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In drought-stricken California, a method to save water by irrigating golf courses less expensively has to attract attention. The worst drought in California's history has forced attention on a relatively obscure method of water conservation — the recycling and reuse of sewage effluents. Now everybody stands to win as a result: a safe method of waste disposal for sanitary engineers, a sound means for recharging dwindling ground water supplies for the conservationist and hydrologist, and

a new source of less expensive water and fertilizer for the golf course superintendent.

Water shortages spur development

Now in its second year, the longest dry spell in California's history is giving strong impetus to waste water reuse. A concentrated campaign is underway to conserve this scarce resource, now critically short from inadequate snowfall in the eastern Sierra Nevada watershed.

Yet the problem is more basic than two years of drought in this populous state, or prolonged dryness throughout the Far West. "We are constantly using more water than is going back into the ground table", observes Dr. Ian Pepper of the University of Arizona Turfgrass Research Center. He points to "enormous interest" by golf course superintendents from all over the country in the work of his institution. Research results will be made public within one year, showing how far beyond consumptive use levels irrigation with sewage effluent may safely be carried on turfgrass-soil systems.

Effluent water— New hope for greener turf

by Harold LeSieur

Researchers at the University of Arizona check turfgrass plots installed in a lysimeter to determine the efficiency of turfgrass-soil systems in removing nitrogen under high effluent loads.



Primary and secondary sewage treatment (Figure 1) produce a disinfected, relatively clear effluent suitable for irrigation use. Tertiary, or advanced water treatment, is comparatively rare and limited generally to recovery of potable drinking water. Now, however, a form of tertiary treatment is seen to be possible using turfgrass-soil systems to "polish" sewage effluents while accepting irrigation water and fertilizer ingredients in the bargain. Until recently, this waste water effluent has been largely reserved for crop production, at irrigation levels only. Now, however, treatment by soil-turfgrass systems, to recharge underground water supplies at capacities far above simple irrigation needs, is the prize being sought.

Combining the promises of conserving a scarce natural resource, at a savings to potential users, with by-product fertilizer as an added bonus and in a manner promising to be non-polluting to the environment — this method has attracted attention for good reasons indeed.

In some cases this waste water is not merely attractive but a necessity. At Rossmore Leisure World, in Southern California's Laguna Hills, a local water company must supply irrigation water to huge Irvine Ranch, to famed "Lion Country" and to the Laguna Hills golf course as well. No outflow to the Pacific Ocean is permitted, so that all waste water must either be utilized or evaporated.

It was not until 1974 that the American Water Works Association, guardian of high quality standards in public drinking water, went on record urging waterworks officials to plan reuse of wastewater. Acknowledging that "pristine waters are rare, and diminishing," AWWA past president Henry Graeser observes that "It is only a matter of time until all water utilities will have to consider the question of waste water reclamation and reuse, at least to some degree." To this Graeser adds, "In the southwestern and western U.S. it is not a matter of time. These areas are living with the problems."

One of the most promising reuse methods, from a cost-effectiveness standpoint, tertiary treatment of

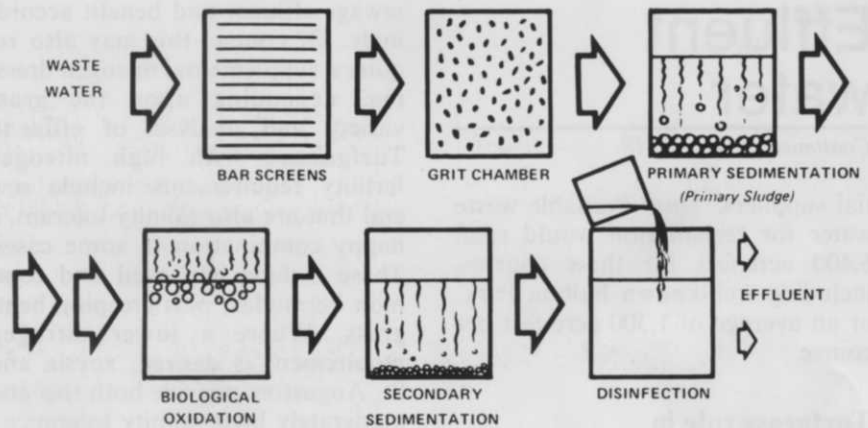


Figure 1 — Flow diagram of primary and secondary sewage treatment.

golf course turfgrass has a champion in Dr. Victor B. Younger of University of California, Riverside. His summary points to the basic need for this technology: "Water is a valuable resource, particularly in the West. This will continue to be true from here on out."

