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Institute for Water Resources
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AQUATIC RESOURCES NEWS

A REGULATORY NEWSLETTER

Headquarters, U.S. Army Corps of Engineers, Regulatory Branch

A Note from Headquarters

As you may have heard, five of our Norfolk Regulatory folks were involved in an accident in April, through no fault of their own. They were stopped for some roadwork and were rear ended by an 18-wheel semi, shoved into the truck in front of them and then pushing that truck into the car in front of it. Fortunately, all were wearing their seatbelts and the car had airbags, so there were a lot of cuts and bruises but no fatalities. However, the van was crushed and the person in the back seat had to be cut out of the wreckage. We were extremely fortunate not to lose anyone.

Regulatory folks do a lot of driving going to meetings, site visits, etc. We at Headquarters would like to stress to everyone that driving is a full time occupation. We have all, in the name of efficiency, been guilty of trying to drink coffee, eat lunch, read maps and files, fish for something under the seat and talk on the telephone or look at others in the car while driving. These activities, however, impair the alertness of the driver. It only takes a split second for a child to run out between cars, another vehicle to run a stop sign or swerve out of their lane, or an animal to run across the highway. While the Norfolk people could do nothing to prevent their accident since they were stopped at the time and boxed in by other cars, some accidents can be avoided by an alert driver.

I was told by a friend of mine who was in an accident that everything in his truck became a projectile - his day planner, boots, briefcase, files, and pens, to name a few. He was pummeled by every loose item in the vehicle. He was wearing a seat belt, so wasn't ejected from the truck, however, slamming against the belt resulted in a cracked sternum. He was in pain for more than a year, especially every time he took a deep breath or coughed.

In a defensive driving class, a highway patrol officer gave us a great piece of advice. He said that the moment you turn on the engine, assume everyone (pedestrian, bicyclist, motorcyclist, car or truck driver) within a five-mile radius is going to do something radically stupid, and you should drive accordingly. Please, take care while on the road and focus on your driv-

Distribution of Aquatic Resources News

The *Aquatic Resources News* will be distributed to field staff by e-mail. The Newsletter will also be available on the IWR website within the month at: http://www.iwr.usace.army.mil/iwr/regulatory/regulintro.htm

You may contact the Editor, Bob Brumbaugh, CEIWR-GR at (703) 428-7069 or Robert.w.brumbaugh@usace.army.mil. HQ point-of-contact for the newsletter is Katherine Trott, CECW-LRD (202) 761-5542 Katherine.l.trott@usace.army.mil

ing, in your own vehicle or any other. Expect the unexpected. You never know when the driver behind or next to you or the one driving toward you will drop a drink in their lap, find a wasp in the car or try to pick something off of the floor. Everyone in this organization is extremely important, not only to your own families, but as a valued member of the Regulatory Branch and your district/division offices. Drive Safely.

A Note from the Editor

A wide variety of mining activities occur across the U.S. mineral resources and extraction procedures. This newsletter describes six district approaches that reflect the nature of mineral resources and extraction procedures and resulting affects on our nation's aquatic resources. These articles describe types of mining, how the mining activities are conducted, the geography of the mineral resource, type of stream or wetlands affected, evaluation of mining impacts, and compensation for affects on aquatic resources.

Certainly, regulation of mining activities has been the center of recent controversy in the coal fields of the Appalachian Mountains. As noted in this Newsletter, Corps Headquarters issued compensatory mitigation guidance for impacts of surface coal mining. Two of the articles discuss surface coal mining activity-in southwestern Virginia and the Illinois Basin in Kentucky, Indiana and Illinois. Two articles discuss mining of stream gravels in the western U.S.-gold placer mining in Alaska and stream gravel extraction in Oregon. Peat mining in Minnesota is the focus of another article, and phosphate mining in Florida is described in a final article.

Mining Activities Reviewed in This Issue

The next issue of this newsletter will return to a topic of an earlier newsletter (Volume1, Issue 2)--a watershed approach to compensatory mitigation decisions. The newsletter will present some of the watershed-based studies and mitigation approaches discussed at the recent National Symposium on Compensatory Mitigation and the Watershed Approach sponsored by the Federal interagency Mitigation Action Plan team.(see *Also of Interest*)

In-Water Gravel Mining in Oregon

John Barco

Introduction

There has been as increase in demand for gravel aggregate for construction related purposes associated with the steady increase in the State's population and a statewide initiative by the Oregon Department Transportation to renovate over 400 bridges throughout the state. As a result, the Portland District Regulatory Branch is currently evaluating permit applications for numerous floodplain and in-water gravel mining projects across the state. In Oregon, the Corps has historically authorized two types of in-water aggregate mining: 1) bar scalping via rubber tire front-end loader and 2) dredging via barge mounted bucket dredge.

Figure 1. Typical Point Bar

Bar scalping is the primary in-water mining methodology employed throughout the state of Oregon. (Figure 1 shows a point bar deposit that might be mined). Provided that the project would result in a discharge of dredged or fill material or occurs within a navigable water (Section 10), the Portland District is faced with two main issues associated with in-water mining in Oregon. The first issue involves ensuring each project is in compliance with the Section 404(b)(1) Guidelines and the National Environmental Policy Act (NEPA). The Section 404(b)(1) Guidelines state in part, that no discharge of dredged or fill material shall be permitted if there is a less environmentally damaging practicable alternative to the proposed discharge. The proposed project and any reasonable alternatives are subsequently evaluated in the public interest review. The second issue involves identifying the potential physical and biological effects associated with in-stream mining and consulting with the appropriate federal resource agencies in accordance with Section 7 of the Endangered Species Act (ESA). Because the majority of the in-stream mining projects within the Portland District are bar scalping operations, this paper will discuss the Portland District's approach to evaluating bar scalping projects.

