TROUT AND TIMBER WORKSHOP

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Summary of Proceedings

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SUMMARY OF PRESENTATIONS

James Lynch: Research at Leading Ridge Experiment Station compared effects of A) total clearcut and herbicide treatment, B) cutting using BMP's, and C) control watershed on stream water quantity and quality. Treatment A increased stream discharge during summer (fewer low-flow days, increased number of peak flows), altered the stream thermal regime, and increased turbidity levels. Stream channel cutting and widening resulted from the increase in peak flows. Summer water temps increased 10C or more, with the duration of warming and the range of diurnal temperature fluctuation both increasing. Winter water temperatures decreased. Stream turbidity peaked three years after harvest and two years after herbicide treatment, possibly due to lack of maintenance of erosion control measures. Macroinvertebrate densities recovered six months after herbicide treatment.

Treatment B produced mean summer water temps about 1C higher than controls. Turbidity was slightly higher than in controls, mainly due to uprooting of some buffer trees by windthrow.

Recommendations included applying BMP's to intermittent stream channels as well, and increasing the riparian buffer zone to as much as 150 ft.

Andy Dolloff: Large woody debris (LWD) defined as greater than 5 cm diameter and 1 m long. LWD creates pools, forms "sediment" terraces that function in food production and trout spawning. Sediment was defined as anything deposited (not only fines). LWD creates a step profile in stream gradients, breaking up water velocities and channel scouring actions. Illinois fish and benthos and Alaskan salmonids all decreased in stream sections which were experimentally cleared of LWD. LWD is especially important as winter habitat.

LWD distribution depends on stream size and source material abundance. LWD stays where it lands in first order streams (not enough hydraulic power), has a clumped distribution in third order streams, and lies along channel margins in sixth order streams. Old growth forests (ex: Pacific Northwest) provide much more stream materials than second growth (ex: Southeast).

James Hornbeck: Forests have naturally "tight" nutrient cycles; not much is lost via streams. Timber harvest changes this. There is the potential for denitification and subsequent higher susceptibility to acid rain. Strip cuts 25 m wide, with riparian buffers, produced much less nutrient loss to streams than clearcuts. We know how to prevent significant changes in stream chemistry due to timber harvest; now we need to apply those techniques during harvest operations.

William Sharpe: Nutrient inflow to forest systems is through mineral weathering (rate unknown) and atmospheric deposition (minor), so inflow is limited. Outflow is from timber harvest, leaching, and streamflow. Timber harvest represents some calcium loss from the system, which could potentially pose a problem in the future. Monitoring of "Fish Run," a fishless stream with reduced pH and elevated aluminum, indicates that the soil water component contributes 25% of stream flow during storms. Global warming could increase soil temperatures and increase nitrification rates. The bottom line is that timber harvest, acid rain, and global warming can lead to nutrient deficiency and soil acidification, especially in nutrient-poor watersheds. Timber and trout interests should be on the same side of these issues, since production in both systems is potentially threatened.

Steve Moore: Stream fish populations exhibit wide annual fluctuations in abundance, so annual monitoring is often needed to assess true response to change. In Smokies streams, YOY rainbow trout density was inversely related to spring discharge (R square =.60). There appeared to be less impact on rainbow populations further upstream. Brown trout populations were higher in downstream sections of monitored waters.

Ray Morgan: Dr. Morgan's group was assessing Maryland trout distribution and abundance in relation to water quality and stream habitat. Trout populations, as indicated by depletion sampling, showed lots of variation during the three years sampled so far (88-90). The 1990 estimates appeared higher and may have been due to a newly lowered creel limit (2/day). Water temperature was significantly correlated with trout densities in 1988 and 1989. There were no significant correlations between trout numbers and dissolved oxygen, conductivity, and alkalinity. Densities of rainbow and brown trout and other fish were reduced where stream pH was below 6.4-6.5. Brook trout densities declined where pH dipped below 6.0. Stream gradient and substrate embeddedness were also significantly correlated to trout densities at least during some years.

Dick Rearden (for Cindy Huber): Highlights of the ongoing Apppalachian IPM Gypsy Moth Project were discussed. The moths were introduced to Massachusetts around 1869 and appear to move about 10-25 miles per year. Individuals have been trapped from across the USA. They can completely defoliate large forest areas; oak forests are especially susceptible. Present research of control methods is focusing on control effectiveness and non-target impacts (including aquatic systems). Control methods have included Sevin (phased out), bacterial treatment (BT), Dimilin, Gypchek (no non-target effects, but extremely limited production and high cost), pheromone disruption, and introduction of sterile eggs and pupae.