California mecca for reclamation

California is prolific in providing examples of existing and planned uses of sewage effluent for golf course irrigation. Arizona and Michigan also boast several courses using this technique, as do some other eastern states.

One of the earliest in California to treat its turfgrass in this fashion is the Corona National golf course, near Riverside, since the early 1950's. Corona's John Bell and Jim Noble are described as "veteran users", by Professor Younger of U.C. Riverside. In the "early days" of their project, Corona's staff consulted with Younger on an algae and chlorosis problem associated with sewage ponding.

A more publicized California recovery project, described as "one of the most successful demonstrations of the use of reclaimed water", is the Santee Country Water District near San Diego. Since the early 1960's, reclaimed sewage has been used to irrigate the Carlton Oaks golf course, plus a tree farm and

even to provide a popular lake for recreational swimming.

Less publicized is the Marine Corps Air Station at Twenty Nine Palms, California, which has utilized reclaimed effluent for over 10 years. At Furnace Creek golf course in famed Death Valley and at Whittier Narrows recreation area, both in Southern California, this economic method of irrigating is practiced.

As many examples again can be mentioned. According to Mike Yamada, a sanitary engineer with the Los Angeles City Bureau of Sanitation, the City of San Clemente has been doing this since 1957. Ventura City, he says, has 10 years experience in waste water use, and the La Cañada Country Club (near Glendale) can point to over 8 years actual trial of the technique. In his list, Yamada also includes the Moulten Niguel and Rossmore Leisure World courses, both in the Laguna Hills, plus the San Joaquin course in the huge Irvine Ranch.

Two courses in Hollywood's rambling Griffith Park are presently in the feasibility study stage, with estimated installation of waste water irrigation within a possible 6 months. Griffith Park will receive reclaimed water from the City of Los Angeles' Glendale plant.

According to the California State Department of Water Resources, San Diego courses are a good bet, with 5 different water treatment plants serving as poten-

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Effluent water

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tial suppliers. Total available waste water for reclamation would total 6,400 acre-feet for these courses, including well-known Balboa Park, or an average of 1,300 acre-feet per course.

Turfgrass role in "polishing" sewage

All types of plants are not equally well suited to irrigation with reclaimed sewage effluent. Fortunately, turfgrasses are among the best in this respect. They take up large amounts of the nitrogen, phosphorus and potash found in such waters. Generally, they can also be exposed to large amounts of boron without showing toxicity symptoms. However, all turfgrasses are not the same, and some are better than others. Salinity tolerance, for example, is highest for improved and common bermudas, creeping bentgrass, zoysia, St. Augustine and tall fescue.

Ornamentals, on the other hand, have a low tolerance to both salinity and boron. If such plants are to be used, a separate irrigation system using better water is recommended by Professor Younger.

In order for turfgrass-soil systems to function efficiently in waste water "polishing", they must perform a number of functions. In addition to taking up soluble fertilizer ingredients — nitrogen, phosphorus and potash — they must maintain satisfactory infiltration rates while effectively screening sediments. An equally important quality of turfgrass-soil systems has been demonstrated recently; namely, denitrification by microorganisms and bacteria. Thus, any nitrogen which is not utilized directly in feeding turf may be further eliminated by bacteria in the carbon content of grass debris and roots.

Naturally, a turfgrass variety with high nitrogen fertility requirement will remove most effectively this fertilizer ingredient from a given

sewage effluent and benefit accordingly. Of course, this may also require a supplemental nitrogen dressing, depending upon the grass variety and analysis of effluent. Turfgrasses with high nitrogen fertility requirements include several that are also salinity tolerant, a happy combination in some cases. These include improved and common bermudas, plus creeping bentgrass. Where a lower nitrogen requirement is desired, zoysia and St. Augustine provide both this and moderately high salinity tolerance.

To illustrate the nitrogen uptake possible, bermudagrass is reported to require 8 to 16 pounds per 1,000 square feet during a 12-month growing season. Annual ryegrass needs approximately one pound of nitrogen per 1,000 square feet per month during the winter season. These grass species, which are common to the Southwest, have a high nutrient demand and may be used effectively year-round for sewage effluent purification.