Evaluation of Alternatives to In-Stream Mining

In general, aggregate mining occurs within a relatively short distance of the intended market to reduce the cost of transporting the material. Coincidentally, there is generally an abundance of aggregate relatively close to many of the metropolitan areas throughout Oregon due to the recent geologic history. During the Pleistocene Epoch, a series of massive floods commonly referred to as the Bretz Floods deposited large amounts of well-rounded gravel in the Columbia and Willamette Valleys, where the majority of Oregon's population resides. Additionally, years of the dynamic riverine systems natural morphologic changes (i.e., channel meandering and flooding) deposited additional aggregate material in the floodplain.

The Portland District is currently utilizing spatial data gathered from various state and Federal sources to assist with the alternatives analysis. The spatial data may vary in quality but can include laboratory testing results from specific aggregate mining sites (both in-stream and upland). Other spatial data includes, but is not limited to: topography, geology, soils, aquatic resources (i.e. wetlands), other aggregate mining sites, urban boundaries, and transportation networks. The spatial data is analyzed using ArcView®, a geographic information system (GIS) software package. The use of the spatial data in conjunction with the information provided by the applicant allows the Portland District to efficiently evaluate the proposed alternatives and ensure compliance with the 404(b)(1) Guidelines and NEPA.

Evaluation of Potential Physical and Biological Effects

Floodplain gravel mining typically involves impacts to palustrine emergent and forested wetlands. The functions and values of affected wetland resources can be assessed utilizing hydrogeomorphic (HGM) and/or other functional assessment methodologies. However, in-stream gravel mining such as bar scalping is generally more difficult to assess due to the potential for a wide range of spatial and temporal effects and differences in geomorphic settings across the state. In most instances, the potential effects to the aquatic environment associated with bar scalping are also interrelated to the potential effects to threatened or endangered anadromous fish species protected by NOAA Fisheries or species protected by the U.S. Fish & Wildlife Service (FWS) under the ESA. To assess the potential wide range of effects, assist in Section 7 ESA consultations, and attempt to provide permitting consistency between state and Federal agencies, the Portland District, in cooperation with FWS, NOAA Fisheries, Oregon Department of Environmental Quality (DEQ), Oregon Department of State Lands (DSL), and Oregon Department of Fish and Wildlife (ODFW) have developed a list (Table 1) of potential physical and biological effects associated with in-stream gravel mining (bar scalping). The list of potential effects is based on an abundance of scientific literature, previous permitting experiences, technical knowledge from several scientific disciplines, and other relevant information.

As Table 1 indicates, bar scalping operations can disrupt the dynamic equilibrium of the stream, which in turn can lead to a multitude of secondary and cumulative effects to the aquatic environment. To better understand the existing baseline conditions, the Portland District, in conjunction with the spatial data used in the alternatives analysis, evaluates information on sediment budgets, longitudinal and cross-sectional surveys at the project site, riparian vegetation, presence of ESA species, wildlife habitat, and various other relevant data/information that is site specific. Once the baseline conditions are understood, the Portland District then evaluates the potential for the occurrence of the effects listed in Table 1. Although all of the effects listed in Table 1 may not occur from a permitted bar scalping operation at a given project site, the list serves as guidance and better assists the Portland District with evaluating the full range of potential effects of the proposed project on the aquatic environment. Furthermore, by identifying the potential effects of the proposed bar scalping operations, the Portland District can better assess what is appropriate and sufficient compensatory mitigation.

Because many of the streams throughout Oregon have experienced some degree of simplification (i.e., loss of floodplain connectivity), a number of compensatory mitigation opportunities could be undertaken to offset unavoidable impacts associated with

Table 1

Potential Effects of Bar Scalping

Physical Effects	Biological Effects
Change in flow hydrualics	Fish entrapment
Change in sediment recruitment	Loss of habitat complex
Change in sediment budget	Loss of spawning gravel
Change in large wood recruitment	Loss of rearing habitat
Increses erosion (onsite & offsite)	Change in macroinvertebrate community
Change in particle size distribution	Loss/change in riparian vegetation
Change in armoring	Loss of boundary layer habitat
Change in width to depth ratio	Loss of edge habitat
Reduced sinuosity	Decreased fish passage/migration
Higher velocities	Decreased function of wildlife migration corrido
Channel incision	Loss of wildlife habitat
Sediment intrusion	Loss of high water refugia
Loss of pools	Loss of high water refugia

in-water gravel mining. One of the best examples is off-channel habitat restoration. Off-channel habitat restoration generally entails reconnecting abandoned side channels to the mainstream and implementing a riparian planting plan. The restoration of side channels can provide refugia for resident and anadromous fish species, lower the peakedness of the channels' hydrograph, and offset many of the other physical and biological effects listed in Table 1.

Summary

The Portland District recognizes the importance of gravel aggregate as a resource used by the construction materials industry for a variety of products and applications throughout the State. As the district continues to work closely with the aggregate mining industry, state agency partners and our Federal resource agency family, it is our vision that an acceptable plan of action can be developed that supports continued mining operations while protecting the aquatic resource. As this process is evolving, the Portland District will continue to work closely with all interested parties and move forward with the use of best available information to maintain a consistent methodology in our permit evaluations. For more information call John Barco at (503) 808-4385.

