OREGON WILDLIFE

September - October 1986

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The Cover

After years of controversy, hunting waterfowl with lead shot appears to be on the way out. Concern about eagles also eating the lead sparked action on the issue (see article on page 4).

Photo by Robert C. Fields

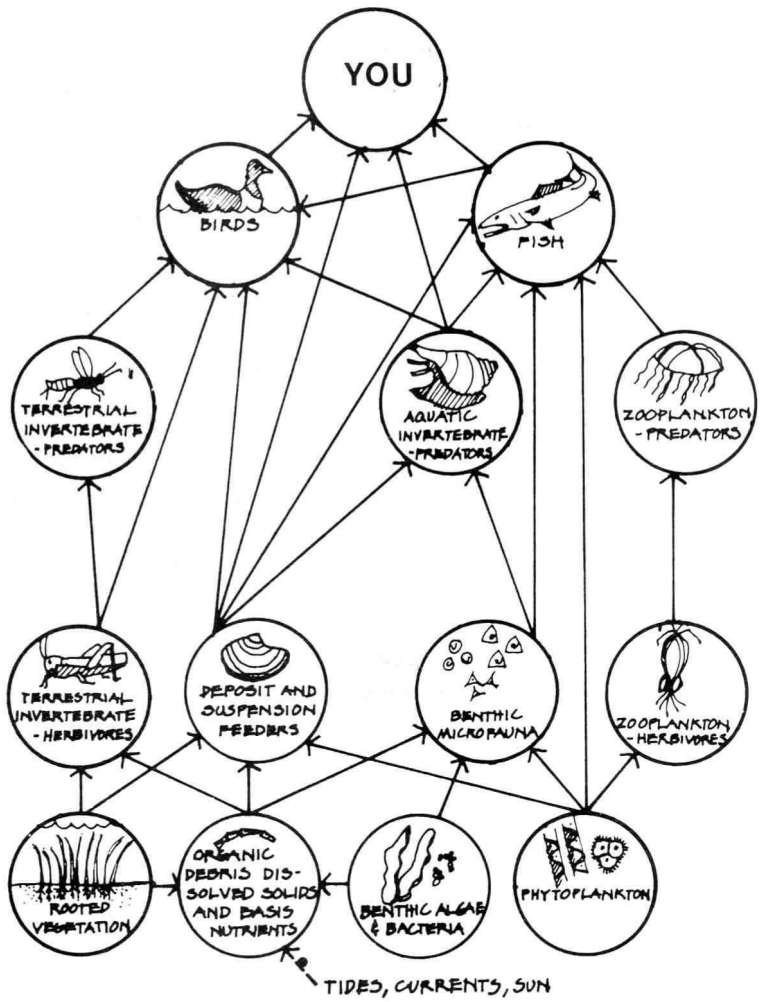
HUNTER EDUCATION PROGRAM

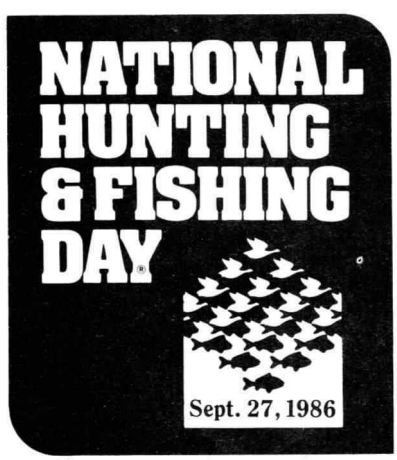
Months of June and July 1986

Instructors Approved	30
Total Active	1,198
Students Trained	932
Total to Date	321,231
Hunting Casualties	0

(Reported in 1986)

Answers to Estuary Food Web Diagram on Page 13





Commission Meetings

September 5	**Columbia River Compact-Lower River Commercial Salmon Season**
September 12	**Columbia River Compact-Review Commercial Seasons**
October 9	**Fish and Wildlife Commission general business meeting**

UPDATE

Sign Up Now For Hunter Education Class

Oregon law requires young people under 18 to pass a ten-hour Hunter Education course before hunting. Now is the time to sign up for these classes in your community.