Potential users of renovated water for golf course irrigation can feel added confidence from the reassurance of Professor Younger. "If a golf course has available sewage effluent water," "it should strongly consider using it for irrigation. From 95 percent to 99 percent of all domestic effluents which have undergone secondary treatment are satisfactory for this purpose." To this he adds, "We have been researching this for years, and don't need more research. We know the method can be used effectively." Of course, Younger is the first to recommend a preliminary test of soil and effluent water source, before selecting proper irrigation rates and deciding upon a suitable maintenance program.

Does this literally mean that further research on this problem is unneeded? Not at all. Even Younger would like to see more data on variations in effluent waters and on salt tolerances of various turfgrasses and ornamentals. However, the technique of using turfgrass-soil systems for tertiary treatment of sewage effluents is a matter of agricultural engineering application — no longer one of basic research. Even so, work underway at several universities does show promise of

broadening knowledge in this socially-valuable field.

One of the more significant programs underway in the U.S. is that of the Turfgrass Research Center at the University of Arizona. As early as 1972, R. C. Sidle and G. V. Johnson of the University's Soils, Water and Engineering Department demonstrated that turfgrass can be irrigated with sewage effluent at rates in excess of plant water requirements and 95 percent purification efficiency, yet without hazard of ground water pollution from nitrogen.

Currently, a team comprising Professors William R. Kneebone, Ian Pepper (a soil biochemist from Great Britain) and the same Gordon Johnson is being funded by the State of Arizona. Specific objectives of this study effort, using turfgrass plots installed in a lysimeter is to determine the efficiency of turfgrass-soil systems in removing nitrogen under high effluent loads. Also, to determine which turfgrass species and cultivars are most efficient in filtering effluent and utilizing nitrogen. Treatments up to four times consumptive use will be evaluated. At the moment, Arizona's researchers are trying common bermuda, overseeded with rye grass during winter, and will monitor this over an entire year to determine variations between seasons.

The use of sewage effluent for irrigation has been well documented for production of food and fiber crops, and this work has served as a valuable back-drop to golf course application of this methodology. Researchers at Pennsylvania State University, University of Pennsylvania, Michigan State and the University of Arizona have demonstrated feasibility of utilizing sewage effluents for irrigating forage and small grain crops, or the safety of simple disposal in forest lands. A joint project at Michigan State University is currently demonstrating use of waste water to grow grass for cattle feeding.

At University of California, Los Angeles, Dr. Wade Berry is reported investigating the use of waste water for irrigation of both vegetables and ornamentals.

Of course, the six years of work

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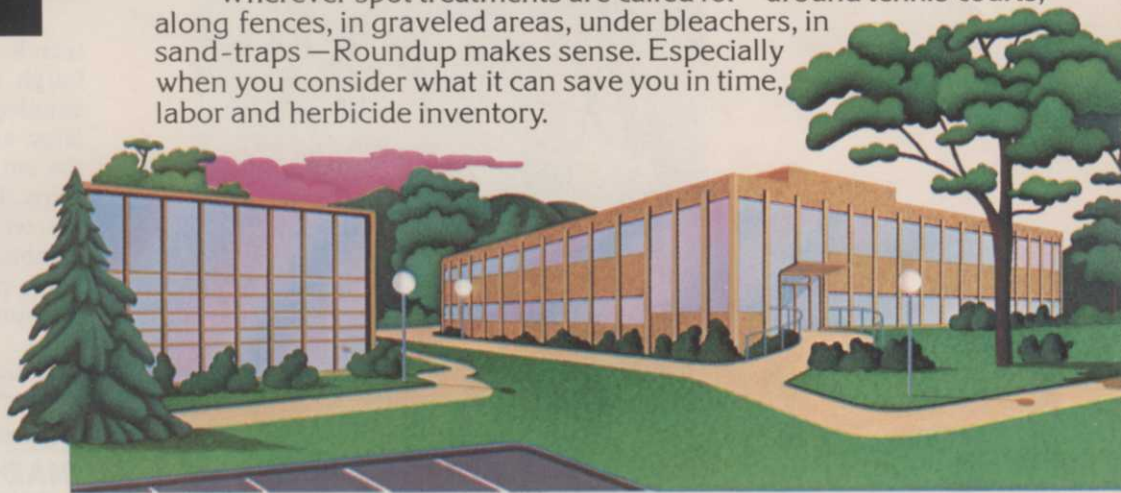
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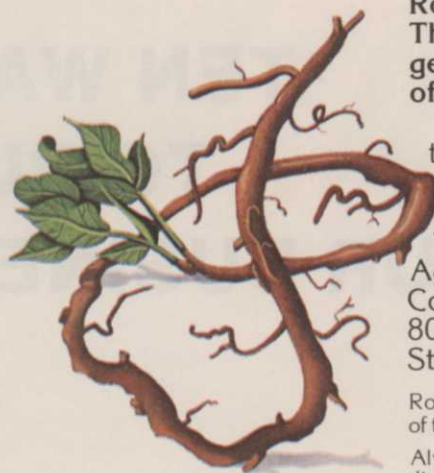
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TEN WAYS TO RUIN YOUR BUSINESS