(John Barco is a physical scientist in the Portland District Regulatory Branch.)

Placer Mining in Alaska

Mike Holley and Victor Ross

Placer mining is defined as the removal of gold or other precious metals such as silver, tin, or platinum from stream gravels. The gold or precious metal has eroded from its original deposit, normally by water and has been re-deposited within the gravel system of a current or historic stream system.

The removal of the gold is done by recreational and commercial mining operations. The Alaska District has defined recreational mining as hand mining with a pick, shovel, pan, and or rocker box or with a floating suction dredge that has an intake size smaller than or equal to 4-inches. The Corps has determined that recreational mining in waters of the United States would have de minimus effects on the aquatic environment, provided the State of Alaska Department of Natural Resources, Office of Habitat Management and Permitting requirements for fish bearing waters are met. The Corps retains the discretion to require authorization on a case-by-case basis if it is determined that effects are greater than de-minimus.

The Corps encourages exploration of placer ground in advance of full-scale mining in order to reduce the footprint of impacts when gold is not present in commercial quantities through that section of the stream. The Corps authorizes fills for exploratory drill pads, trenches, side casting from trenches, bulk samples and other test methods in regulated waters of the United States. Nationwide permits and the Alaska Regional General permit are used as appropriate.

In 1988, the Corps developed a general permit (GP) for placer mining in the State of Alaska. The GP authorizes the placement of dredged and or fill material into waters of the United States, including wetlands, in association with mechanized land clearing; construction of sedimentation basins; stream diversions; foundation pads; access roads; required reclamation work; the stockpiling of overburden and pay gravel; and similar activities associated with removal of gold or other precious metals.

Figure 1. A mine cut with two settling ponds and the plant at Petersville, located on a bench above the original creek channel.

Figure 2. A reclaimed mining operation at Valdez Creek (view upstream). The BLM and Alaska DNR has recognized this project for outstanding reclamation.

Under the GP, the cumulative surface disturbance of any one mining project shall not exceed ten (10) acres including streams, unreclaimed ground, wetlands, and uplands at any time. All project features including mine cuts, settling ponds, diversions, berms, work and camp pads, stockpiles, etc. that will not be used during the next year's mining season must be reclaimed prior to the end of the current mining season. Figure 1 is an example of a typical mining operation with settling ponds. Areas that have been reclaimed in accordance with the State of Alaska under the Reclamation Law or a Federal land management agency are not included in computing the area of disturbance. The GP includes guidelines and conditions for restoration and reclamation of the mine site.

The Corps review of the mining project includes consultation with the land manager responsible for the final reclamation and bond release on site, Federal and State resource agencies. The Corps encourages concurrent reclamation of the mining operations.

Reclamation includes recontouring of tailings, stream restoration and the establishment of riparian vegetation around settling ponds, fresh water ponds, and mine cuts. Figure 2 shows an example of a reclaimed mining operation.

The Alaska district considers restoration and reclamation activities associated with the authorized mining activities, as compensatory mitigation for aquatic losses. Many of the mines are working in historic mining areas that have been previously mined with minimal historic reclamation requirements. In addition, all restoration requirements of the land manager must be met at the mine site. If the stream systems have anadromous or resident fisheries the requirements of the State of Alaska Department of Natural Resources, Office of Habitat Management and Permitting must also be met. These State requirements vary somewhat with circumstances, but include stipulations to prevent/reduce sedimentation and turbidity and often carry a timing window to avoid spawning fish in the stream.

Many of the operations are off of the road system, and provide employment and revenue in rural locations through out the State of Alaska. Placer mining continues today to be a part of the Alaska economy. For more information, please call Mike Holley at (907) 753-2712.

(Mike Holley is a lead project manager for the Alaska District Regulatory Branch working primarily with oil and gas development activities, especially on the North Slope of Alaska. He is a PROSPECT instructor for Regulatory IIB and III and conducts local wetlands delineation training. Victor Ross is a mining engineer and project manager for the Alaska District Regulatory Branch working mainly on Department of Interior mining projects.)

Peat Mining in Minnesota

Tim Smith

The State of Minnesota contains over six million acres of peatlands accounting for approximately 11 percent of the state's total area. According to statistics compiled by the Minnesota Department of Natural Resources, less than 3,000 acres of these peatlands have been mined under the State's regulatory program (covering operations that exceed 40 acres). However, despite the relatively low total acreage, the scale (40 to 850 acres) and duration (5 to 50 years) of most commercial operations combined with the fact that peat mining is conducted almost exclusively in wetlands results in unique challenges from a regulatory perspective.

Peat harvesting methods can be divided into two general categories, wet and dry. Both techniques require that the site be cleared of vegetation and debris prior to harvesting. Wet techniques involve removal of the peat and off-site drying. Using the wet slurry method, a ditch is constructed and a high-pressure stream of water is used to cut peat from the face-wall. The peat slurry is then pumped to a dewatering facility and dried either mechanically or using solar energy. Another wet option, referred to as the slurry pond method, uses mechanical excavators to dredge the peat from the site. The peat is then screened to remove roots and stumps and pumped to a dewatering and drying facility.

