Bureau of Indian Affairs (BIA) formulated the program. J.P. Kinney served from 1910 to 1933 and established

BIA forestry guidelines to ensure that forest management would meet tribal landowner goals and perspectives. Kinney argued that the overall objective of managing Indian forestlands was not the same as the objective for the US Department of Agriculture (USDA) Forest Service (Gomez and Tiller 1990). In more recent years, others have also noted unique forest management practices ongoing throughout tribal forestry programs (Gordon et al. 1993, 2003, 2013, Trosper 2007, Stan et al. 2014), including but not limited to the use of long rotations, active prescribed fire and balancing the triple bottom line of sustainability where social, ecological, and environmental benefits are valued equally.

A foundational understanding of how different entities and cultures view natural resources will help students balance multiple

or conflicting social objectives, which will enable them to sustain forests and other valued natural resources in perpetuity (McIntire-Stennis Strategic Plan 2007). There is also a critical need to increase students' capacity and understanding of the social dynamics of natural resource management. On graduation, forestry students possess enough technical skills and abilities to become professional foresters but often lack the expertise in human dimensions and concepts such as cultural competency and social dynamics (i.e., managing conflict and cross-cultural communication) that is critical for sound forest management (Sample et al. 2015). Forestry education has shown a continuing need for improving Bachelor of Science in Forestry curricula to include human dimensions (Bullard et al. 2014). Thus, producing "society-ready" foresters has been the focus of a revised forestry curriculum that fosters student's people skills (Bullard et al. 2014). Further, forestry curricula for the 21st century are emphasizing human relationships and working with different cultures to increase students' sensitivity and concern for ethical issues (Bullard 2015, Verma et al. 2016).

The large amount of tribal land within Arizona is another critical factor in exposing NAU forestry graduate students to Indian forestry. More than one-quarter (28%) of the state is tribal land; thus, tribes have a

Received September 15, 2016; accepted January 20, 2017; published online February 16, 2017.

Affiliations: Serra J. Hoagland (sjhoagland@fs.fed.us), Laguna Pueblo Tribal Member, USDA Forest Service, Southern Research Station, Flagstaff, AZ. Ronald Miller (ronald.miller@bia.gov), Bureau of Indian Affairs Fort Apache Agency. Kristen M. Waring (kristen.waring@nau.edu), Northern Arizona University, Orlando Carroll (orlando.carroll@bia.gov), Bureau of Indian Affairs Fort Apache Agency (White Mountain Apache Tribal Member).

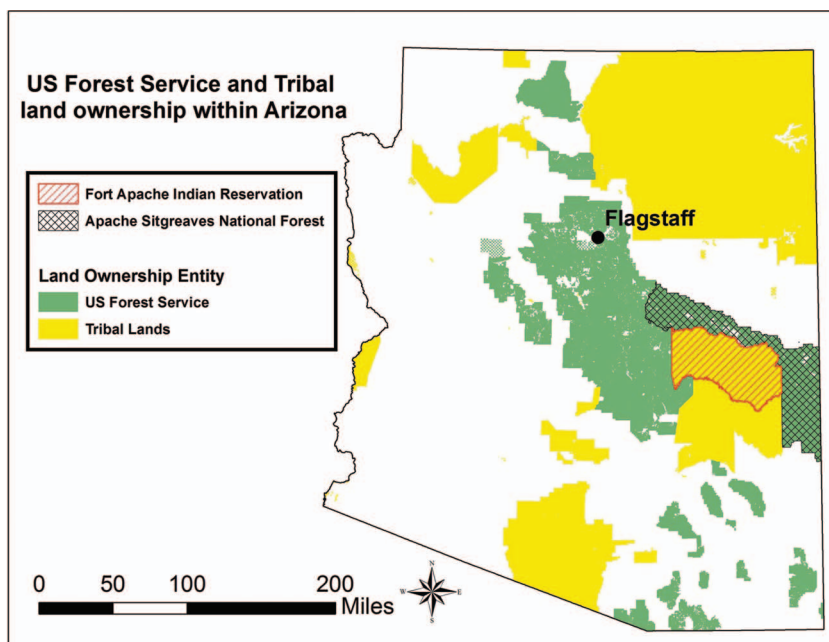


Figure 1. Fort Apache Indian Reservation of the White Mountain Apache Tribe located in central eastern Arizona, which shares northern and eastern borders with the Apache-Sitgreaves National Forest. Note the proximity to Northern Arizona University in Flagstaff and the size and distribution of tribal lands and National Forests throughout the state.

large influence on land management within Arizona. In comparison, the USDA Forest Service manages 15% of land within the state (Figure 1). Tribes, due in part to their sovereign status, have the ability to proactively manage their lands (Gordon et al. 2013) and can serve as outstanding laboratories for student engagement. Further, forestry faculty are particularly interested in exposing students to the diversity of forest management practices occurring across land ownerships.