Whether you own your own Green Industry business or are responsible for the non-crop vegetation management for a private or public organization, how well you manage can determine its success or failure.

The Bureau of Business Research of the University of Pittsburgh recently conducted a highly detailed survey of why businesses large and small fail. Following are the ten most common management traps. Being guilty of failing one of the ten major ones outlined, or a combination of several, can sink your profitable organization into oblivion.

KEEPING INADEQUATE RECORDS



The surest way to run afoul of accountants and tax collectors is to conduct your business with "scraps of paper." A drawer full of bills, a stack of receipts and notations on the backs of envelopes detailing orders is not sufficient.

Poor records lead to an absence of adequate information to allow you to judge the results of your operation. Inadequate record keeping was the greatest single cause of business failures unearthed. It was a major factor in nine out of every ten businesses studied. Managers did not know they were heading for trouble until it was too late.

IGNORE NEW DEVELOPMENTS IN YOUR FIELD



Doing things the same old way simply because they were once successful is a sure way to invite aggressive, up-to-date competition to take over. The report emphasized that "keeping abreast" was not only essential to growth, but

detailed a number of instances where failure to adopt new ways was a dominant factor in leading to the "out-of business" signs. One important method of keeping abreast of new developments is to read your business publications such as WEEDS TREES & TURF.

INCUR CUMULATIVE LOSSES



A trickle of red ink isn't much to worry about, or is it? At least 40% of the businesses studied discovered that the "little" leaks added up to a torrent. Add one unproductive crew to excessive waste in some other area: couple it to "minor" losses elsewhere, and the result can wreck havoc with your profit and loss statement.

HITCH YOUR WAGON TO ONE CUSTOMER



Signing a single big customer to the exclusion of others may look like an easy road to a secure future. Sod growers and tree farmers who concentrate on one large customer and lawn care companies that contract for one development will have no place to hide when the customer suddenly sours. The University of Pittsburgh report shows that three out of every ten bankrupt firms fell into this particular inviting trap.

BE YOUR OWN EXPERT



Trying to save money on professional advice can lead to costly mistakes, the survey shows. Experts usually do cost money, but specialized opinions minimize errors: for a sound basis for decisions.

Also consider the valuable assistance that can be provided by your County Extension Agent.

Operate solely on your own hunches and half-proven guesses and you could wind up making one or two that could literally destroy your turfgrass or shrubbery.

BUILD A FAMILY EMPIRE



Nepotism may be one way to keep your family in control, but beware. Unless your relative is at least as competent in his job as someone else you might hire, the practice of burdening a payroll with family members siphons cash from the till and squelches initiative in non-family employees.

It isn't only a question of the cash drain going out to a non-productive or lazy relative. Think what happens to other members of your team when conscientious, eager management talent finds the top of the ladder blocked.

FORGET ABOUT COST ANALYSIS



So long as the checkbook shows a balance, why bother? For one thing, the investigators proved that unless you know exactly what it costs to provide your service or produce your product, the matter of pricing is largely guesswork. Usually it boils down to "meeting the competition." But competition can only go so far in setting a price.

If you cannot provide your product or service at a profitable price, it is probably better, the experts agree, to drop it and let the competition go bust. If the competition can handle the product or service profitably, then something is wrong with your costs. Only careful cost analysis can pinpoint the faults.