In contrast, dry methods require that a site be drained following the removal of woody vegetation to permit the harvesting of peat from surface layers of the bog. Under the most common dry method, the dry milled method, once the drainage ditches have been excavated, any stumps and woody material left after logging are shredded and removed by raking. Following raking, the surface of the harvest cell is profiled to create a crown to promote drainage and aid in uniform drying of the peat. The top layer of *Sphagnum* peat is then shredded in a process referred to as milling to promote evaporative drying. The milled peat is then turned periodically until it is dry enough to harvest. The peat is then collected using vacuum harvesters driven or towed over the surface of the drained bog.

Figure 1. Forested *Sphagnum* bog in northern Minnesota dominated by black spruce.

Figure 2. Black spruce-dominated *Sphagnum* bog in northern Minnesota. White flowered plant is cottongrass.

Dry harvesting methods are the industry's current choice for large-scale peat harvesting. The dry harvest method is more cost-effective, produces a higher quality product, and results in less environmental impact. From an aquatic resource perspective, the long-term effects of the dry method are significantly less than wet techniques since it results in less air emissions, requires less infrastruc-

ture and overall footprint, and most importantly, permits in-kind restoration of the site. Wet harvesting techniques require more fuel inputs for equipment, mechanical drying and pumping and typically result in large open water areas where higher functioning wetland systems formerly existed.

The Saint Paul District recently completed an evaluation of an application for a large-scale peat mining operation in an expansive patterned peatland in Koochiching County, Minnesota approximately 25 miles northwest of the City of Big Falls. The proposed 840-acre mining site, referred to as the Pine Island Bog, is an ombrotrophic (raised) bog that supports a dense black spruce overstory with an understory of ericaceous shrubs and ground cover comprised almost entirely of *Sphagnum* (Figures 1 and 2). Impacts to the bog were evaluated using the Minnesota Routine Assessment Method (MnRAM) for Evaluating Wetland Functions. The latest version of MnRAM (version 3.0) was developed using the concept of ideal theoretical pre-European settlement wetland conditions as the baseline. Similar to the Hydrogeomorphic (HGM) approach to wetland functional assessment, MnRAM utilizes field indicators, variables, and relationships between variables to estimate the function of a wetland. A total of nine functions were included in the MnRAM assessment for the Pine Island Bog:

Maintenance of Characteristic Vegetative Diversity/Integrity
Maintenance of Hydrologic Regime
Flood/Stormwater Attenuation,
Downstream Water Quality
Maintenance of Wetland Water Quality
Shoreline Protection
Maintenance of Characteristic Wildlife Habitat Structure
Maintenance of Characteristic Fishery Habitat
Maintenance of Characteristic Amphibian Habitat.

A separate MnRAM assessment was conducted for each vegetative community at the bog.

The results of the MnRAM assessment were used to develop compensatory mitigation requirements for the proposed project. Since in-kind reclamation of the bog was proposed by the Applicant and required by the Saint Paul District, the MnRAM assessment was used primarily to determine compensatory mitigation for temporal impacts realized over the life of the mining operation (30 to 50 years).

The compensatory mitigation plan for the project includes the following components:

Mitigation for Temporal Impacts

·Installation of plugs in existing ditches to restore hydrology to previously drained areas.

·Bog habitat enhancement on a 40-acre parcel of peatland by controlling the encroachment of woody brushland species and maintaining open bog conditions.

·In addition, when mining is complete at the site, the ditches urrently bordering the site will be blocked and abandoned to restore wetland hydrology to the entire 840-acre mining area and the 320-acre area directly north of the mining site. Portions of the site have been impacted by various attempts at agriculture and peat harvesting since the turn of the century. All of these activities occurred prior to the Clean Water Act. The site is currently ditched on three sides (north, east, and west), which is one of the reasons why it was selected for peat harvesting.

·Construction of sedimentation basins to control the pH of water from the mine site and monitoring of mercury concentrations in the discharge water

Restoration of Mined Areas and Sedimentation Basins

·Mined Areas. All mined areas will be restored to functioning *Sphagnum* wetlands as the peat fields are depleted of horticultural quality peat, resulting in staged restoration of the entire site. The restoration approach proposed for the mined areas is based on research conducted to date on *Sphagnum* dominated peatlands demonstrating the potential for re-establishing native vegetation on harvested or disturbed sites by plugging ditches to restore hydrology, and then spreading moss and other plant fragments, collected from natural, undisturbed, "donor" sites, on bare peatland surfaces (Figure 3). Donor sites are open *Spahgnum* bog areas located as close to the restoration site as possible. Plant collection is done in the spring with a rotivator while the ground frost is close to the surface to prevent the machinery from sinking and to avoid destroying the roots of the plants and the peat structure of the bog. When spread on the reclaimed area, the shredded plants encourage the primarily vegetative reproduction of *Sphagnum*, and allow associated peatland plant establishment from seeds, rhizomes, and other plant structures, included with the donor vegetation. This restoration method, often referred to as the "Canadian Approach" or "North American Approach", has proven effective in Canada in providing "in-kind" and "on-site" mitigation for peat-mining impacts. The technique has been shown to very successful in Quebec and New Brunswick, Canada. Regionally, the University of Minnesota's Natural Resources Research Institute initiated the first large scale restoration project in northern Minnesota this past winter/spring (shown in Figure 3). Although

Figure 3. Equipment spreading donor material at site being reclaimed to *Sphagnum* bog.

there are general concerns with this type of restoration, the resource agencies are generally supportive of the methodology.