Northern Arizona University (NAU) offers degrees in forestry at the Bachelor's, Master's, and Doctorate levels. Other experience-based learning curricula have been developed and successfully implemented at the NAU School of Forestry (SoF) for education in concepts of ecological restoration using hands-on examples from global perspectives to develop respect for alternative viewpoints (Covington et al. 2000). Further, NAU is currently ranked 8th in the nation for Native American student population (Carnegie Communications 2016) and was noted as graduating the highest percentage (16%) of American Indian forestry professionals during a survey of tribal and BIA foresters (Gordon et al. 2013, Hoagland and Gervais 2014).

The forestry profession, among other natural resource fields, is beginning to understand the value of human diversity and

increased representation of American Indian professionals to support Indian self-determination (Public Law 101-630 1990). Field trips to tribal forests may help recruit and retain tribal students in natural resources. Therefore, NAU with its close proximity to several large tribal communities with timber-based economies, high Native American student population, and a reputation for graduating Native American foresters may be uniquely posed to address workforce diversity issues within the forestry profession.

Background

Beginning in 2008, a relationship developed between faculty in the NAU SoF and foresters working on the Fort Apache Indian Reservation. The relationship has

served teaching, research, and service goals over the years. An annual field trip, showcasing forest management in east-central Arizona, began in 2009. Our objectives for this article are the following: to assess the forestry field trip (hereafter field program), including benefits to the parties involved (faculty, students, and professional foresters); to provide a framework for developing similar educational programs; and to identify ways for improving on the current program.

The Field Program

The field program has involved two graduate-level courses taught during the spring semester at NAU: a course designed to teach graduate students without a background in forestry the basics of silviculture, and an advanced course in silviculture and stand dynamics. The field program generally includes visits to the Fort Apache Indian Reservation and the adjacent Apache-Sitgreaves National Forest to present students with multiple approaches to forest management. Initial goals for the tribal forestry component included the following: a general introduction to tribal governance; exposure to the 1990 National Indian Forest Resource Management Act (Public Law 101-630 1990); and culturally based values of multiple forest resources. Field program goals for the National Forest component varied each year, but common themes were forest treatment implementation, policy adherence (e.g., Forest Plan and National Forest Management Act) and wood utilization.

The Field Program Setting: The White Mountains and Fort Apache Indian Reservation

Location and Forests

The Fort Apache Indian Reservation (hereafter the reservation) is the ancestral

Management and Policy Implications

Recent forestry graduates will be faced by complex ecological issues in the 21st century where balancing social, ecological, and economic needs will be a growing challenge. Further, current literature suggests that there is a need for developing forestry students' nontechnical skills, such as human dimensions and professional interactions. This article presents an evaluation of a field program that attempts to address these needs by involving field trips to tribal lands to showcase the differences in forest practices on tribal and nontribal lands. This experience-based learning fostered students' affective skills and broadened their perspectives regarding the cultural values that forests provide to Indian people. Perspectives from faculty, students, and tribal natural resource professionals indicate high field program success, and the framework could provide other institutions with a model for developing similar curricular activities for student engagement.