For class information watch the local paper, contact city or county park bureaus or a Department of Fish and Wildlife office. Information on classes in the Portland Metro area is available on a recorded message by calling 229-6666.

Elkhorn Plan Adopted

A plan designed as the first step in a long range and on-going program to alleviate big game damage problems in Baker Valley of northeastern Oregon was approved July 28 by the Fish and Wildlife Commission.

Under the plan, the department is authorized to purchase or obtain long-term leases on five parcels of private property already being used for deer and elk feeding. These lands would be in addition to acreage within the Elkhorn Wildlife Management Area currently owned by the state.

The feeding program is intended to help maintain elk and deer herds at huntable population levels, while also preventing these animals from damaging agricultural crops.

Peregrines Are Back In Gorge

Peregrine falcons are being reintroduced to the Columbia River Gorge. The birds have not nested there for more than thirty years. Oregon's peregrine recovery program is a cooperative project of the Department of Fish and Wildlife and the U. S. Forest Service. Part of the funds used for the project come from state tax refund donations.

Did You Give, And Not Get?

If you gave ten dollars or more to the Nongame Wildlife Fund through your state tax refund donation, you are entitled to a free, fine art poster suitable for framing. To get your poster, write the department telling us how much you gave and where to send the poster. Your card or letter should be addressed to POSTER, PO Box 59, Portland, OR 97207.

The department has learned that some people thought the poster would be sent automatically once the donation was accounted in Salem. Not so. We must hear from the donor directly before a poster can be mailed.

Pigeon And Dove Seasons Start

Hunting seasons for pigeons and doves opened on the traditional September 1 starting date. The seasons will run through the month. Deer and elk bow hunting seasons, which began August 23, will continue through September 21. Statewide deer season begins October 4.

There have been several changes in deer and elk hunting regulations this year. Read your 1986 hunting regulations carefully before going afield. Most of the major changes are emphasized in green ink on the hunting synopsis.

LEAD SHOT - STEEL SHOT

ROBERT C. FIELDS

The GREAT METALLIC DEBATE

By Ken Durbin

Few issues involving waterfowl have stirred more emotion, controversy and confusion than the current donnybrook over the required use of steel shot for hunting waterfowl.

Some hunters, and others, believe steel shot should be mandatory for *all* waterfowl hunting. Others believe steel shot, as a solution, is worse than the problem it is intended to cure. Where does the truth lie? Probably, like most truths, it falls somewhere between the extremes.

Why steel? Why not lead? What's it all about, anyway? We will try here to review the problem, the issues, and recent events that will have a far-reaching effect on waterfowl, other wildlife and waterfowl hunting in the future.

One thing is a near certainty in this controversy. All pro and con arguments aside, events of the past several months will lead to waterfowl hunters using nontoxic shot nationwide within the next few years.

Ever since the shotgun was invented, it has been used to fire a cloud of small round shot. For more than two centuries that shot has been made of lead. Why? . . . because lead has an almost ideal combination of characteristics. It is heavy for its volume. It is relatively cheap. It has a low melting point, and can easily be formed into spheres by allowing molten droplets to fall through air into water.

When mixed with other metals, like antimony, lead can be hardened to maintain its shape when fired from a gun.

But is has one major disadvantage. It is poisonous to all living animals.

It is generally known that lead is toxic to man. The response to this threat has been efforts to reduce man's exposure by removing lead from gasoline, most paints, water pipes, etc. Fewer people, perhaps, know that it can and does affect wildlife.

Lead poisoning or "plumbism" has been recognized as a disease in waterfowl for more than a century. It has only been in relatively recent times, though, that a nontoxic alternative to lead has been available. Right now, the only commercially available alternate is steel.

The arguments center on just how effective soft steel really is as a substitute for lead. Some hunters believe the use of steel shot will result in more waterfowl lost to increased crippling than now succumb to lead poisoning. Some still believe that shooting steel shot will damage their guns and/or subject them to danger. Others argue that the estimate of 1.5 to 2 million waterfowl lost annually to lead poisoning is grossly exaggerated. And, of course, there are legitimate concerns about the higher cost of ammunition loaded with steel shot.