·Sedimentation Basins. Sedimentation ponds will be blocked and filled with peat material to restore hydrology. *Sphagnum* species will be established on these areas to restore them to functioning *Sphagnum* wetlands. The major difference from mined areas is that the sedimentation ponds would be filled in with peat material to restore the buffer between the mineral substrate and the surface where the donor material would be spread.

For more information on peat mining and regulatory issues in northern Minnesota, please call Tim Smith at (651) 290-5432.

(Tim Smith is a senior project manager in the St. Paul District Regulatory Branch, where his interests include wetland functional assessment and watershed planning.)

Surface Coal Mining of the Illinois Basin

Michael Ricketts, Russell Retherford,
Sam Werner, and George DeLancey

The 20,000 square miles of surface and underground minable coal reserves covered by the Newburgh Regulatory Field Office of the Louisville District, includes areas in southwest Indiana, western Kentucky, and southeast Illinois. According to the most recent statistics, approximately 85 million tons of coal was produced in this area in 2002, making it one of the most productive coal fields in the country. Although portions of the reserves formerly mentioned are obtained through underground mining techniques, this article will discuss surface mining techniques and its impacts on aquatic resources.

Surface mining in this area is accomplished by one of two methods, truck/shovel or dragline operations. Mines in this region commonly range in size from 200 to 10,000 acres, of which 20 - 600 acres can be mined in any given year depending on geology, market conditions, equipment, and method of mining.

Truck/shovel operations begin the mining process with an initial excavation (box cut). The first step in the mining process is to remove the soil layers and stockpile them for later distribution. Secondly, blast trucks and drill rigs are then used to break up the geological consolidated overburden in preparation for removal to the depth of the coal seam. Shovels are utilized in all phases to remove the soil, the consolidated overburden, and the underlying coal. After the coal has been removed, this routine starts again, and the overburden from the subsequent pits fill in the currently open pits along with distributing soil for reclamation purposes. This process continues until the economically minable coal in that particular field has been extracted.

Dragline operations, commonly used on larger acreage fields, differ from truck/shovel operations in that they additionally employ a large excavator known as a dragline to remove blasted overburden. The dragline can weigh in excess of 6 million pounds with a 300-foot boom and can have a bucket 30 to 150 cubic yards in capacity (Figures 1 and 2).

The coal in this region, which is bituminous, is found in a geologic formation known as the Illinois Basin. The coal fields are found in rocks of Pennsylvanian-age formed in a nearly spoon shaped depression that covers a portion of Indiana, Kentucky, and Illinois. The surface geomorphology overlaying this coal field region reflects glacial activity in many locations. The northern portions of the coal field regions of Indiana and Illinois lie within the flat to gently rolling glacial till plain, which owes its configuration mostly to the Wisconsin glaciation, the most recent glacial advance. Coal deposits in this region tend to be small in size. Extending southward from the till plains, the eastern boundary of the coal field lies within uplands, deeply dissected with steep-sided hills, that missed the leveling affect of the glacier. Coal deposits in this area also tend to be small and scattered and are usually mined by smaller operations. Western portions of the coal field lying within western Indiana and southeastern Illinois, within the Louisville District boundary, are located in areas of gently rolling hills and flat river valley floodplains. The far northern parts of this area lie beneath glacial sediments while the southern portions lie beneath glacial outwash, lacustrine (lake bed) sediments, or loess. Coal deposits within this area are very large. Since the present location of the Ohio River marks the southern most limits of glaciation, portions of the western Kentucky coal field lie beneath lacustrine sediments or loess while other portions are steeply dissected bedrock parent material. Like it's neighboring area north of the Ohio River, these coal deposits are very large. The glacial geomorphology of the Illinois Basin contributes to numerous streams and wetlands that can be affected by the large

Figure 1: The dragline known as "Gentle Ben", deposits overburden while working a pit. Note the Caterpillar D-11 bulldozer for scale at the base of the dragline (see arrow). Other equipment used in these operations includes 250-ton dumps, articulating dump trucks, wheel loaders, and hydraulic excavators with 3- to 5-cubic yard buckets.

Figure 2: The overall view of the pit shown in Figure 1.

coal mining operations. Mines that include areas of vast bottomland may affect large areas of wetlands and multiple types of waterways, while mines in more dissected areas may affect ephemeral and intermittent streams. Regardless, each mining activity will likely result in the relocation of streams and/or wetlands.

Wetlands in this region can be comprised of bottomland hardwoods consisting of willow-cottonwood, cypress-tupelo, and hard mast producing oak-hickory stands to emergent and prairie wetlands. Low gradient streams in Western Kentucky are located in lacustrine deposits and are quite sinuous. Streams located in heavily dissected areas where bedrock is the controlling feature, display riffle/pool characteristics in addition to sinuosity. Extensive agricultural pressure in Indiana and Illinois has resulted in a significant number of streams with sinuosity, riffle-pool, and riparian buffer features being altered into straightened sediment-laden agricultural ditches. Significant head cutting has occurred within these streams due to increased velocities caused by increased grades as the streams constantly seek equilibrium. Streams of the Western Kentucky region tend to be characterized by better ecological conditions than what is typically found in the southwestern Indiana and southern Illinois regions due to the pressures of agriculture.

Evaluations of the quality of the aquatic resources that are affected by these mining activities are not restricted to one methodology. Wetland and stream assessment protocols that have been utilized by applicants and reviewed by regulatory personnel include The Rosgen Stream Order Classification System, EPA Rapid Bio Assessment (RBP), Hydrogeomorphic Classification (HGM), Cowardin, Corps of Engineers Wetlands Delineation Manual (January 1987), and Best Professional Judgment with on-site investigations.

