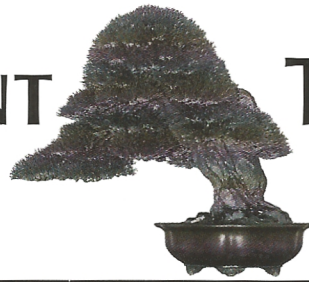


# PINE MANAGEMENT THEORY

## PART 3



By  
Greg Cloyd

### Vigor

Paramount to determining how a pine will respond to any stress, but particularly pruning stress, is its state of health and overall vigor. Vigor is simply the tendency for the tree or tree part to grow in a strong and healthful way. A shortcoming of most pine teaching is that the techniques used to manage the tree are accurately described, but the "why" is missing. Secondly, many articles state that the described techniques should only be used on healthy, vigorous and well-established trees. How does a new owner know a strong tree from a weak one? Dennis Makishima has done an outstanding job of describing dozens of signs of strength to allow the new grower to differentiate a vigorous pine from a tree in decline.

### Determining The Vigor Of A Pine Buds

In temperate climates, by autumn, the central dominant buds, which will form next year's strongest candles, should be visible on the branch tips. If next year's buds are visible earlier than usual, in larger numbers or size, these are indications of strength. The opposite is an indication of weakness. Later bud formation may also indicate cooler weather patterns. If a strong black pine grown in a warm climate is decandled in spring, the summer replacement shoots will produce a visible terminal bud by autumn.

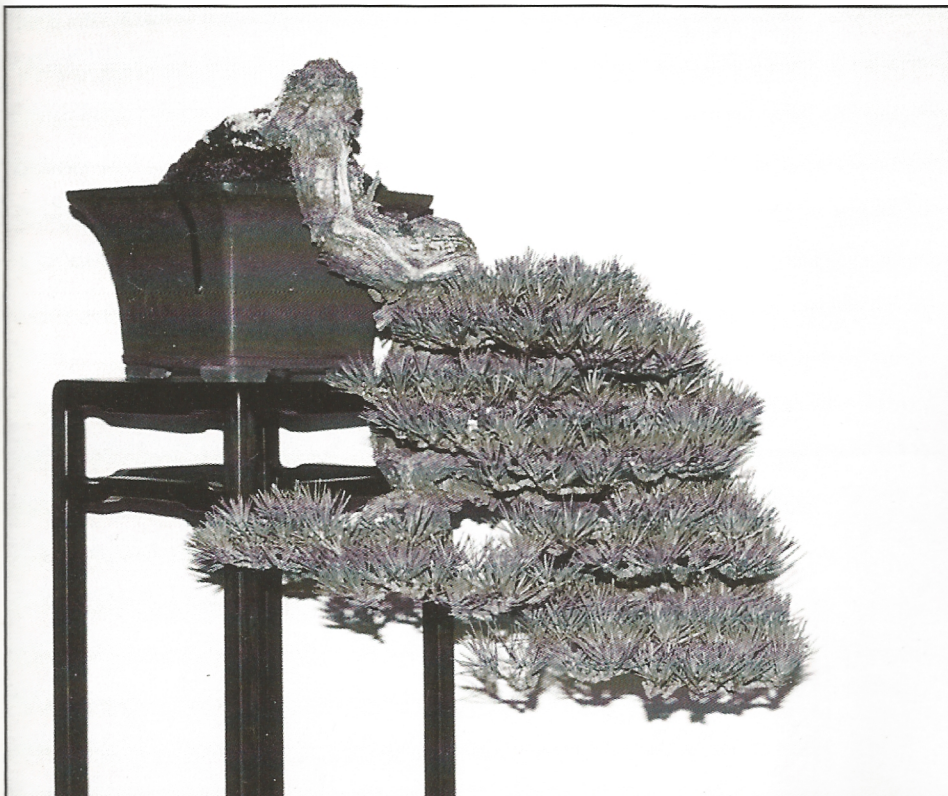
A weaker Japanese black pine, a Japanese black pine grown in a cooler climate or a Japanese black pine decandled later in spring than usual,

may not produce a visible terminal bud on replacement shoots until winter or the following spring.

