

finding on a petition to add *Taxus brevifolia* (Pacific yew) to the List of Endangered and Threatened Plants. The Service finds that the petition has not presented substantial information indicating that the requested action may be warranted.

DATES: The finding announced in this notice was made on January 7, 1991. Comments and materials related to this petition finding may be submitted to the Field Supervisor at the address listed below until further notice.

ADDRESSES: Information, comments, or questions concerning the Pacific yew petition may be submitted to the Field Supervisor, Sacramento Field Station, U.S. Fish and Wildlife Service, 2800 Cottage Way, room E-1803, Sacramento, California 95825-1846. The petition, finding, supporting data, and comments are available for public inspection, by appointment, during normal business hours at the above address.

FOR FURTHER INFORMATION CONTACT: Jim Bartel at the above Sacramento, California, Field Station address (telephone 916/978-4868 or FTS 460-4868).

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(A) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1544) (Act), requires that the Service make a finding on whether a petition to list, delist, or reclassify a species presents substantial scientific or commercial information to indicate that the petitioned action may be warranted. To the maximum extent practicable, this finding is to be made within 90 days of the receipt of the petition, and the finding is to be published promptly in the *Federal Register*.

On September 19, 1990, the Service received a petition dated September 19, 1990 from Mr. Bruce S. Manheim, Jr., of the Environmental Defense Fund; Dr. Elliott A. Norse of the Center for Marine Conservation; Dr. William P. McGuire; and Dr. Susan B. Horwitz; Mr. John M. Fitzgerald of the Defenders of Wildlife; Mr. Douglas P. Norlen of the Friends of the Ancient Forest; Mr. Jim Waltman of the National Audubon Society; Mr. Wm. Robert Irvin of the National Wildlife Federation; Dr. Faith T. Campbell of the Natural Resources Defense Council; Mr. James Monteith of the Oregon Natural Resources Council; and Mr. George T. Frampton, Jr. of the The Wilderness Society. The petition requested that the Service designate the Pacific yew as a threatened species pursuant to the Act.

This finding is based on numerous published and unpublished studies and

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; Notice of 90-Day Finding on Petition To List *Taxus Brevifolia* (Pacific Yew) as Threatened

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of petition finding.

SUMMARY: The U.S. Fish and Wildlife Service (Service) announces a 90-day

reports, agency documents, literature syntheses, and field sighting records. In addition, staff conducted interviews with botanists, foresters, and other people familiar with the yew. All documents and phone conversation records on which this finding is based are on file in the Sacramento Field Station.

The petitioners stated that though the Pacific yew occurs over a large part of western North America, the species is rare throughout its range, occurring more frequently in old-growth forests than in mature or young stands. They contend that the species is seriously depleted in comparison to its historical distribution. The petition stated that the yew is vulnerable to logging, and is in fact more abundant on public land where more old-growth remains compared to private land. The petition also stated that the species' status on Forest Service lands is precarious because of scheduled logging activities, that the yew is at risk on the Nezperce National Forest in Idaho where logging has reduced yew habitat by at least 10,000 acres, and that these stands are threatened by browsing ungulates and fire. Finally, the petitioners stated that the yew should be afforded protection because it is the major source of taxol, which is in critically short supply, and that the Endangered Species Act would prohibit unauthorized collection of yew bark and could provide for other conservation measures.

Though Pacific yew typically is a minor forest component (Bolsinger and Jaramillo *in press*), this role is not universal. For example, Bolsinger and Jaramillo (*in press*) reported that the species is a dominant within 40,000 acres within the South Fork of the Clearwater River basin in Idaho. In addition, they noted that the tree is fairly common in the Cascade Range and abundant in some sites in southern Oregon. The yew extends over 18 degrees of latitude and two climatic zones, Pacific maritime and the Northern Rockies (Bolsinger, *pers. comm.*, U.S. Forest Service, September 30, 1990). Much of the range of the yew has not been subject to statistical inventories, especially the northern portion (i.e., Alaska and British Columbia). Nonetheless, based on stand information together with satellite imagery, the U.S. Forest Service (1990) estimated that 130,000,000 yew trees occur on 1,778,000 acres of National Forest lands in the Washington and Oregon Cascades, and Oregon Coast Range. According to the Bureau of Land Management (BLM), the species occurs on an additional estimated 734,000 acres

of public and private land in California, Idaho, Oregon, and Washington. Though likely severely underestimated due to lack of statistical surveys, Pacific yew occurs on at least 2.5 million acres. Thus, the yew is not rare, but merely often subdominant throughout millions of acres of forested habitat.