In determining compensatory mitigation, consideration is given to a functional assessment and on-site investigation of the aquatic resources where impacts are unavoidable. Pre-existing conditions, resource quality, opportunity for on-site versus off site mitigation, type of waterways and wetlands all factor in the determination of what is compensatory to offset the impacts to the aquatic resources. While on-site, off-site, and a combination of the two have been utilized in mitigation, on-site mitigation tends to be a problematic issue in this region as the coal companies often do not retain surface rights to the resources being impacted. While in-lieu opportunities are present in Kentucky, they have not been utilized to any real extent in this service region. While stream and wetland mitigation banks are in conceptual phases for this service area, they have yet to be established for utilization in mitigation. For more information on regulatory issues in this region, please contact Michael Ricketts at (812) 853-0472.

(Michael Ricketts is the team leader for the Louisville District Newburgh Field Office. Russell Retherford, Sam Werner and GeorgeDeLancey are Regulatory Project managers in the Newburgh Field Office.)

Surface Coal Mining in Southwestern Virginia

Annette Poore

Southwestern Virginia has seven counties in which coal has been mined or is actively being mined. The majority of Southwestern Virginia's coal is, however, mined in only two counties--Wise and Buchanan.

Typical types of mining in Virginia's coalfields include underground room and pillar, underground longwall mining, surface contour, surface auger/highwall mining, surface finger ridge removal, and a small percentage of mountaintop removal. The Virginia Department of Mines, Minerals and Energy estimates eighty percent of Virginia's surface mining, predominantly contour mining, is conducted on abandoned mine lands. Mining conducted on abandoned mine lands is commonly referred to as remining (Figures 1 and 2).

Figure 1

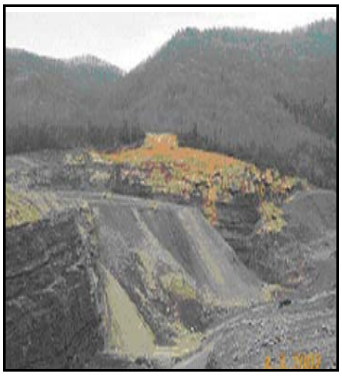

Figure 2

Figures 1 and 2 show remining of the Black Creek watershed (ranked Virginia's highest priority watershed under the Office of Surface Mining's Appalachian Clean Streams Initiative). This will reclaim pre-SMCRA disturbances that have degraded streams & wetlands as well as abating acid mine discharges from old deep mines.

Abandoned mine lands (AML) are areas that were mined for coal but were not adequately reclaimed prior to the passage of the Surface Mining Control and Reclamation Act (SMCRA). Recognizing that abandoned mine lands present hazards to human health and safety, and to the environment, SMCRA was signed into law in 1977 for the purpose of reclaiming and restoring land and water resources adversely affected by past coal mining. SMCRA established a tax on active coal-mining operations for the purpose of raising funds to support reclamation of AML. SMCRA established mandatory uniform standards for mining activities on state and federal lands, including a requirement that adverse impacts on fish, wildlife and related environmental values be minimized.

The AML program has effectively reclaimed many abandoned mine lands in Southwestern Virginia. However, the most cost-effective time to reclaim AML is when an active mining operation is in the area, when operating equipment and excess spoil are readily available. Remining AML provides an opportunity to restore lands that were adversely impacted by pre-law mining.

Most streams impacted by coal mining in Southwestern Virginia are 1st & 2nd order high gradient streams with bedrock, cobble, or gravel substrates. The streams vary from steep (typically 4-10% gradient), relatively straight reaches dominated by step pools to channels that are less steep (2 - 4% gradient), have greater sinuosity and are dominated by riffles and pools (Figures 3 and 4) Most of these streams were heavily impacted by pre law mining operations. Remining operations that incorporate natural stream designs based on sound fluvial geomorphic principles can be self-mitigating.

Figure 3. See next figure.

Figure 4

Figures 3 and 4 show streams affected by mining in Southwest Virginia, which are typically 1st & 2nd order, high gradient streams with bedrock to cobble substrates.

Stream channel relocations are required when the coal to be retrieved lies under the stream and/or are associated with the construction of hollow fills. Typically, perimeter diversion ditches and sediment ponds are installed, stream flow is diverted to the perimeter ditches (Figure 5) while active mining and/or hollow fill is being constructed. Fills are stabilized with new stream channels constructed after the first growing season and riparian areas are replanted after the new stream channels are constructed.

In most mining operations (underground mine, surface mine, or associated facilities such as preparation plants, etc.), drainage control is installed prior to any mining. Generally, a combination of drainage control devices is used to convey drainage to sediment basins. Whenever possible sediment ponds are constructed on mine benches, however, when this is not practical the sediment ponds are sometimes located in streams or wetlands. Other jurisdictional activities on mine sites include culverted stream crossings and stream channel relocations.

Figure 5. Streams are typically diverted around active mining sites via perimeter ditches.