Side buds or secondary nodal buds circling the main bud of the cluster may be produced from summer until autumn on a plant that was not decandled. Following decandling, the smaller secondary buds of the terminal bud cluster of a replacement shoot, as well as adventitious buds, will appear throughout the winter and into the spring. The greater the number and size of the side buds of the cluster, the greater the vigor of the branch and tree. Likewise the earlier the nodal side buds appear the stronger the branch.

Five to seven buds forming eventually in a Japanese black pine bud cluster indicates strength. Ten buds per nodal cluster may be produced in a very strong apical

*Japanese black pine, Pinus thunbergi, trained in the one-line cascade style from a collected specimen. This bonsai was exhibited at the 2001 National Bonsai Exhibition in Tokyo, Japan.*



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FIG. 6—  
SIGNS OF VIGOR IN A PINE  
BUDS

HIGH VIGOR	LOW VIGOR
Many buds	Few buds
Large buds	Small buds
Pointed buds	Blunt buds
Firm buds	Soft buds
Many secondary buds	Few secondary buds
Adventitious buds present	Adventitious buds absent
Buds light color	Buds dark color
Early appearance of buds	Late appearance of buds
Absence of bumpy or distorted buds	Presence of bumpy or distorted buds



zone of a vigorous tree grown in the ideal black pine growing areas of Japan. Up to 20 buds per cluster may occur on yatsubusa varieties. Three buds per cluster is more typical of Japanese black pines grown in the U.S. Formation of adventitious buds or non-nodal buds is an additional sign of strength. Only one bud occurring on a branch tip indicates poor health of the branch or tree.

The weaker pine species produce smaller numbers of buds per cluster at the branch tips. Strong Japanese white pines (*Pinus parviflora*) produce three to five rounded, tan buds per cluster on vigorous terminals. Ponderosa pines (*Pinus ponderosa*) generally produce not more than three pointed buds per cluster in the most vigorous growth zones of a tree.

The largest buds will be found in the center of the bud clusters on the most vigorous upper and outer branch tips of the tree. Buds should be pointed, smooth and very firm. Japanese black pines, Scots or Scotch pines (*Pinus sylvestris*) and

Pitch pines (*Pinus rigida*) ideally have white to cream colored buds.

The strongest buds are generally lightest in color. Japanese white pines, Japanese red pines and Ponderosa pines possess tan or cinnamon colored buds. Visible resin tears are a sign of strength on Scots pine, Pitch pine and Ponderosa pine. Beads of resin are visible on the buds of certain pine species. In some instances the presence of resin tears can indicate insect attack, but it is usually an indicator of strong bud vigor.

Buds will begin to swell in late winter or early spring. The earlier buds begin to swell the milder the winter has been for the plant. Onset of bud swelling is the traditional indication to begin repotting and end heavy branch pruning of Japanese black pines. Bud swelling is also the sign to begin fertilization.

#### Roots

Just prior to swelling of buds, root tip growth initiation occurs. Large numbers of tiny white root tips indicate good root health. Many small root tips have a greater surface area for nutrient and water absorption than a few large root tips. Large roots, easily broken roots or black slimy roots indicate anaerobic, waterlogged conditions and root rot.

#### Candle Formation

Bud elongation or candle formation occurs after buds swell. When bud elongation occurs wiring and repotting should stop. Early bud elongation indicates that the tree has been exposed to more warmth and sunlight than usual during the autumn and winter. The sooner the side buds of terminal bud clusters elongate, the closer they are in vigor compared to the central dominant bud of the cluster. Interior and lower branches begin bud elongation after the most vigorous upper zone buds elongate. The sooner the lower and interior clusters elongate after bud elongation of the terminal clusters high on the tree, the closer these lower and interior areas are in vigor to the strongest zones of the tree. The most easily made comparison of vigor distribution is candle length and diameter. The greater the diameters and lengths of the new candles on a branch, the greater the vigor of the branch. The closer in length and diameter candles are compared to other parts of the tree the more similar the parts are in vigor.