homeland of the White Mountain Apache Tribe and encompasses 1.68 million acres in the mountainous forested region of east-central Arizona (Figure 1) (Tiller 2005). The reservation land base extends approximately 75 miles east to west and 45 miles north to south. The geography of the reservation slopes predominately to the south and southwest. Elevations range from 11,420 ft on the top of Mount Baldy to 2,640 ft where the Salt River leaves the reservation at the southwest corner (Fuller and Miller 2010). Most of the reservation is in the transition zone below the Colorado Plateau Province and above the Basin and Range Province. The reservation contains approximately 1.56 million acres of forest divided between timberland and woodland resources (US Department of Interior Bureau of Indian Affairs 2015). The neighboring Apache-Sitgreaves National Forests encompass approximately 2 million acres, of which almost 700,000 acres burned in either the 2002 Rodeo-Chediski or 2011 Wallow fires (USDA Forest Service 2015). The White Mountains region is a biologically diverse area within Arizona, encompassing an array of flora and fauna. Timberland on the reservation accounts for 797,080 acres, whereas woodlands encompass 763,221 acres (US Department of Interior Bureau of Indian Affairs 2015). The primary timber species in the region are ponderosa pine (*Pinus ponderosa*), Douglas-fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), Engelmann spruce (*Picea engelmannii*), and southwestern white pine (*Pinus strobiformis*) (O'Brien 2002). Quaking aspen (*Populus tremuloides*), blue spruce (*Picea pungens*), corkbark fir (*Abies bifolia*), and Chihuahuan pine (*Pinus chihuahuensis*) also are abundant but are not primarily managed for timber production on the reservation (Fuller and Miller 2010). Woodland species include Rocky Mountain juniper (*Juniperus scopulorum*), alligator juniper (*Juniperus deppeana*), one-seed juniper (*Juniperus monosperma*), Utah juniper (*Juniperus osteosperma*), piñon pine (*Pinus edulis*), Gambel oak (*Quercus gambelii*), Arizona white oak (*Quercus arizonica*), and Emory oak (*Quercus emoryi*) (O'Brien 2002). Other species, such as riparian trees, are found throughout these forests as a minor component that are very important to the Tribe but are generally left undisturbed to protect the important rivers, streams, creeks, and springs around the reservation.

Land Management

As described in the 2005 Forest Management Plan,

The lands comprising the Fort Apache Indian Reservation have been managed according to sound practices that conserved the natural resources while meeting the needs of the Apache people. The White Mountain Apache Tribe's connection with the land has endured in the face of many changes over the centuries. The Tribe has vigorously maintained its sovereignty over its lands to ensure that this portion of its ancestral homeland will always be beautiful and productive. The Tribe has consistently rejected development proposals that were not compatible with its concepts for the land and future generations. The Apache philosophy of living in balance with the natural world permeates all aspects of the Tribe's resource management... (Williams et al. 2005, p. 89).

It is into this land of rich cultural and biotic diversity that the students are invited to learn and ask questions from those that practice the science and art of professional forest management on the reservation.

Benefits of the Field Program

Faculty Perspectives

Forestry undergraduate education and curricula have always included hands-on field activities as a focal point for student learning and success, even though the degree to which practical skills is emphasized has been contentious (Miller and Lewis 1999). In recent years, such activities that fall under the realm of experiential learning, activities in which the students have direct contact with the concepts being studied (Keeton and Tate 1978, as cited in Millenbah and Millspaugh 2003, Hix 2015), have been recognized as fundamental to student learning (Lewis and Williams 1994, Millenbah and Millspaugh 2003). Placing students in novel classroom environments, including outdoor field courses, can lead to better retention of material (Easton and Gilburn 2012). Graduate education has been criticized as being too disciplinary (Innes 2005); the field program at NAU broadens the education of the students enrolled by exposing them to different land management perspectives, the role of human dimensions in natural resource management, and the diversity of forest practices within the state of Arizona. Although difficult to assess, students also tend to gain affective skills (learning outcomes that are more related to personal development, such as attitude or behavioral changes) during field courses (Cov-

ington et al. 2000, Easton and Gilburn 2012). Our field program lends itself to building interpersonal communication (both between students and between students and field program hosts), personal development, and emotional intelligence. From the teaching standpoint, a field program that reinforces cognitive classroom concepts while also building affective skills is a win-win situation.

Native Graduate Student Perspective

Visiting tribal forests and contrasting the experience with visits to the adjacent National Forest gives students a solid impression of on-the-ground forestry, the range of employment opportunities that are available on graduation, and the differences in challenges and opportunities that face each landowner. Often in the classroom setting, lectures lack real world components, and student-centered learning approaches can be more effective (Nilson 2010). During the field program, students are able to ask questions, understand the complexity of various prescriptions and see the importance of establishing goals, objectives, and appropriate evaluation criteria for forest management. The latter concepts are fundamental in silviculture and stand dynamics and were solidified by experiential learning. Students also learned firsthand about the importance of planning, stakeholder input, collaboration, and vegetation monitoring. Interestingly, students expressed interest in obtaining jobs in Indian Country on graduation. In addition, it was clear to student participants that there were differences in the challenges that faced each landowner. For example, Forest Service managers face more challenges related to extensive decision time frames and other logistical hurdles related to management of resources on National Forests. Conversely, tribal land managers were hampered by low budgets and staff capacity to manage the variety of tasks associated with forest planning, documentation, and implementation (Gordon et al. 2013). It appeared that tribal land managers had greater flexibility with their management opportunities and fundamentally had the moral and legal obligation to engage the Tribal Council and the tribal public regarding forest management. Students were also introduced to the federal-tribal consultation processes and federal trust responsibility and its relation to tribal government establishment