To assess stream conditions the Norfolk District uses EPA's Rapid Bioassessment Protocols for use in Wadeable Streams and Rivers, the Eastern Kentucky Stream Assessment Protocol (EKSAP) (see Aquatic Resources Newsletter Vol 2, Issue 1, Spring 2003 for more information) and the West Virginia Stream Condition Index. If we determine that the proposed reclamation does not fully offset the impacts associated with a project, additional mitigation is required. Mitigation may be on-site, off-site, in-lieu fee or any combination of provided the total mitigation package ensures that project impacts are minimal. There is no mitigation bank currently serving the coalfields of Southwestern Virginia. We are currently in the process of having the EKSAP validated for use in Southwestern Virginia. Until the protocol has been validated for use in Southwestern Virginia, outputs are being viewed as supportive information. The most common type of compensation is on-site construction of streams and wetlands (Figure 6). However; the in-lieu fee program is becoming increasingly popular (four applicants have proposed payment of in-lieu fees since January 2004). Our project managers prepare a stream assessment form, which is forwarded to our Trust Fund Administrator (TFA). The TFA prepares a quote based on a formula that estimates what it would cost the applicant to do the mitigation. Our TFA researches and estimates the cost of the following (as applicable) in preparing the in lieu fee amount: Site identification and search; land

Figure 6. Compensatory mitigation in the Black Creek watershed includes construction of wetlands as passive treatment of acid mine discharges.

price; land price premium/availability; closing costs, subdivision survey; project design; equipment mobilization; clearing; excavation and earthwork; wetland surface regrading and preparation; removal and disposal of excavated material; planting; monitoring hydrology and plants; construction management and consulting; risk of failure, contingencies; over head to sponsor; long term stewardship; and any other potential costs that may apply.

(Annette Poore is a project manager in the Regulatory Branch, Norfolk District. Her primary interest regarding coal mining issues is achieving appropriate mitigation for the 404 discharges into Waters of the U.S.)

Phosphate Mining in Florida

John R. Hall and Chuck Schnepel

The State of Florida provides a home to several types of mining including phosphate, aggregate (limestone, sand, shell), peat, heavy metals and certain clays. This article will address only one of those types - phosphate mining.

Phosphate deposits were first discovered by Captain J. Francis LeBaron, while surveying a planned cross-Florida canal in 1881. Captain LeBaron was a civil engineer and at one time served as chief of the Army Corps of Engineers. His find consisted of pebbles of phosphate in the Peace River south of Fort Meade. By 1900, phosphate mining was one of the leading industries of the state along with lumbering and turpentine production.

Current techniques in phosphate mining have come a long way since 1900 when picks and shovels were supplemented with steam shovels. Phosphate reserves are located in the central portion of Florida known as Bone Valley. Bone Valley stretches from Polk County southward through portions of Hillsborough, Manatee, Hardee, Sarasota and DeSoto Counties. Current phosphate mining operations usually cover from 7,500 acres to over 15,000 acres. Land cover ranges includes upland forests, agricultural lands (primarily row crop, citrus, and ornamentals), pasture, and isolated and adjacent wetlands (both canopy and herbaceous).

Since the phosphate ore is found between 15 to 40 feet below the surface of the ground, the surface features must first be removed. The surface communities are removed by large bulldozers, which then pile the vegetative material in windrows to one side of the operation. Large electric draglines then remove the overburden in long linear cuts down to the phosphate matrix sidecasting the overburden material in linear mounds. Once the phosphate matrix is encountered it is excavated and placed into an adjacent, previously dug shallow pit, where high-pressure water cannons discharging water at the rate of 14,000 gallons a minute, pound the matrix into a slurry. A dedicated piping system then pumps the slurry to a processing plant where the phosphate is recovered.

At the processing plant, a process known as beneficiation separates the sand and clay from the phosphate rock. Screening removes the largest particles of phosphate rock and the slurry is then further processed separating the clay faction. Waste clay is pumped to large (300 to 1,200+ acre) holding ponds known as clay settling areas. Sand and sand sized phosphate particles are generally processed through a flotation methodology, which utilizes chemical reagents, water, and mechanical mechanisms to separate the sand and phosphate. Sulfuric acid is one of the reagents used in the processing of phosphate into a soluble form. This process produces gypsum in large volumes, which typically is stored in lined mounds over 150 feet in height and covering hundreds of acres. Any remaining sand is pumped back to the mine where it is utilized in reclamation of the linear mine cuts.

Prior to any work at the mine, a ditch and berm system is constructed around the entire mining unit. This not only protects the surrounding area from turbidity discharges but also captures water from mining operations as well as rainfall events. These construction measures allow for the reuse of 97% of the water at the mine site.

Currently, phosphate miners avoid affecting first order streams and high quality adjacent wetlands within the 25-year flood plain. Central Florida is relatively flat with only minor elevation changes over hundreds of feet. Wetlands being directly affected include isolated depressions as well as forested communities. Adjacent systems affected include depressional marshes, scrub shrub, wet prairies, low pine flatwoods, and hardwood forests.

Mining impacts are evaluated within the Jacksonville District by a qualitative tool called the Wetlands Rapid Assessment Procedure or WRAP. This methodology had its beginning with the South Florida Water Management District (SFWMD), which developed it for mitigation compliance purposes. Numerous agency representatives worked with SFWMD providing additional information for incorporation into the WRAP model. The WRAP model tries to capture information about the following natural attributes of the environment:

1. Fish and wildlife utilization;
2. Vegetative community-overstory;
3. Vegetative community-ground;
4. Hydrology; and
5. Water quality amelioration.

These attributes are regionally calibrated by an interagency team for each attribute with scores ranging from 0 to 3. The scoring for all attributes are averaged and then modified by factors related to landscape position, temporal loss, risk of failure and possibly uniqueness in the watershed.