Spies (*in press*) noted that Pacific yew was one of four taxa that occurred with greater frequency and abundance in old-growth, and Jimerson and Scher (*submitted for publication*) stated that yew may be a useful indicator of old-growth. According to BLM inventory data, the yew occurred in 10 percent or more of the plots located in stands older than 200 years. Nonetheless, the yew was recorded from all age classes, including nearly 5 percent of the BLM sampled stands 50 years or less in age. Bolsinger (*pers. comm.*, 1988) estimated that 60 percent of the yew stands are less than 100 years, and 40 percent of these are less than 50 years. In a representative plot within a Pacific yew stand in northern Idaho, more than 80 percent of the yews were 80 years or younger (Crawford 1983). Because a substantial portion, if not most, of the remaining yew trees likely occur in the more abundant young/seral forests, the greater densities and frequencies of yew in old-growth stands do not substantiate the assertion by the petition that the long-term survival of yew is "ultimately linked to ancient forests."

Spies (*in press*) reported that old-growth species, like *Taxus*, would suffer the greatest decline in regional populations if most of the current old-growth is clearcut and converted to short rotational plantations. However, he noted that conditions favoring the yew and other old-growth species can be found in younger stands. In fact, much of the yew occurs in young and maturing stands and, absent fire (especially broadcast burning), such stands likely will be subject to continual colonization by the yew; the seeds of which are brought into areas by foraging wildlife (Bolsinger and Jaramillo *in press*). Spies stated that many forest species suffer declines after clearcutting and site preparation. The techniques used to reforest clearcuts will determine to what degree the Pacific yew reestablishes its former abundance on these sites. Spies concluded that maintenance of old-growth species in managed stands and landscapes is good, but that additional data are needed on the autecology of such species.

Jimerson and Scher (*submitted for publication*) noted 11 major determinants of Pacific yew distribution. Although old stand age was listed first,

this factor is not the major determinant. Instead, proximity to water, vegetative cover, slope position, and elevation are major determinants of yew distribution in northwestern California (Scher and Jimerson 1988). Scher and Schwarzhild (1989) noted the affinity of yew for moist sites. Stand age was mentioned by Scher and Jimerson (1988) as one of three related factors influencing distribution of the species.

Distributional data for the Pacific yew prior to modern settlement (mid-1880s) of the Pacific Coast does not exist. As a result, comparisons of the present and historical ranges of the Pacific yew are largely based on conjecture or inferred from chronosequence studies. Nonetheless, Crawford (*pers. comm.*, University of Idaho, July 17, 1990) concluded that the species' native range has decreased over the last approximately 100 years as a result of development and land clearing in the lowlands and to a lesser degree in the mountains. However, he also noted that the simultaneous reduction in fire frequency likely increased the size of local populations. In addition, Gruell (1983) concluded that climax communities and their associates, like the yew, are more common in the Northern Rockies today than during the period of 1870 to 1940. No data exists to show that any historical reduction in yew abundance has occurred.

The petition stated that the Pacific yew is vulnerable to logging and listed several factors to support this claim. The petition noted that the thin-barked Pacific yew is susceptible to fire and heat. Though this observation has been made by several researchers (Stickney 1980, DeByle 1981, Scher and Jimerson 1988), the long-term effect of this susceptibility to fire is unknown given that the Pacific yew can stump sprout after low-intensity fires. Many species of conifers are typically consumed by fire and, yet, are not threatened by the failure of individual trees to survive a fire. Thus, the significance of this observation in relation to the yew is not well understood.