from managers who work regularly on tribal sovereignty issues. Although these are topics not generally discussed in forestry education, they are critical for graduates who enter any federal career or employment on tribal lands. This was the first exposure to these concepts for most students.

Unfortunately, societal stigmas and myths that may reflect a negative view of Native Americans still linger within the broader public. Yet those stereotypes quickly diminish when one observes experts in the forestry profession informally complementing and praising tribal land management. As stated by one Native student involved in the field program: "I felt a sense of ownership and pride when tribal forest practices were accepted and validated by mainstream university forestry faculty." The field trips provide positive learning experiences that are vital to graduate student development. The direct communication and interaction with foresters results in a better understanding about the nuances associated with forest management (i.e., differing human values, budgets, forest health risks, and working with tribal councils).

Professional Foresters' Perspectives

Tribal forest management is strongly guided by tribal goals and objectives that may or may not mirror those for adjoining lands. Students are exposed to Apache tribal land ethics and values along with current forest practices and silvicultural lessons when they visit the reservation. Similar to, but predating, Aldo Leopold's land ethic, Apache cultural knowledge and traditions clearly influence forest practices on the reservation. This can be seen throughout the BIA Forest Management Plan, Inventory Analysis, Environmental Assessments, and other documents. It is also clear by observing on-the-ground management practices.

The Apache people and the land are inextricably linked, and these connections are used to guide forest management planning and direction. In fact, the Apache word for "land" (*shi nii*) is literally the same word as the Apache word for "the mind." An understanding of cultural connections to natural resources in Indian Country is just as important as an understanding of the silvics and ecology of the resources being managed (Miller 1997). Often the cultural value of the resource can far surpass its nominal commercial value (Miller and Downes 1998). This is

validated by tangible and intangible forest values that are a vital part of ceremonies.

Speaking before an audience at the Intertribal Timber Symposium, Robert Lacapa, then a Supervisory Forester and now the Forest Manager for the BIA Fort Apache Agency, explained the strong tie that tribal members have with the land and natural resources that are so abundant on the reservation: "Apaches have a close spiritual connection with the land, a high respect for their elders, and a strong desire to share what they have today with future generations. As with many Native American cultures, Apaches have an evolving social structure with a strong desire to preserve their culture, language and tradition" (Lacapa 1998, p. 39).

Forest practices on the reservation must follow all National Environmental Policy Act (NEPA) requirements, receive feedback from tribal resource managers, and go through the Tribal Historic Preservation Office and the Cultural Advisory Board. A final tribal review process occurs before the entire project goes before the Tribal Council for review and approval. This process ensures resource sustainability and tribal participation. The intention of the program is that NAU SoF students recognize and appreciate the differences and approaches to forest management that they see on and off the reservation and that they apply the positive aspects experienced during the field program in their future forestry careers.

Framework

Since inception, a total of 57 students or approximately 48% of the total graduate student population within the SoF (Karen Blalock, Northern Arizona University SoF, pers. comm., Feb. 16, 2016) have participated in the field program over a 6-year period (2009–2015). Five students have attended the field lab for 2 consecutive years; all others have attended just once. Eight tribal and BIA presenters, five of whom are certified silviculturists and four of whom are tribal members have interacted with students during that time along with multiple Forest Service employees. Some of these interactions have led to graduate student research projects that focused on tribally relevant research questions (Looney 2012, Goodrich 2015). Other interactions have led to various job and internship opportunities.

Participants in the field program were enrolled in either a basic or advanced grad-

uate silviculture course at NAU SoF; participation in the field program was required in all years except one when it was optional (and most students chose to attend). Graduate students at NAU SoF are required to fulfill up to 15 units of forestry coursework if they do not have an undergraduate degree in forestry. The two graduate silviculture courses meet these requirements, but students often take both. The field program format generally requires one overnight camping trip, with one field day devoted to tribal forestry and one day spent on the National Forest. The agenda varies on the National Forest depending on staff availability but previous labs have included active harvesting operations, pellet mill operations, postfire regeneration, mixed-conifer silviculture and stand dynamics, urban-wildland interface issues, and recreation and forest health concerns.

