AGGREGATE RECLAMATION IN NORTH AMERICA

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Summary

Aggregate production is a major industry in North America. But one of the negative consequences of such a popular industry is the creation of vast tracts of derelict land. Poor practices resulting in derelict land rather than proper reclamation is no longer tolerable. Various levels of government must review their stance on reclamation and re-evaluate the aging regulations in place. Of course, the general populace or community must also be educated about their own dependence on the aggregate industry and the incorrect image of mining, as a pillaging industry must change. This can be accomplished by involving the entire community in the positive aspects of mining, specifically with reclamation. The reclamation process itself can be categorized into three groups based on end land-use and each having its own strengths and weaknesses: a) passive rehabilitation, b) naturalization and c) urbanization. The key to successful reclamation is in advanced planning and community involvement.

Introduction

Today's society relies heavily on the aggregate industry in a variety of ways. The infrastructure of any urban community cannot exist without a constant influx of sand and gravel. Tied to this idea is the economic state of the community, which often prospers along side a booming aggregate industry. But the growth of any mining industry is not with out its drawbacks; the destruction of the environment is a severe consequence. Over the past fifty years, the production of aggregates has more than quadrupled in the United States alone (National Aggregates Association 1994), causing vast amounts of land to be rendered derelict. Of these lands only a third are reported as being reclaimed (Buttleman 1992).

Even in those lands that have been reported as being reclaimed, the success and quality of reclamation varies drastically from place to place. This, in part, is due to the inconsistent use of the word "reclamation". To some, it may simply imply the removal of machinery, whereas to others, it may hold a more proactive definition. Reclamation should not only incorporate the clean up of a disturbed site, but also the rehabilitation or transformation of the land into either a similar state to what it once was or into some other beneficial condition.

The discussion that follows explores the roles played by the various levels of government and the community in the reclamation process throughout North America, as well as looking at the different types of reclamation.

Government

In most industries, the government acts as a regulatory agency that protects the people and the economy from malpractice and neglect. Within the aggregate industry, the government's role and level of involvement varies greatly across North America.

There are three main levels at which a government may operate: federal, provincial/state, and local (including counties and municipalities). As well, within each level of government there may be several agencies that regulate specific aspects that may affect aggregate mining. For example, it depends on the location of planned site, if it is on public or private land, if it falls within certain environmental zones or if the pit will intersect or affect the water table. Regulations set by these agencies cover broad latitudes of topics, but can be categorized in to three basic regimes: i) public safety, ii) environmental protection and iii) site remediation.

These regulations are often available in the form of guideline manuals from the corresponding agency, but whether or not they deal with the topic of reclamation depends on where one resides. While reviewing their own legislation in the late 1980s, the Minnesota Department of Natural Resources, USA, conducted a national survey to see how other states regulate reclamation practices (Task Force on Sand and Gravel Pit Reclamation 1989). A summary of the results of this survey is given in Fig. 1. The figures show that of the forty-one states that responded, 21% have both state and local laws governing reclamation, 34% have only state regulations, 24% have local and 21% have neither state nor local regulations. It is also clear that there is no correspondence between the size of the aggregate industry in the state and the level of government involvement.

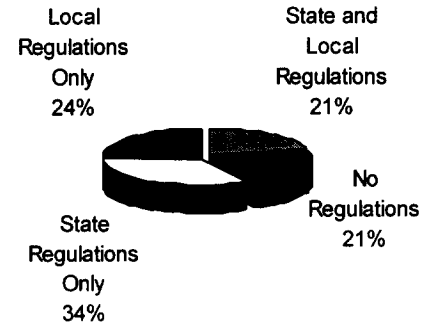

Figure 1. Distribution of governmental regulations of 41 states in the United States of America.

More and more states and provinces across North America are re-evaluating their stance on reclamation regulations, much like Minnesota has accomplished. This trend necessary, as existing legislation is often archaic and no longer meets today's societal needs. The aging, vague regulation and guidebooks for pit reclamation are being replaced with more informative, multi-disciplinary approaches. Excellent examples of this include "A Handbook for Reclaiming Sand and Gravel Pits in Minnesota" (Buttleman 1992) and "Best Management Practices for Reclaiming Surface Mines in Washington and Oregon" (Norman *et al.* 1997).