The petition noted that yew foliage often dies following overstory removal because of increased insolation and greater exposure to frost. Though the foliage of released trees "often dies," "released trees can adapt eventually to unshaded conditions through changes in leaf morphology and twig distribution" (Minore *et al.* 1988). According to Crawford (1983), 78 percent of understory yews survived overstory removal in an experiment in Idaho. Graham and Jones (1985) concluded that the "yew can adapt to high light

intensities." Arthur Zack (pers. comm., U.S. Forest Service, November 30, 1990), noted that yews left within clearcuts in Idaho "appeared to be growing quite well in the openings created by canopy removal." Crawford (1983) concluded that "yew will survive overstory removal and contribute to the development of the next yew stand." As a result, overstory removal leading to increased insolation and greater exposure to frost likely only effects minor or temporary adverse impacts to yew populations.

Scher and Jimerson (1988) noted that the survival and germination of seeds are influenced by "maximum temperature and time of exposure." They also stated that "seedlings are frequently killed at soil level from overheating of the soil surface." However, these remarks refer to conifers and other plants in general, not the yew specifically. Spies (pers. comm., U.S. Forest Service, November 26, 1990) reported densities of 15.4 to 50.8 seedlings per hectare in the Cascades, and Zack (pers. comm., November 30, 1990) noted yew seedlings on sites that were clearcut and burned in Idaho.

Dietrich (1990) noted that browsing wildlife can decrease yew vegetation, while Minore *et al.* (1988) stated yew "growth can be severely affected." Bolsinger and Jaramillo (*in press*) also stated that yew is heavily browsed in some portions of its range. However, none of these researchers or other studies concluded that such browsing actually threatens the species or results in significant mortality. Given the use of *Taxus* in topiary, continued browsing likely only suppresses individual plants until they grow beyond the reach of animals (U.S. Forest Service 1990, cf. Crawford 1983).

The petition stated that the slow-growing Pacific yew will not reach maturity in tree plantations during the typical 50-80 year rotation. However, modern silviculture is less than one cycle old and typical rotations often extend to 120 years. In addition, no experimental data exist to show that silvicultural practices threaten maturing individuals of the species. According to BLM data, 4.8 percent of the sampled plots within 0 to 50 year old stands harbored yew. While yew occurred in 11.3 percent of the BLM plots within stands over 210 years in age, most (i.e., about 55 percent) of the BLM sample plots with yew were recorded from 0 to 50 year old stands. Although this study may have oversampled within younger stands, the precise effect of timber harvest on yew is largely based on conjecture or inferred from

chronosequence studies absent pre-harvest data. Clearly, no experimental study has been undertaken to determine the long-term effect of current logging practices and modern silvicultural techniques on the Pacific yew.

In an abstract of a paper he gave at a workshop on taxol and *Taxus*, Bolsinger noted that the yew averaged 18 trees per acre on private land compared to 36 trees per acre on BLM land. In addition, he stated that "stands 100 years or older occupied 41 percent of BLM land, and 14 percent of non-Federal." The source of this information or location for these data is not clear in the Bolsinger abstract. Regardless, as discussed above, Pacific yew does occur in greater densities in old-growth stands. Thus, these statements merely reaffirm that most old-growth and the associated denser stands of yew remain on Federal lands. Whether this observation confirms that logging on private land has effected and will continue to effect a decline in the yew is open to question. According to BLM data on a state-by-state basis, little difference exists between public and private land regarding the percent of acreage with yew. For example, BLM estimated that 4.0 percent of their timberland contained yew versus 3.7 percent on private land in Oregon. In California, BLM estimated that 0.9 percent of the timberland not owned by the Federal government harbored yew compared to a trace from national forest lands. Similar differences were reported from Idaho, Montana, and Washington. To reiterate, no experimental study has been undertaken to determine the long-term effect of current logging practices and modern silvicultural techniques on the yew. The existing data base is largely observational with somewhat conflicting and varying interpretations.

The petitioners stated that the status of the yew on Forest Service lands is also precarious because of scheduled logging operations. With the threat logging poses to the Pacific yew open to question, the claim for public land is also largely unsubstantiated. As an aside, the rates of logging of ancient forests developed by The Wilderness Society (1988) and cited in the petition were made prior to the listing of the northern spotted owl. The actual logging rates likely will be significantly lower.