The field program on the reservation has consistently started with an overview of forest practices either in a classroom setting or in a natural setting like a local cattle camp (Figure 2). During this portion of the program, students are introduced to broad tribal goals and objectives prevalent on the reservation and to cultural and historical background information to explain how forest management practices evolved over the last century. Tribal and forest maps are presented to familiarize students with the reservation setting through PowerPoint presentations to further clarify topics. Because the field learning is so important, this first portion is usually limited to 1 hour.

Once in the field, site visits have included silvicultural treatment areas associated with old-growth ponderosa pine stands, recreational areas (Figure 3), stocking study sites, and regeneration versus density discussions in areas where the forest has been thinned to prescribed basal area levels. Silviculture within the context of tribal goals and objectives is part of the core discussion each year that allows students to see on-the-ground applications and implementation of forest prescriptions. Managing for values not necessarily taught in mainstream university forestry curricula is important to help students "think outside the box." As an example, managing piñon trees to increase nut production or ensuring that Emory oak remain and thrive on-site for later acorn gathering by tribal members might be a silvicultural objective for a particular stand.



Figure 2. Forestry graduate students are orientated to the landscape at the beginning of each field visit. Students listened to the different management needs for different forest types found on the reservation. (Photo credit: R. Miller [2009]).



Figure 3. The outdoor setting gives students a better grasp of how tribal goals and objectives and good forest management intersect on the reservation. (Photo credit: O. Carroll [2009]).

Suggestions for Improvement

Students generally reported (through informal conversations) that the field pro-

gram was an enjoyable learning experience and specifically appreciated the inclusion of tribal forestry. Several logistical improve-

ments have been made over the years to address concerns about the program, such as regular class time “compensation” (i.e., reg-

ular class cancellation) for time spent on the overnight trip. However, improvements could also be made to the curriculum that may lead to better retention and in-depth discussion.

- Many students are surprised by the differences between the BIA and Forest Service, which could be highlighted through background readings or a 1-page handout directly comparing the two agencies.

- Generally, students have not been required to actively engage field program content after the trip due to constraints and limitations on other required course material. However, learning might be enhanced by a full class session devoted to discussing the field program or an essay response to differences between Forest Service and tribal forest management.

- Undergraduate students currently do not participate in a similar field lab. More students, including a larger number of Native American students, could be reached by expanding the field lab to include undergraduate forestry majors at NAU. Native students would also have more opportunities to connect with Native mentors within their profession, which is an invaluable recruitment and retention tool for a student demographic that has historically low graduation rates (Wright 1991).

- Involving or inviting members of the Tribal Council to the student field trips would solidify the cultural aspects of managing tribal forests. Students could be directly exposed to traditional practices, when or if it is appropriate to share, including nontimber forest products that are used by tribal members. For instance, periodically, stand-level prescriptions are written to address the importance of maintaining culturally significant nontimber species such as Gambel oak, Arizona white oak, Emory oak, and alligator juniper. Previous visits have shown how history and tribal views led to different silvicultural approaches emphasizing uneven-aged management with a strong emphasis on cultural and special uses of the forest resources. Visiting stands where the cultural values supersede other goals is a unique way to educate students about the importance of integrating societal values.

Conclusion

Our evaluation of this program indicates that students were exposed to the unique forest management practices ongoing on the Fort Apache Indian Reservation

and corresponding practices on National Forests. The field program facilitated students' sensitivity to alternative viewpoints such as culturally valuable nontimber forest resources and indigenous perspectives toward resource management. Students were exposed to sustained-yield timber harvest, federal-tribal trust relationships, and multiple use concepts. We suggest that, where applicable, forestry institutions engage with local tribal entities to create collaborations and partnerships. This can accomplish workforce development goals and objectives similar to those listed in the McIntire-Stennis Strategic Plan (2007) to develop students' affective skills and instill a greater appreciation and ability to communicate the value of forestry resources for diverse human societies.

Supplemental Podcast

This article includes a podcast interview. Visit the online version of this article to listen to the podcast.

Literature Cited

BULLARD, S.H. 2015. Forestry curricula for the 21st century—Maintaining rigor, communicating relevance, building relationships. *J. For.* 113(6):552–556. doi:10.5849/jof.15-021.