What about these arguments?

There is no question that differences exist between steel shot and lead shot. Steel is lighter for its volume than lead, which means the effects of air resistance are greater. In other words, it slows more quickly as it flies through the air. To offset this, ammunition manufacturers recommend using steel shot two sizes larger than would be used if it were lead.

JIM GLADSON

Because steel is almost immune to deformation on firing, it can be loaded to higher velocities. It starts from the gun faster than lead to help compensate for the fact that it slows more quickly. Because of these different characteristics, using steel shot takes a bit of relearning. Most authorities agree that the better a hunter is with lead ammunition, the harder it might be to learn to shoot as well with steel.

Also, because steel shot retains its smooth round shape, it flies more truly with fewer "fliers" which serve to spread lead shot patterns. For this reason, steel shot patterns are usually tighter and shorter than lead patterns fired from the same barrel, giving the shooter less margin for error.

As to effectiveness, a number of shooting efficiency studies have been conducted around the country in the last two decades. During that time, steel shot loads have improved, but overall, most studies find no significant crippling differences between hunters using steel shot versus those using lead shot.

What about gun damage? Early on in the development of steel shot loads, there were some problems with damage to gun barrels. Since steel shot is appreciably harder than lead, it can score gun barrels if it comes in contact on firing. Modern loads virtually eliminate this problem by enclosing the shot in a tough, thick plastic cup which prevents the shot from touching the inside of the gun barrel.

It is true that using even modern steel shot loads can, over a period of time, cause a slight barrel bulge just behind the choke. In many barrels of recent manufacture this does not occur, and when it does, amounts to only a few thousandths of an inch. The bulge is merely cosmetic and does not affect the shooting or patterning efficiency of the gun barrel.

The same bulge, by the way, can occur from shooting heavy

magnum lead loads. Some guns of older or foreign manufacture should probably not be used with steel shot. If in doubt, your gun manufacturer will be able to provide the best advice.

Cost? It is certainly true that in most areas, the average cost of a box of steel loads is higher than for a box of lead loads commonly used by waterfowl hunters (premium lead loads, though, are just as expensive as steel loads).

As the use of steel loads increases around the nation and within Oregon, the price might be expected to become more competitive. With increased demand, it is also reasonable to expect that shells in a greater range of gauges, shot sizes and load types will follow. Nothing stimulates technological development like demand!

Exactly what the losses of waterfowl to lead poisoning are is extremely difficult to document, but evidence continues to grow that these losses are substantial, and the 1.5 to 2 million annual loss estimates are not unreasonable.

Monitoring programs in Oregon have shown substantial levels of lead ingestion in waterfowl gizzards. In recent years, liver samples have also shown high lead absorption levels. Waterfowl that do absorb lead into their systems sicken and often die. That is simple fact.

The continuing argument over the exact degree of waterfowl losses to lead poisoning obscures the fact that ducks, geese and other wildlife are widely exposed to lead shot in wetland areas and that it is doing them no good.

As evidence on the effects of lead mounts, waterfowl managers across the nation have become increasingly concerned about the problem. Several states have already switched to steel shot for all waterfowl hunting, and others have committed to do so within the next few years.

In the West, many states have been reluctant to take such a broadbrush approach since our land base is so large, and a great deal of waterfowl hunting takes place in areas where hunters are not concentrated and where there is little likelihood of a lead poisoning problem. In Oregon, the "hot spot" approach has been favored.

Oregon's history with nontoxic shot dates to 1974 when the first steel shot zones were adopted for the Sauvie Island Wildlife Area, and for William Finley and Baskett Slough National Wildlife refuges. In 1975, Ankeny NWR was opened to waterfowl hunting under a nontoxic shot requirement, and Umatilla NWR was also added.

Many other states were following a similar pattern. But one thing lacking was any kind of a national set of criteria on which to base the implementation of nontoxic shot requirements.