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IGNORE YOUR COMPETITOR'S MISTAKES



Many business magazines detail glowing success stories. Meet a fellow manager or superintendent at a convention, and he is likely to tell you about the things he's doing right. But what about the ones that fall by the wayside. If they are in your Green Industry, it is a good idea to find out what happened.

The answers may be more revealing than studying — or worst yet, envying the success around you. One important method of keeping up is to take a look at the many agronomy and business courses offered at your local universities.

analysis" and that credit to some thinly capitalized companies in the study was surprisingly easy.

LET EVERYONE SHIFT FOR HIMSELF



The researchers cite several instances where partners were so busy trying to outsmart each other that otherwise profitable businesses were jeopardized by the intramural struggles. Uneven work loads on supervisory personnel, failure to delegate authority along with responsibility, unusual or unequal management privileges inevitably sap a management team of its enthusiasm.

Coordination comes from the top and the objectives and energies of your business must come from the same direction.

Failure to provide firm guidance along these lines results in either staff or crew bickering or a company figuratively set adrift. In either case, the management breakdown can prove disastrous.

There are other points in the Bureau of Business Research study: Failure to watch depreciation schedules on equipment, neglecting to provide for a competent successor to the present management, and a host of specialized reasons why particular businesses went bust. But the ten points listed here are applicable to any business, large or small.

Whether or not you are next on the red ink parade depends, in large measure, upon how well you follow or how well you avoid this checklist of ten common management traps. □

*Take a look at
the agronomy
courses offered at
your local
university.*

EXPAND BEYOND RESOURCES



An enthusiastic employee who signs up dozens of big orders can throw your business schedule into a tailspin if you aren't geared to increase your output. Likewise, a prosperous business gulping down smaller businesses whenever the opportunity occurs, can result in more problems with coordination than were dreamed of when the business was a single unit.

Again, if your business expands, or your responsibilities do, before you have a solid base for the old ones, you have expanded beyond your resources.

A really successful business, the study shows, grows within its means. The rate can be fast or slow, but it must have sound financial footing and, above all, the management talent necessary to consolidate new gains.

Also under this heading are such expansion moves as runaway borrowing to purchase little needed equipment. The report states quite frankly that some lenders lack "proper management and financial