BULLARD, S.H., P.S. WILLIAMS, T. COBLE, D.W. COBLE, R. DARVILLE, AND L. ROGERS. 2014. Producing “society-ready” foresters: A research-based process to revise the Bachelor of Science in forestry curriculum at Stephen F. Austin State University. *J. For.* 112(4):354–360. doi:10.5849/jof.13-098.

CARNEGIE COMMUNICATIONS. 2016. *Colleges with the largest enrollment of American Indian or Alaskan Native students*. Available online at www.collegexpress.com/lists/list/colleges-with-the-largest-enrollment-of-american-indian-or-alaskan-native-students/372/; last accessed Feb. 11, 2016.

COVINGTON, W.W., P.Z. FULÉ, T.M. ALCOZE, AND R.K. VANCE. 2000. Learning by doing. *J. For.* 98(10):30–34. <http://www.ingentaconnect.com/contentone/saf/jof/2000/00000098/00000010/art00006>.

EASTON, E., AND A. GILBURN. 2012. The field course effect: Gains in cognitive learning in undergraduate biology students following a field course. *J. Biol. Educ.* 46(1):29–35. doi:10.1080/00219266.2011.568063.

FULLER, L.R., AND R.K. MILLER. 2010. *Forest inventory analysis*. Fort Apache Indian Reservation, Whiteriver, AZ; Fort Apache Agency, Whiteriver, AZ. 219 p.

GOMEZ, A.R., AND V.E. TILLER. 1990. *Fort Apache forestry: A history of timber management and forest protection on the Fort Apache Indian Reservation 1870–1985*. Tiller Research, Inc. Albuquerque, NM. 212 p.

GOODRICH, A.E. 2015. *Pinus strobusiformis in southwestern mixed conifer forests threatened by a non-native forest pathogen: Geographic and en-*

vironmental variations in regeneration success and adaptive traits. PhD dissertation. Northern Arizona University, Flagstaff, AZ. 195 p.

GORDON, J., J. BERRY, M. FERRUCCI, J. FRANKLIN, N. JOHNSON, C. MUKUMOTO, D. PATTON, AND J. SESSIONS. 2003. *An assessment of Indian forests and forest management in the United States*. Intertribal Timber Council, Portland, OR. 134 p.

GORDON, J., J. FRANKLIN, K.N. JOHNSON, D. PATTON, J. SEDELL, J. SESSIONS, AND E. WILLISTON. 1993. *An assessment of Indian forests and forest management in the United States*. Intertribal Timber Council, Portland, OR. 174 p.

GORDON, J., J. SESSIONS, J. BAILEY, D. CLEAVES, V. CORRAO, A. LEIGHTON, L. MASON, M. RASMUSSEN, H. SALWASSER, AND M. STERNER. 2013. *Assessment of Indian forests and forest management in the United States*. Available online at www.itcnet.org/issues_projects/issues_2/forest_management/assessment.html; last accessed Oct. 1, 2014.

HOAGLAND, S., AND B. GERVAIS. 2014. Investing in the next generation of Indian foresters. *Evergreen Mag.* Spring 2014:38–39. Available online at https://forestthreats.org/products/publications/EvergreenSpring2014InvestingintheNextGenerationofIndianForesters.pdf/at_download/file.

HIX, D.M. 2015. Providing the essential foundation through an experiential learning approach: An intensive field course on forest ecosystems for undergraduate students. *J. For.* 113(5):484–489. doi:10.5849/jof.14-065.

INNES, J.L. 2005. Multidisciplinarity, interdisciplinarity and training in forestry and forest research. *For. Chron.* 81(3):324–329. doi:10.5558/tfc81324-3.

KEETON, M.T., AND P.J. TATE. 1978. The boom in experiential learning. P. 1–8 in *Learning by experience: What, why, how*, Keeton, M.T. and P.J. Tate (eds.). New Directions for Experiential Learning, No. 1. Jossey-Bass, San Francisco, CA.

LACAPA, R. 1998. White Mountain Apache tribal presentation. P. 38–40 in *Proc. of the Twenty-second annual national Indian timber symposium, evolving partnerships in trust management, 1998 June 22–25, Hon-Dah, AZ*. Intertribal Timber Council, Portland OR.

LEWIS, J.G., AND C.J. WILLIAMS. 1994. Experiential learning: Past and present. *New Dir. Adult Contin. Educ.* 62:5–16. doi:10.1002/ace.36719946203.