As part of an effort to force mining companies to deal with reclamation and plan for the future, mining companies are being required to complete a reclamation plan prior to the issuance of extraction permits. In so doing, the companies are not only bettering their relations with the surrounding community but are also benefiting themselves by planning for a more efficient extraction and reclamation process.

Some governments also require reclamation bonds to be paid before mining may commence. This is a way to ensure that

the company follows through with their plan to reclaim the land. Currently in Manitoba, Canada for instance, mining companies are required to pay a bond ranging from (Canadian) $5,000 to $10,000 depending on the number of mines that the company owns. This is in contrast to the system used in Mississippi, USA, where the size of the bond is dependent on the amount of land that will be disturbed; here ranging from (US) $500 to $2,500 per acre.

Community

The availability of extractable and economical aggregate deposits often dictates the growth, and thus economic state, of urban communities. This relationship exists because sand and gravel are key commodities used in the construction of such infrastructure as roads, buildings and dams. For example, building a 1,500 square foot home requires approximately 114 tons of aggregate material (Southern California Rock Products Association n.d.), which pales in comparison to the amount required to construct one mile of four-lane interstate highway, some 85,000 tons (Langer and Glanzman 1993). On an even larger scale, the Grand Coulee Dam in Washington, USA, required 17 million tons of aggregate products during its construction (Langer and Glanzman 1993). If these materials are being mined by local businesses, the money and jobs involved are kept within the community, thus stimulating the local economy. In 1990, $9.1 billion U.S. was grossed by the aggregate industry within the United States, accounting for more than half of the volume of materials mined for non-fuel purposes (Langer and Glanzman 1993).

The efficiency with which a city draws on aggregate deposits has a great impact on the economy. If deposits become covered with permanent structures of urban sprawl, then the resource is lost to the community and an alternative source must be found. If adequate deposits are not locally available, distant sources must be mined and because hauling costs can be as much as two or more times the value of the commodity itself (Lingley and Jazdzewski 1994), the economy suffers. For this reason, aggregate pits are found in close proximity to, if not within, the communities that are exploiting the resource.

With mining operations so close to the communities, the positive aspects of the pits are often overshadowed by the negative. A recent survey showed that the public believes that mining exploits its workers, harms the environment, harms the people in the nearby community and has little personal benefit to the individual (Langer 1998). Such false perceptions can lead to misguided pressures exerted by the community and may result in unnecessary re-zoning and regulations that impede efficient extraction (Baker 1998). The best deterrent for such a situation is community education and involvement.

If the community is informed about the need for aggregate resources and the nature of it being only a temporary use of the land, and if they are involved in the planning of the subsequent land-use, then there will be less resistance and likely more cooperation. An example of this can be found along the San Joaquin River in California, USA (Beeby 1998). There, a parcel of land became of interest to several groups, one of which wished to develop the land for a large residential subdivision. Environmentalists, and community members were in opposition of this and together with a mining company lobbied for an alternate use. Working with the government, they implemented a plan to extract much needed aggregates from the site using in-stream methods, after which the land was reclaimed as parkland.

Reclamation

One of the major concerns addressed in the early stages of urban development should be the location and subsequent land-use of aggregate pits. Planning ahead can minimize the negative impacts that often fuel the public's poor perception of the industry. Noise pollution, water pollution, dust and increased traffic are all inherent problems of aggregate pits but are more or less confined to the it's operation life and can be controlled with proper mitigation. More tenacious problems are associated with the improper, or nonexistent, reclamation of derelict land that leads to environmental problems, public safety issues and unauthorized activities such as the dumping of garbage.

There is some literature that addresses the methods of reclamation, specifically dealing with the time at which the land will be reclaimed relative to the operation life of the mine; whether reclamation occurs during or after mining or simultaneously. Such information is important for planning and each method has its advantages, though progressive reclamation is generally the most favored (Buttleman 1992). Equally important to the process of reclamation is the end land-use itself. Reclaimed land can take on a large variety of forms, and so, it is convenient to classify the different styles of reclamation into three broad categories: passive rehabilitation, naturalization and urbanization. These groupings are only theoretical, and should not be considered as distinct forms, rather as end-members on a ternary diagram (Fig. 2). A property being reclaimed may be the product of a combination of the three categories.