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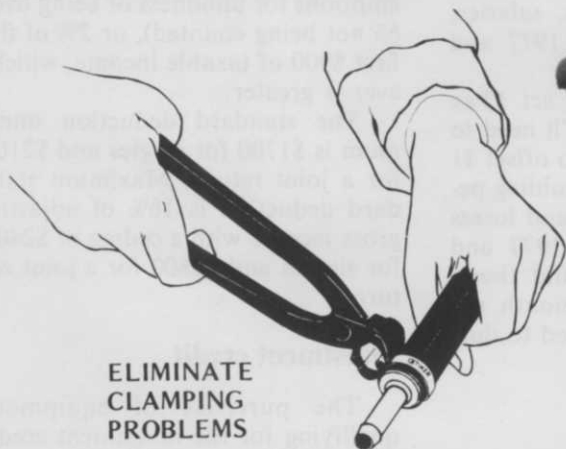
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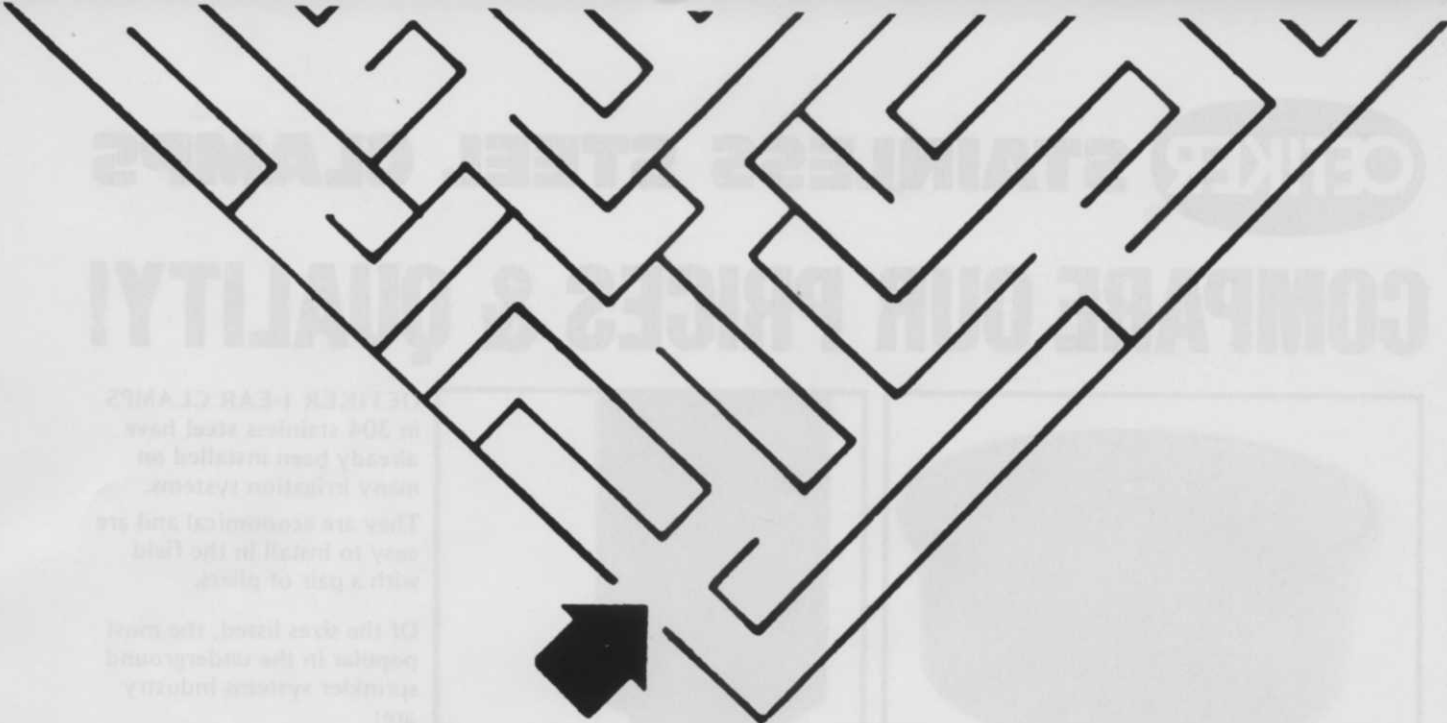


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Living in 1977 with the Tax Reform Act of 1976

by Joseph Arkin CPA, MBA

The Tax Reform Act of 1976 is the most comprehensive, complex and massive overhaul of our tax system that has ever been attempted. It affects you both as an individual and as a Green Industry businessman.

Some of the provisions enacted into law have proven to be unduly harsh and there are hearings being held at the time of this writing to enact legislation to mitigate some of the provisions of the 1976 Act.

Listed below are some of the more important features affecting the filing of your 1977 tax return:

Corporate rates

The reduced corporate rates have been extended through December 31, 1977. Corporations will pay 20% on the first \$25,000 of taxable income, 22% on the next \$25,000 and 48% on taxable income in excess of \$50,000.

Capital gains and losses

As an individual you'll be entitled to deduct \$2000 in capital losses against other ordinary income (interest, dividends, salaries, business profits, etc.) in 1977 and \$3000 in 1978.

As in the prior tax act (Tax Reform Act of 1969) you'll need to use \$2 of long-term loss to offset \$1 of ordinary income. The holding period for long-term gains and losses will be nine months in 1977 and twelve months in 1978 and thereafter instead of the six-month period we've been accustomed to during these many past years.

Individual rates

There hasn't been any change in the tax rates but all taxpayers having a taxable income of \$20,000 or less must use a new set of tax tables.

These new tables are based on taxable income as opposed to adjusted gross income as in years 1975 and prior. In 1977 there will continue to be a credit of \$35 per exemption (exemptions for blindness or being over 65 not being counted), or 2% of the first \$900 of taxable income, whichever is greater.

The standard deduction minimum is \$1700 for singles and \$2100 for a joint return. Maximum standard deduction is 16% of adjusted gross income with a ceiling of \$2400 for singles and \$2800 for a joint return.

Investment credit

The purchase of equipment qualifying for the investment credit will give rise to a 10% credit as a reduction against tax liability — this applies both to individuals and corporations.

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