Conservation Talk

Mike Trinkley

Welcome to the new Conservation Talk column. By way of a quick introduction, I am a stone conservator with over a decade of experience working with cemeteries. I have columns lined up that cover topics as widely ranging as the usefulness of simple epoxy repairs to why Portland cement is a poor choice to correct landscape approaches. But I would also like very much to hear from you. If you have conservation related questions, please let me know by emailing AGS (info@gravestonestudies.org) or myself (trinkley@chicora.org). We want this column to address the concerns and questions of the membership—so please let me hear from you.

The Role of Lichen in Stone Deterioration

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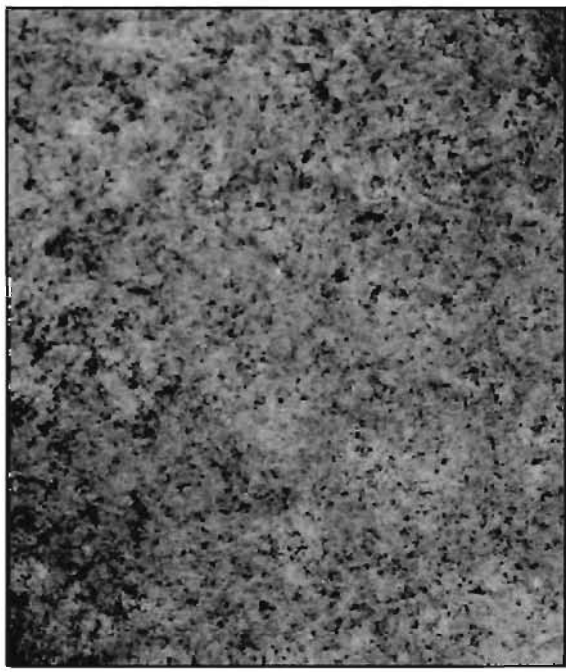
At the recent Eternal Places conference in Georgia, one speaker encouraged the growth of lichen on gravestones, talking about their beauty and the sense they convey of antiquity. Although I was familiar with the British Lichen Society and the UK Conservation of Wild Creatures and Plants Act 1975, I did not realize that there was a somewhat similar and misguided effort in the States. It may be helpful to briefly remind AGS members of the impact that lichen have on monuments.

Lichens are symbioses of fungi and algae. Both contribute to the relationship; the fungi provide structural support, mineral nutrients and a growth medium for the algae. The algae chemically fix atmospheric carbon and synthesize organics such as carbohydrates, amino acids and vitamins. Moisture, light, appropriate pH levels, pollution, decay and aging masonry all encourage lichen growth on monuments. Growth is typically millimeters per year, although when conditions are optimal, growth may be as much as 0.5 centimeters per year. Lichens are noted on nearly all substrates, including granite, sandstone, slate, marble and limestone.

Lichens are broadly classified by their growth forms: crustose, foliose and fruticose. Crustose lichen forms a distinct crust on the surface of the stone; foliose lichen is more loosely attached and often takes the form of well-defined rosettes; fruticose lichens have a bushy or hair-like form. In contrast, algae (without fungi) will rarely exhibit sharp boundaries. The "body" of the lichen is the thallus. Hyphae or rhizines root the lichen to the stone.

All studies agree that lichen degrade stone both chemically and mechanically. The metabolic processes produce a range of organic acids including oxalic and carbolic acids. The introduction of these chemicals can change minerals from a relatively stable state to more easily erodible products. This degredation occurs even in granite where the feldspars and micas are changed to illite, kaolinite and smectite—erodible clays.



Damage to granite under lichen growth (the light areas are where foliose lichen have been removed).

These geochemical reactions combine with the mechanical action of "root" growth to erode the surface. On granites, lichen hyphae can grow several millimeters into the rock. On limestone (and probably marble) which can be readily dissolved by the organic acids, some lichen can extend their hyphae up to 16 mm into the stone. As the lichen penetrates the stone and excretes products into the intergranular fissures, we see enhanced weathering reactions and decreased cohesion between the individual rock grains.

The damage, however, does not end here. Lichens hold moisture against the stone. They are also known accumulators of pollutants from atmospheric outwash. One study suggests they clog the pores of the stone, increasing the potential for frost damage.

Another issue worthy of mention is that lichen can significantly reduce the aesthetic quality of cemetery monuments, making it difficult or even impossible to read the inscriptions. This disfigurement, in turn, can lead to inappropriate cleaning methods (such as the use of bleach, ammonia, acids or abrasion) that further damage

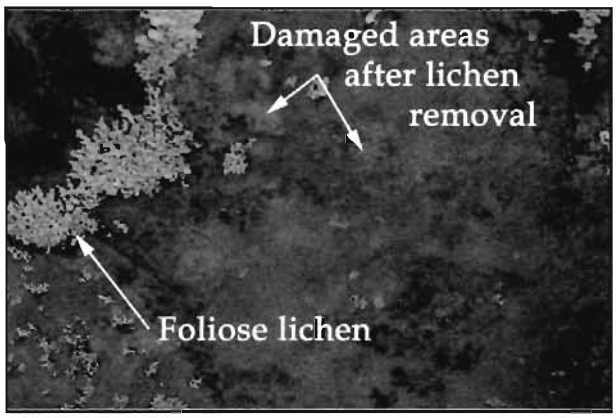
Marble obelisk showing moderately severe growth of crustose lichens.

Granite die on base showing severe growth of crustose lichens over both unpolished and polished surfaces.

the stone. Even some detergents leave behind residues of phosphate (a nutrient normally in limited supply) that can dramatically promote lichen growth after cleaning.

So, however "beautiful" lichen may appear, there is no doubt that they are causing irreparable harm to the stones they colonize. While it may not be necessary, or even appropriate, to remove every last vestige, there are situations where it is of critical importance to reduce the lichen for the health of the stones and masonry. The best products we have found for lichen removal are the quaternary compounds such as Cathedral Stone's D/2 Architectural Antimicrobial or Prosoco's BioWash. Contrary to some product recommendations, it is good conservation practice to prewet stones (this helps prevent large quantities of the cleaner being drawn deep within the stone) and to thoroughly rinse after treatment. These products provide excellent results. ♦

Sandstone headstone showing both crustose and foliose lichen. Although much of the face has spalled off, the small amount left is unreadable because of the lichen deposits.



Crustose lichen removed from slate, showing damage.

Slate headstone with grayish-green foliose lichen and a broader covering of crustose lichen. Together they make the stone illegible.