Lloyd Swift: USFS fire protection practices have led to suppressed reproduction and reduced diversity of some plant species. Controlled burns are being tested now to see if different site preparation methods can increase diversity, encourage nutrient cycling, and improve site productivity. Only the elevated material is burned; the soil and humus are to remain intact. Research has basically just begun.

Dan Boone: This plant ecologist for the Maryland Natural Heritage Program focused on the need to maintain biodiversity. The state's "Wild Lands" designation is aimed at restoring the old growth forests needed to maintain biodiversity. Timber mangement activities can lead to decreased stream base flows relative to that in old growth, increased stream sedimentation from roads, and increased pressures on native resources due to easy public access.

George Dissmeyer: We here today have a shallow depth of perception. Much of the sediment now in stream channels is the result from old land use in the late 1800's and early 1900's, when 90% of the South's land base was in row crops. In the last 30 years, improved land management (tree planting, better farming techniques) has allowed much watershed rehabilitation. Many streams now are simply cutting through the sediment deposits from times past. Forestry effects are just one factor involved in the complicated process of stream channel cutting and filling.

Jim Gracie: Much of the fieldwork for Leopold's book, Fluvial Processes in Geomorphology, was done in Maryland. The geomorphic and fluvial processes that shape stream channels were discussed and the Rosgen Stream Classification System was illustrated.

Cheryl Bryan: The Delphi technique was used to assess the attitudes of trout anglers (Virginia Trout Unlimited members), landowners (VA), and fisheries professionals (Southeast) concerning land use effects on trout streams. The ranking of "worst" to "not as bad" land uses was Industry, Urban Development, Roads, Forestry, Farming. Discussion of differences among user groups followed along with a recommendation for better public education on the issues.

John Moring: Results of three separate studies were presented. In the Oregon study, areas along four streams were clearcut with no buffer, four other watersheds were clearcut with buffers, and four were subjected to thinning and road placement. The group subjected to clearcutting without buffers showed significant biological and chemical changes relative to the two other treatments.

The second study (Alsea Watershed) compared streams in three watersheds: one completely clearcut, one with some clearcutting coupled with riparian buffers, and one control. The first treatment resulted in increased streamflow (27%), sediment (200%), water temperature, and water temperature variation, and lower dissolved oxygen (sometimes below 6 ppm in summer). The water temperature regime took seven years to recover. The two other treatments showed only slight variations in those parameters. Cutthroat trout abundance in the first watershed dropped drastically and didn't recover for seven years. Sculpin populations were "wiped out." Size of coho smolts and adults was smaller. Study conclusions were that buffer strips filter sediment and temper thermal alterations, provide wildlife habitat, and act as a "policeman" to loggers. Roads need proper design and maintenance to minimize effects.

The third set of studies followed Maine brook trout populations. When one side of a stream was logged, trout populations did not change because of groundwater input and 95% shading due to the untouched stream bank. On a second stream, a spruce budworm salvage cut removed 90% of watershed vegetation and 80% of the riparian vegetation. Brook trout disappeared as water temperatures approached 90F. Pools filled with sediment, and the invertebrate community changed.

Monte Seehorn Monte reviewed stream protection criteria and standards for southern national forests. He explained that during the late 1960's and early 70's , the USFS developed "Criteria for Watercourse Buffer Strips," based in large part on the data in Trimble and Sartz (1957) (Journal of Forestry 55 (5)). Most southeastern forest plans call for sediment buffers on both perennial and intermittent stream channels. Ground skidding was limited to slopes below 45% in most plans (range 35-55%). All forest plans call for shade strips along perennial streams, while some plans also require them along intermittent streams. Monte believed that forest plans "prohibiting" certain timber harvest activities use overly restrictive terminology and felt that each site should be evaluated individually as to optimal harvest methodology. He stated that most clearcuts in this region are 20 acres or less and are not comparable to larger cuts done in the west. Those of you interested in the stream protection criteria summaries should ask Monte (404-536-0541) for a copy of his overhead transparencies.

Jim Burtis: This retired Director of the MD state forestry program explained the evolution of sediment control initiatives in his agency. Commercial forestry at present is a much "cleaner" practice than that done at the turn of the century. There are good sediment control standards in place, but they are only as good as their implementation. On a watershed basis, forestry practices often have minisscule effects when compared to other land uses. The agency pushed for the requirement of forest buffers during the Chesapeake Bay cleanup initiative of the early 1980's, and although the buffer requirement did not make it into regulations for the entire land base (strong agriculture lobby), it was incorporated in some ares. The state sediment control program now covers forestry operations as well.

Lloyd Swift: This Coweta Lab researcher stressed the correct use of terminology. A "buffer" is a generic term that is too often used without clear definition. Two kinds of streamside buffer strips are shade strips and sediment filter strips.