Currently, the majority of the existing mines are all within one watershed--the Peace River watershed. The industry has been providing in-kind replacement for all wetlands impacted within the reclaimed mined unit. The reclamation of the mined areas also contain a mosaic of isolated wetlands similar to the natural landscape of this region. All reclaimed wetlands are noted on mitigation plans, which accompany the Department of the Army permits. Currently, all mitigation is provided on-site.

There are thousands of acres of unreclaimed phosphate mined areas. The State of Florida has a program, which was intended to

fund the reclamation of these areas. However, funding has not been consistently provided by the State legislation. Most recently, a mining company has proposed a mitigation plan, which provided for appropriate wetland reestablishment over approximately 50 acres of unreclaimed mine areas. Federal resource agencies agreed with the Corps determination that this proposal would greatly benefit the downstream wetland communities.

Jacksonville District's processing of applications for phosphate mining is extremely challenging due to numerous environmental concerns and the many endangered and threatened species presently utilizing these lands. We continue to expand our knowledge based on new information and technology and ecosystem management by watersheds. We strive to provide a balanced range of hydraulic conditions characteristic of a healthy watershed in the processing of phosphate mining applications.

Phosphate mining is an important industry to the State of Florida providing an extremely valuable product to the nation and the world. We look forward to continuing our review and processing these applications in an objective manner. For more information on phosphate mining and the Corps Jacksonville District, please call Charles A. Schnepel at (813) 840-2908.

(John R. Hall is Chief of the Regulatory Division, Jacksonville District, and Charles A. Schnepel is Section Chief, Jacksonville District.)

Also of Interest

On May 7, 2004, Corps HQ issued a new guidance document titled Mitigation for Impacts to Aquatic Resources from Surface Coal Mining. It's purpose is to provide supplemental guidance for more uniform and flexible implementation of compensatory mitigation requirements and policies for unavoidable impacts to ephemeral, intermittent and perennial streams affected by the permanent impacts from surface coal mining activities. It discusses making decisions within a watershed context and allows some flexibility to accept out-of-kind mitigation (e.g., removal of straight pipes and the discharge of pollutants) as part of a larger compensatory mitigation plan that also includes other activities such as bank stabilization, channel reconstruction and re-creation of riparian habitat. The document may be found at http://www.usace.army.mil/inet/functions/cw/cecwo/reg/NWP21guidance.pdf *(Katherine Trott)*

Mitigation Action Plan Update. The Federal Interagency Mitigation Action Plan (MAP) team is continuing to work on and finish up 2003 and 2004 action items and has initiated some research on 2005 items. The site-kind guidance was put out on the Federal register notice, and the MAP team is currently evaluating comments on this document. The MAP team anticipates this document will be finalized and distributed this Fall. The MAP interagency team is currently working on developing guidance on the use of preservation and buffers in compensatory mitigation. The team is also working on a document on difficult-to-replace wetlands in accordance with the National Research Council recommendation (in their report on compensatory mitigation published in 2001) that these aquatic resources should be avoided to the extent possible. These documents will be circulated for review by the field prior to their finalization. The MAP schedule calls for all three of these guidance documents to be completed by the end of 2004.

Measuring Mitigation: A Review of the Science for Compensatory Mitigation Performance Standards has been completed as has a draft of the *Stream Mitigation Compendium. The Stream Mitigation Compendium* is a technical resource document that can be used to help identify appropriate impact and mitigation assessment tools for activities affecting streams. These documents is available for review on the MAP website at http://www.mitigationactionplan.gov/stream%20comp%20page.htm. In addition to working on these guidance and technical documents, Headquarters is working with the MAP interagency team and other agencies to identify existing mitigation databases that could be shared to improve regulatory decision-making.

In May 2004, a "National Symposium on Compensatory Mitigation and the Watershed Approach" was sponsored by the MAP team in Washington, D.C. The purpose of this symposium was to elicit information from experts around the country on how to use a watershed approach for making compensatory mitigation decisions in the Section 404 program. The symposium was hosted and facilitated by the Environmental Law Institute. Symposium background reading and presentations are posted on the ELI website at http://www.eli.org/research/watershed symposium.htm. Guidance on a Watershed Approach to Compensatory Mitigation decisions is scheduled to be completed in 2005.

The next Stakeholder Forum will be held in Tampa, Florida. The purpose of these forums is to provide a forum for a broad range of stakeholders to comment on and discuss the National Mitigation Action Plan (MAP) process, products in development, and anticipated work in order to inform efforts to improve federal compensatory mitigation. Results of these forums are posted on the mitigation action plan website. *(Meg Smith)*

Court Cases. On April 5, 2004, the Supreme Court rejected three cases that sought to restrict the Corps authority to regulate wetlands. The court turned back appeals involving disputes over lands in Maryland and Virginia, which are considered part of the Chesapeake Bay system, and refused to hear the case of a Michigan man facing prison for destroying wetlands. The cases are NewDunn Associates v. United States Corps of Engineers, Deaton v. United States, and Rapanos v. United States. *(Katherine Trott)*

Changes to HQ. Since the last issue, HQ has welcomed Meg Smith from the Institute for Water Resources (prior to that Meg was in the Baltimore District Regulatory Branch), where among other duties she assisted the editing of this newsletter. Meg will be working on Administrative Appeals, Enforcement, the Endangered Species Act issues, and will be in Regulatory Community of Practice along with Mark Sudol and Kirk Stark.

Newsletter Communication

To comment on the newsletter, suggest topics, submit an article, or suggest events or articles of interest, please contact Bob Brumbaugh at:

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