The petitioners stated that Pacific yew is also at risk on the Nezperce National Forest in Idaho where logging has reduced yew habitat by at least 10,000 acres. In addition, they stated that these stands are threatened by browsing ungulates and fire. Crawford and Johnson (1985) indicated that logging

evidently had resulted in the replacement of approximately 10,000 acres of yew-dominated communities in the Nezperce National Forest, not that the yew had been eliminated from 10,000 acres. Given the yew's typically minor role in most forest communities (Bolsinger and Jaramillo *in press*), timber harvest probably has reduced the species to subordinate status on the subject acreage in Idaho. As an aside, Crawford and Johnson (1985) did not provide the derivation methodology or authority for their claimed loss of yew-dominated communities. Their synecological paper was not an analysis of the effects of logging on yew, but a detailed discussion of a habitat classification involving the yew in Idaho. Given that Crawford (1983) in his dissertation concluded that "yew will survive overstory removal and contribute to the development of the next yew stand," no substantial case has been made that logging on the Nezperce National Forest threatens the long-term survival of the yew.

The petitioners stated that the Pacific yew should be afforded protection because it is the major source of taxol, which is in critically short supply. The compound taxol has been used to treat ovarian as well as other types of cancer. The petitioners stated that listing the yew as threatened under the Act would prohibit unauthorized collection of yew bark and could provide for other conservation measures. The purpose of the Act, however, is not to provide needed supplies of drugs for medical research, but to provide for the conservation of endangered and threatened species and their ecosystems.

Although large Pacific yew trees (i.e., greater than 10 inches in diameter at breast height) are commercially exploited, BLM estimated from data collected in Oregon that only 7.5 percent of the yew trees are 6.0 or more inches in diameter at breast height. We anticipate that similar percentages of large yews will be found throughout the range of the species. Notwithstanding the relative rarity or insufficient quantity of large yew trees needed for cancer research, the potential entire loss of larger size classes due to taxol harvest does not pose a significant threat to the species. In addition, no substantial case has been made that the current lack of special protection by Federal and State agencies resulting in commercial use of yew or continued logging of its habitat threatens the long-term survival of the Pacific yew.

Summary and Recommendation

Due to the lack of thorough distribution/status surveys and experimentally-based studies of the autecology of Pacific yew, insufficient scientific information exists to determine whether regulatory protection under the Act may be justified. Regardless, an analysis of the existing data based strongly suggests that listing is not warranted. This conclusion was reached by other yew researchers, like Crawford (pers. comm., July 17, 1990) who asserted that the species is "not threatened with extinction in any way." Despite the potential for a severe underestimation, Pacific yew still occurs on at least 2.5 million acres. This figure is more than twice the estimate supplied with the petition. In addition, the existing data, which are based largely on synecological work and chronosequence studies, seem to substantiate the contention that the yew is not vulnerable to logging or collection. Logging activities evidently reduce the density of yew immediately after harvest. Moreover, land development and clearing historically have decreased the species' range in the lowlands and to a lesser degree in the mountains (much of which probably has been offset by reduced fire frequencies.) However, based on the relative abundance of the Pacific yew and the conflicting and non-experimental nature of the data on the species, no substantial data exist to show that any historical reduction in yew abundance has seriously depleted the species. In short, due to insufficient information contained in the petition, referenced in the petition, or otherwise available to the Service, the petition to list the Pacific yew does not present substantial information indicating the requested action may be warranted.

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Author

The primary author of this notice is Jim Bartel of the Sacramento, California Fish and Wildlife Enforcement Field Station (see ADDRESSES section).

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, and Transportation.

Authority: 16 U.S.C. 1361-1407; 16 U.S.C. 1531-1544; 16 U.S.C. 4201-4245; Pub. L. 99-625, 100 Stat. 3500; unless otherwise noted. (Notice: Pacific yew (*Taxus brevifolia*), petition finding)

Dated: August 12, 1991.

Bruce Blanchard,

Acting Director, U.S. Fish and Wildlife Service.

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