#### Staminate Cones

Staminate or male pollen producing cones will begin to be produced throughout the winter and should be easily visible during candle elongation. Pollen cones are small, round and bumpy. They are yellow on Japanese black pines and purple on Japanese white pines, Pitch pines and Ponderosa pines. As spring progresses, staminate cones open and produce clouds of yellow pollen if disturbed. Male cones are found close to the base of the new candles (current year's growth). Pines under stress may produce significant numbers of male cones. No needles grow among these cones. Thus a heavy

**FIG. 7—  
SIGNS OF VIGOR IN A PINE  
ROOTS**

HIGH VIGOR	LOW VIGOR
Profusion of small root tips	Few large root tips
White root caps	Brown root caps
Earthy odors	Rotten odors
Absence of slimy or black root tips	Presence of slimy or black root tips
Well-ramified roots	Poorly ramified roots
Absence of wrap-around roots	Presence of wrap-around roots (potbound)
Absence of root zone pests	Presence of root zone pests
Plentiful mycorrhizae	Minimal or absence of mycorrhizae
Presence of mycorrhizal fruiting	Minimal or absent mycorrhizae
Predominance of small feeder roots	Predominance of large woody roots
Even root distribution throughout pot	Absence of fine roots directly under trunk base

**FIG. 8—  
SIGNS OF VIGOR IN A PINE  
CANDLES**

HIGH VIGOR	LOW VIGOR
Many candles	Few candles
Long candles	Small candles
Thick diameter candles	Thin diameter candles
Straight candles	Twisted candles
Upright candles	Diagonal candles
Rubbery candles	Soft candles
Presence of non-nodal candles	Absence of non-nodal candles
White candles	Greenish candles
Early lengthening of candles	Late lengthening of candles
Absence of distorted candles	Presence of distorted candles

**FIG. 9—  
SIGNS OF VIGOR IN A PINE  
STAMINATE CONES**

HIGH VIGOR	LOW VIGOR
Few pollen cones	Many pollen cones
Cones primarily in strong zones	Cones distributed throughout the tree



cone bearing area of a candle will produce a long, bare internode. Reproductive energy expenditures divert the tree's resources away from root and shoot production, as well as production of defensive chemicals. As soon as the cones can be identified they should be removed. Some trees consistently produce large numbers of staminate cones and are considered of lesser quality for bonsai. Dennis Makishima has observed many healthy pines producing large numbers of pollen cones. This pattern usually appears after a mild winter followed by a long growing season.

### Pistillate Cones

Female or pistillate cones will eventually bear seeds. Staminate cones are distributed throughout the pine at the base of the current year's new candles. Unlike staminate cones, pistillate cones are found primarily on the outer tips of upper branches. Pistillate cones are found on the tips of last year's shoots. Pistillate cones are miniature versions of classic pine cones and when pollinated begin to swell. As they swell the branch swells and the cone attachment point hardens. A significant scar will develop at the pistillate cone attachment point if the cone is not removed

while small. In addition to scarring the branch, mature pine cones are usually too large to be proportionate for bonsai and are thus removed.

### Shoots

The spring candle, if not removed, turns from white and non-photosynthetic to green and energy producing. The transition does not occur all at once. Over a period of days the color changes from white to green and the needles push outward away from the shoot core and away from their cluster mates. Both processes start at the base of the shoot and end at the tip. Soon thereafter the shoot stops lengthening. Needle lengthening can continue for several more weeks. Healthy needles are initially soft, easily pulled from the fascicle and light green in color, like spring grass. The soft needles quickly harden, firm their attachments within the fascicle and turn a dark glossy green if given proper full sun exposure. Healthy shoots have closely spaced needle clusters. Note; shading of a plant can produce long, but weak, shoots with widely spaced needle clusters. These shaded needles will be lighter in color, soft, lackluster, long and poorly attached within the fascicle.



*Japanese five-needle pine, Pinus parviflora. This bonsai was trained from a collected tree and was exhibited by Daizo Iwasaki, Takasago-an Bonsai Garden at the 2001 National Bonsai Exhibition in Tokyo, Japan.*

### ABOUT THE AUTHOR Greg Cloyd

Greg Cloyd is a serious bonsai hobbyist who has studied pines for many years. He has organized an advance bonsai study group and invited many of the top pine specialists from the country for discussions and educational programs. The search for authoritative information on pine has recently led him to Japan where he visited many of the top growers.

Dr. Cloyd is a physician and member of the Cleveland Bonsai Club. He is also interested in native collected trees. He freely shares the results of his research and study by presenting programs and writing articles for publications. He maintains an impressive bonsai collection in Hudson, Ohio.