LOONEY, C.E. 2012. *Cronartium ribicola effects on white pine growth, vigor and survival in Arizona and New Mexico*. MSc thesis. Northern Arizona University, Flagstaff, AZ. 137 p.

MCINTIRE-STENNIS STRATEGIC PLAN. 2007. National Association of University Forest Resource Programs. Available online at www.naufp.org/pdf/m-s%20plan.pdf; last accessed on July 4, 2016.

MILLENBACH, K.F., AND J.J. MILLSPAUGH. 2003. Using experiential learning in wildlife courses to improve retention, problem solving, and decision-making. *Wildl. Soc. Bull.* 31(1):127–137.

- MILLER, C., AND J.G. LEWIS. 1999. A contested past: Forestry education in the United States, 1898–1998. *J. For.* 97(9):38–43. <http://www.ingentaconnect.com/contentone/saf/jof/1999/00000097/00000009/art00011>.
- MILLER, R.K. 1997. Southwest Woodlands: Cultural uses of the “forgotten forest”. *J. For.* 95(11): 24–28. <http://www.ingentaconnect.com/contentone/saf/jof/1997/00000095/00000011/art00010>.
- MILLER, R., AND B. DOWNES. 1998. Long overlooked Indian woodlands prized for cultural and spiritual values. *Evergreen* 9(19):40–41. Available online at http://wp_medialib.s3.amazonaws.com/wp-content/uploads/2014/10/EG_June1998.pdf.
- NILSON, L.B. 2010. *Teaching at its best: A research-based resource for college instructors*, 3rd ed. Jossey-Bass San Francisco, CA. 400 p.
- O'BRIEN, R.A. 2002. *Arizona's forest resources, 1999*. USDA Forest Service, Resour. Bull. RMRS-RB-2, Rocky Mountain Research Station, Ogden, UT. 116 p. <https://www.treesearch.fs.fed.us/pubs/6046>.
- PUBLIC LAW 101-630 1990. *National Indian Forest Resource Management Act*. Available online at: www.fs.fed.us/spf/tribalrelations/documents/policy/statutes/PL101-630NIFRMA.pdf; last accessed on Feb. 11, 2016.
- SAMPLE, V.A., R.P. BIXLER, M.H. McDONOUGH, S.H. BULLARD, AND M.M. SNECKUS. 2015. The promise and performance of forestry education in the United States: Results of a survey of forestry employers, graduates, and educators. *J. For.* 113(6):528–537. doi:10.5849/jof.14-122.
- STAN, A.B., P.Z. FULÉ, K.B. IRELAND, AND J.S. SANDERLIN. 2014. Modern fire regime resembles historical fire regime in a ponderosa pine forest on Native American lands. *Int. J. Wildl. Fire* 23(5):686–697. doi:10.1071/WF13089.
- TILLER, V.E.V. 2005. *Tiller's Guide to Indian Country*. BowArrow Publishing Co. Albuquerque, NM. 888 p.
- TROSPER, R. 2007. Indigenous influence on forest management on the Menominee Indian Reservation. *For. Ecol. Manage.* 249(1):134–139. doi:10.1016/j.foreco.2007.04.037.
- US DEPARTMENT OF AGRICULTURE FOREST SERVICE. 2015. *The rising cost of wildfire operations: Effects on the Forest Service's non-fire work*. Available online at: www.fs.fed.us/sites/default/files/2015-Fire-Budget-Report.pdf; last accessed on Feb 16, 2016.
- US Department of Interior Bureau of Indian Affairs. 2015. *Existing Vegetation Type Map*. Fort Apache Agency, Whiteriver, AZ.
- VERMA, P., K. VAUGHAN, K. MARTIN, E. PULITANO, J. GARRETT, AND D.D. PIIRTO. 2016. Integrating Indigenous Knowledge and Western Science into forestry, natural resources, and environmental programs. *J. For.* 114(6):648–655. doi:10.5849/jof.15-090.
- WILLIAMS, M., R.K. MILLER, AND J.A. DRURY. 2005. *Forest management plan*. Fort Apache Indian Reservation, Whiteriver, AZ; Fort Apache Agency, Whiteriver, AZ. 362 p.
- WRIGHT, B. 1991. American Indian and Alaska Native higher education: Toward a new century of academic achievement and cultural integrity. Available online at files.eric.ed.gov/fulltext/ED343771.pdf; last accessed on Feb 16, 2016.