Eastern forest experiment station studies have shown that cutting to the stream edge generally increases stream temperature by 4-5 C in summer and reduces minimum temperatures in winter. Shade strips may also keep soil cool, thus maintaining cool groundwater input to stream channels.

In a recently (1985?) published study, Lloyd tracked sediment movement from roads in relation to slope, road treatment (bare, gravel, grass), and barriers (no litter, forest litter, brush barrier and litter). For bare roads, most sediment moved over 100 feet where there was no litter, stayed within 100 feet if litter was there, and stayed within 50 feet of the bottom of the fill if a brush barrier was in place. Roads without cover (gravel, grass) delivered heavy sediment loads. Lloyd felt that if grass could not be established quickly on a newly constructed road, it was not the proper time of year to be building it. He also suggested that the present national forest standards for sediment control strips may be overly restrictive.

The major sediment control problem area on forest roads is at intermittent and perennial streams crossings, where there is little room for erosion control measures. Lloyd felt that most of the sediment input came from these areas, which usually total less than 1% of the watershed.

Karen Sykes: Foresters are working with landowners to promote those tree species that best fulfill landowner management objectives (timber, aesthetics, wildlife production, etc.). New trees and deciduous trees have high nutrient demands and can filter up to 90% of the nutrients from agricultural runoff. Tree species management holds potential for helping to meet fisheries management objectives for interested landowners.

Jay Sheppard: A local Trout Unlimited chapter planted seedlings along a meadow section of the Pautuxent River (MD), where trout populations were 75% below those above and below the site. Long-term objectives were to increase shading, reduce bank erosion, and increase available cover. Willow and alder cuttings failed the first year (1986), but sycamore seedlings planted the next year have worked better. Problems encountered have included beaver predation and the need for weeding and also watering because of drought conditions. Bank erosion rates have been faster than expected, so the first row of trees may be affected too quickly, within 5 years.

Jim Gracie: When a stormwater detention dam blew out, it dumped 120 cu. yds of sediment into a Baltimore County brook trout stream. The subsequent unstable channel caused about 3000 yds more input into the system. The developer was ordered to restore the downstream reach and repair the dam ($1.2 million total).

Gracie's company evaluated the reach using the Rosgen system and restored it using a suction dredge, a backhoe, bank revetments, and streambank grassing. The most difficult task was obtaining permits to do the restoration work. The restoration of 1500 feet of stream cost somewhere around $200,000.

Steve Koehn: Steve's literature review indicated that there was a broad middle ground between too much and too little sediment in streams. In mitigating timber harvest effects in the streamside management zone, silviculurists should be concerned with erosion, shade, woody debris input, and other factors along with the economic return to the landownwer. The prescription has to be feasible. Buffer strips and selective harvest are two examples of management to increase woody debris input, while buffer strips also can minimize stream temperature effects. Sediment delivery can be controlled using forestry BMP's and improved technology for road building and erosion control.

Better planning, more thorough analyses, and reasonable expectations are needed of resource professionals across several disciplines. Watershed planning is needed, but is difficult where there are small, private tracts. Other needs include better supervision of logging (don't quit at the prescription stage), more timely advice from natural resource professionals, greater contact with private forest owners, and better incentives for landowners.

Jim Kochenderfer: Water quality effects from three watershed treatments were evaluated. The Clover watershed was farmed, the South Haddix logged following West Virginia BMP's (46% basal area removed), and the Fernow was a control. Sediment yield was highest from the farm, intermediate from timbering, and lowest from the control watershed. During large floods, treatment effects were swamped. The study supported the results of prior workshop presentations concerning nitrogen export, temperature increase, and sediment export.

Jack Webster: Stream ecosystem effects of logging on second order streams were studied at Coweeta Watershed 7 (cable logged 1977) and 14 (reference). Even before logging, sediment delivery was high during large storms. After logging, stream discharge was greater during the late summer and fall. Stream nitrate levels even in the disturbed watershed were still way below those seen in other regions of the country. Summer temperatures in the logged stream were elevated for about four years. Primary production was elevated, due to more sunlight, for about three years.

The organic matter budget of the logged stream changed. There was decreased input, increased output, accelerated turnover (more rapidly decaying leaf species), and resulting depletion of the instream storage of organic matter. The reference stream was more retentive because it had twice the amount of large woody debris (LWD). Smaller debris will enter the logged stream, but it will decay before it can stabilize the stream bed and retain organic matter. Increased sediment transport to downstream reaches was predicted due to the loss of LWD and its trapping ability. LWD will not be available in the system until the forest again matures. The effects of increased sediment input during current southeastern forest regrowth may have been mitigated by input due to the chestnut blight.