Last year, the U.S. Fish and Wildlife Service undertook to develop a set of scientifically-based criteria. States were involved through each of the four Flyway Councils, and many interested sportsmen's groups and individuals also participated.

A year ago this month, the criteria were finalized and put into effect.

Oregon began monitoring under this program in the Fall of 1985, taking samples in five areas of the state. These were Multnomah-Columbia, Washington, Benton, Klamath and Lake counties.

Before the sampling was completed, and before any analysis was done, however, the ground rules changed.

While efforts were underway to deal with lead poisoning problems in waterfowl, concern was also developing over lead poisoning in bald eagles and other wildlife.

In response to this, last year the National Wildlife Federation petitioned the U.S. Fish and Wildlife Service, asking that a large number of counties across the country be designated as steel shot zones to protect bald eagles. Eagles can become lead poisoned by ingesting lead shot contained in the tissues of sick or crippled waterfowl, a major winter food source in many areas.

After review of the list of counties proposed by NWF, the service proposed its own somewhat reduced list of eagle protection zones. Among them was a portion of Klamath County in Oregon. Although no cases of eagle deaths were documented from Klamath County, the area was selected as a potential problem area due to its large wintering populations of both waterfowl and eagles.

Unfortunately, the new zone was proposed only a few months prior to the 1985 waterfowl season, leaving little time for sporting goods outlets to stock sufficient supply of ammunition loaded with steel shot or for hunters to adjust to the change.

Under a congressional amendment to the service's budget appropriations bill, the service is forbidden to implement or enforce nontoxic shot zones without the permission of the affected state. Because of the short implementation schedule, and because no serious problem with bald eagles had been shown in Klamath County, the Oregon Fish and Wildlife Commission denied permission for the new zone. Four other states also denied permission to implement proposed eagle zones.

In response to this, the NWF filed suit in federal court asking that FWS be forced to refuse authorization of a waterfowl season in 1985 in proposed eagle zones where state permission had been denied. The court ruled in favor of NWF. Given a choice between a steel shot zone in southwestern Klamath County or no season at all, the commission authorized the new zone.

In its ruling, the court also directed FWS to take all necessary steps to eliminate the threat of lead poisoning in eagles. In efforts to comply with this direction, the service announced a series of nontoxic shot eagle protection zones for 1986. In doing so, it notified the states that a waterfowl season would not be authorized in any of the selected areas where state per-

mission to implement was denied.

Portions of the state affected by the federal ruling are: the shore of the Columbia River between Bonneville Dam and the Astoria-Megler Bridge; the upper Columbia between Arlington and the Oregon-Washington border; Klamath County (except for Davis Lake) and Lake County west of Highway 395; a portion of Malheur County along the Snake River; and three federal refuges in the Willamette Valley.

No sooner had FWS published its list of eagle protection zone proposals for 1986, than the National Wildlife Federation again filed suit in federal court, this time demanding that lead shot be banned for all waterfowl hunting in the United States beginning with the 1987 waterfowl season.

A number of efforts to reach an out of court compromise to allow a phased, more orderly conversion to nontoxic shot by 1991 failed. NWF refused to drop its suit or compromise on its demand.

While all this was going on, several additional developments occurred. During the past year, the U.S. Fish and Wildlife Service has been updating a 1976 environmental impact statement (EIS) on the use of steel shot for hunting waterfowl. Their purpose was to incorporate a great deal of new information developed since publication of that first EIS.

The updated EIS incorporates information on lead poisoning in eagles as well as other wildlife species, and summarizes results of research on the subject completed since publication of the 1976 document.

A series of alternatives concerning the use of steel shot for hunting waterfowl were evaluated, but in the final draft, a position proposed by the International Association of Fish and Wildlife Agencies (which represents all state fish and wildlife management agencies in the U.S.) was selected as the preferred alternative. That position calls for gradual nationwide conversion to nontoxic shot for all waterfowl hunting by 1991.

