After visiting hundreds of mines throughout the state, OMR botanists have seen “the good, the bad, and the ugly” when it comes to revegetation of mined lands. If one of the key steps to successful revegetation is skipped or poorly implemented, success is elusive and remedial measures are costly. Following these 10 essential concepts and techniques will make the time and expense of reclaiming mined lands pay off, reaching revegetation success criteria in the shortest amount of time.

1. **Topsoil Salvage.** It is extremely difficult to revegetate a site without topsoil so this is the most important of the 10 essentials! Often, mine operators tell us there is no topsoil on their site. However, the term topsoil simply refers to the uppermost layer of soil, usually 6-12 inches deep, but sometimes deeper. Unless a mine site is on bare bedrock or on river gravel bars, topsoil is present and must be salvaged, managed, and replaced correctly. This layer is chemically and biologically active and rich in organic matter, nutrients, seeds, fungi, and microorganisms, unlike deeper layers. It should not be mixed with other “overburden” materials or “fines” recovered from processing or sediment ponds, although these materials may be used as growth material underneath the reapplied topsoil layer.

2. **Surface Preparation.** In addition to replacing the salvaged topsoil, decompaction of all compacted areas such as roads, processing areas, and equipment storage areas is essential for the seedlings’ ability to make contact with the soil, germinate, penetrate the ground, grow deep roots, and uptake water and nutrients. This is usually accomplished by ripping to a depth of 3 feet. A variety of surface roughening techniques - such as track-walking, imprinting, and “moonscaping”- are also very helpful in enhancing germination and growth and slowing surface erosion.

3. **Correct Species Selection.** While many species of plants may be present on a mine site, it is important to know which species will perform well with minimal input in a reasonable amount of time. Even if the target vegetation type is a
shrub formation, grasses and nitrogen-fixing legumes are important pioneer plants to include in the seed mix to quickly stabilize the soil. Some species may be difficult to germinate and are a waste of money when included in a seed mix.

4. **Best Planting Methods.** Seeding, hydroseeding, planting container plants, and transplanting salvaged plants are all options for revegetating a site. What method or mix of methods will work best on a site depends on the planting palette and on local site conditions such as slopes, access, rockiness of soil, climatic variables, availability of equipment, and other factors.

5. **Proper Planting Time.** Working with California’s Mediterranean-type climate with its dry summers has its challenges. The optimal planting time is usually during the fall and winter months to take advantage of the natural precipitation pattern, especially since most mining operations are not able to irrigate on a large scale. Our drought-tolerant native plants are adapted to this climate regime and will do fine once established.

6. **Making the Most of Test Plots.** Operators can save money testing a variety of options on a small scale prior to implementing full-scale reclamation. One operator in northern California realized savings of almost $4000 per acre by implementing a well-designed test plot program. Some of the variables to test include different seed mixes at different application rates, seed versus container plants, different soil amendments, the use of irrigation, and different plant protection devices.

7. **Setting Realistic Performance Standards.** Revegetation performance standards, also called success criteria, should be quantitative, realistic, and achievable. If they are set too high, a mine operator won’t be able to reach them in a reasonable amount of time. If they are too low, they won’t provide a vegetative cover that protects the soil from erosion, resists invasion by weeds, or blends the site into the surrounding landscape.

8. **Maintenance and Monitoring.** You have to keep track of the progress of revegetation efforts, both in test plots and in areas undergoing reclamation, to find out what’s working and what’s not and undertake remedial measures as
soon as possible. This means following an “adaptive management” approach that allows you learn from failures and build on successes.

9. **Weed management.** Unfortunately, noxious weeds are a terrible problem in California and they will quickly invade disturbed soil surfaces. If they aren’t managed vigilantly, they can ruin a revegetation project and cost a lot of money to eradicate. Early detection, rapid response, and consistent effort throughout all phases of mining and reclamation are essential steps to keep weeds under control.

10. **Hiring professionals.** All of the 10 essential steps require the involvement of trained professionals such as botanists, restoration ecologists, landscape architects, and seed companies or nurseries familiar with native plants.

**OMR’s botanists are here to help**

OMR’s botanists are responsible for reviewing the revegetation portion of reclamation plans and providing comments on the plan’s adequacy in meeting the minimum requirements of SMARA and the CCRs. We also routinely make suggestions for changes to planting palettes, performance standards, or other details of the plan based on our professional expertise to aid the mine operator in successfully reaching their revegetation goals. Our botanists can also offer technical assistance with test plot design, reviewing annual monitoring reports, developing remedial measures to solve revegetation problems, confirming the achievement of revegetation performance standards for 3805.5 closures, presenting revegetation workshops, and many other important aspects of successfully revegetating and reclaiming California’s mined lands.

**OMR botanist Leah Gardner helping to monitor the success of revegetation at a mine site in San Bernardino County.**