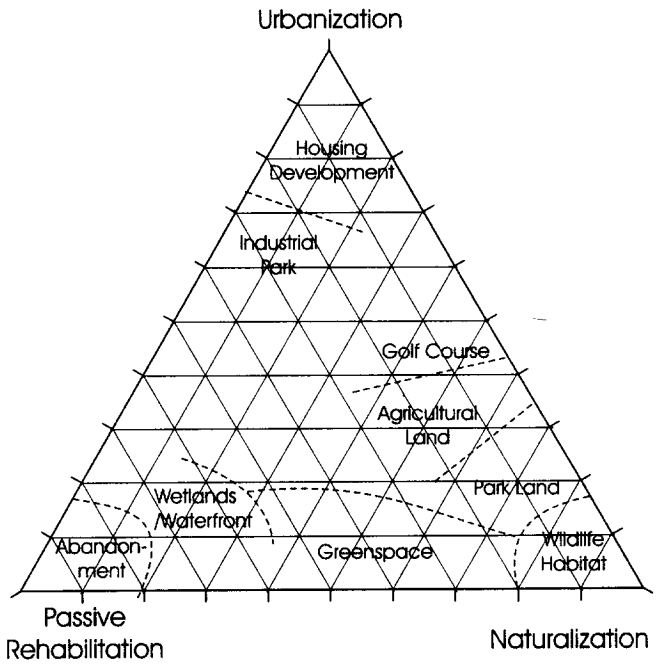

Figure 2. Ternary diagram depicting examples of reclamation.

The first type of reclamation, passive rehabilitation, is the cheapest and, unfortunately, the most common. The popular

saying "time heals all" summarizes the essence of this method nicely. Once the extraction of resources has stopped, the pit is more or less left on its own to reclaim itself. This does not necessarily mean that the mining company has not cleaned up the site. They may have removed their equipment, stabilized the pit and controlled the run-off, but there was no effort in bringing the land into a state of greater utility. Over time, pioneer plant colonies will re-vegetate the pit and eventually a stable community will take root. But this does not happen over night, and in the mean time the pit is considered a nuisance by the surrounding community and becomes the target of detrimental activities.

Reclamation by naturalization is the process of returning derelict land into a state that blends in with its surrounding environment. This is probably the most difficult type of reclamation to successfully complete, as it requires an in-depth knowledge of the local ecology as well as a long-term commitment on the part of the mining company. In some ways, this approach to reclamation is similar to passive rehabilitation, in that as re-vegetation occurs, an ecological community grows with it. The major difference is that the process is planned, developed and managed in order to ensure success. Examples of this type of reclamation varies from salmon spawning habitats to bird sanctuaries to prairie grasslands.

Naturalization for the purpose of creating human habitat is termed urbanization. This is perhaps the most natural process when considering that communities often encompass aggregate pits. Urbanization can be broken down into further categories depending on the intention of the end land-use: residential, commercial/industrial, recreational and agricultural. If planned ahead of time, this type of reclamation can often be not only beneficial to the community but also lucrative to the mining company. Some of the products of urbanization are shopping malls, golf courses, residential subdivisions and parks.

Progressive Thinking

As an offshoot from the aggregate industry, many new companies have been formed that deal specifically with the process of reclaiming land. These companies work with the mining company and the community to bring parcels of derelict land back into a productive use according to the needs of those concerned. The level of the community's involvement in reclaiming land is of utmost importance. If the land is to be successfully reclaimed, it only stands to reason that the people, who will be using it, are made part of the process.

Reclamation committees that are diverse and involve members of the government, mining industry, business community and the general public, will result in a higher success rate than those run by a select interest group. With this in mind, the entire community should be educated on the need for aggregates within communities and the positive aspects of mining. Public seminars, workshops and bulletins are useful in this respect and may relieve undue tension that can result in the poor management of resources and ultimately affect the economy.

Conclusion

The rapid expansion of urban communities across North America over the past fifty years has partially been fueled by the availability of aggregate resources. Primarily due to hauling costs, aggregate pits are often found within the community; a fact that often leads to public dismay. This can be over come through a stricter attitude towards reclamation from the government, responsible mining practices, and public participation and education.

Many of the regulations in place are inadequate and should be reviewed. The government should lead the industry by showing no tolerance to companies that disregard reclamation practices and give incentives to those companies that are willing participants. Aggregate mining companies also must change their attitudes. The more they work for the community instead of against them, the more efficient they become. As well, they must understand that reclamation is not a synonym for impoverishment, but on the contrary can be lucrative. Lastly, the public's perception of the mining industry must change and they must realize the essential need of aggregate within their communities.

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