S. BRUCE CRAVEN

Lead poisoning in waterfowl and other wildlife results almost entirely from the consumption of lead shot. Shouldn't we be willing to accept some change in our traditions for the resource that means so much to us?

A federal court hearing of the NWF lawsuit asking nationwide conversion by 1987 occurred late in June. After hearing all arguments and reviewing the final draft EIS prepared by the Fish and Wildlife Service, the judge dismissed the NWF suit, declaring it to be premature in view of the direction under proposal by FWS.

If all this sounds confusing and complex, I'm not surprised. A lot has been happening in the last two years on a variety of biological, political and legal fronts.

Although the current action goes farther than many believe necessary to substantially reduce lead poisoning problems in waterfowl and other wildlife, there is little question that many of our most popular waterfowl hunting areas are suffering problems with lead poisoning. There is also little question that a nationwide conversion to steel shot will largely eliminate the problem within a relatively short period of time.

It appears we had all better get used to the idea of using nontoxic shot for hunting waterfowl.

In areas like Sauvie Island, where steel shot has been required for more than a decade, hunter concerns have been found to be largely groundless. With a bit of practice, hunters *can* learn to be just as effective with steel shot as they have been with lead. Damage to guns *has not* been the problem that many feared it would be, and ammunition costs, while higher for steel than for lead, actually represent a fairly small part of the cost of hunting waterfowl.

The most compelling point — converting to steel will benefit waterfowl as well as eagles and other species of wildlife.

Studies have shown that most of the lead shot ingested by waterfowl in any given year was deposited during that same hunting season, so nationwide conversion to steel shot can nearly eliminate the incidence of lead poisoning in a very short time.

Lead poisoning in waterfowl and other wildlife results almost entirely from the consumption of lead shot. As sportsmen, there is a question we should each ask of ourselves. We are the cause of a problem that can be remedied. Shouldn't we be willing to accept some change in our traditions for the resource that means so much to us?

HUNTER

By Bill Hastie

Two men are hunting deer at dusk in Lane County. They are on connecting spur roads in a forested area. One hunter spots a deer in some brush, and fires. The bullet passes through the deer and strikes his hunting partner who is standing just beyond the deer, killing him.

A group of seven hunters surrounds a clear-cut in Linn County. One of the hunters fires at a deer in the clear-cut. The bullet strikes one of the other hunters across the clear-cut in the wrist.

Two bowhunters are hunting elk on a wooded hillside, working downslope about 50 yards apart. One of the hunters sees an elk ahead, draws his bow, and fires. The arrow strikes his hunting partner, who is standing between the shooter and the elk, killing him.

All of these hunting accidents have one thing in common: they probably could have been prevented if the victim had been wearing at least some hunter orange clothing.

In fact, hunting accident reports for 1982-85 reveal that 35 of the 45 accidents where hunter visability was a major factor (mistaken for game, in line of fire, swinging on game), probably could have been prevented by use of hunter orange clothing. That is about one-third of the total hunting accidents.

Hunter orange, also called blaze or florescent orange, is technically a bright orange material having a dominant wave length between 595 and 605 nanometers, an excitation purity of not less than 85 percent, and a luminence factor of not less than 40 percent. Huh? Technical descriptions are fine, but the really important quality of this color for hunters is that it can be seen in all light conditions except total darkness.

It is an immediate warning that "this is no game animal." And considering the curious things hunters have been mistaken for in the last four years (blue grouse, opossum, deer, elk, bear and coyote), it appears this early warning system is important. In addition, hunter orange can be recognized by hunters with color vision deficiencies — almost ten percent of all hunters.

... the really important quality of this color for hunters is that it can be seen in all light conditions except total darkness.

Does hunter orange work? To date, thirty-seven states and six Canadian provinces have established some sort of hunter orange requirement for big game hunters. Studies by the National Shooting Sports Foundation show that in states requiring hunters to wear some hunter orange (200 square inches average), hunting accidents where visibility is a factor, were reduced by 50 percent.

States requiring a minimum of 500 square inches to be worn on the chest, back and head reduced their accident rate in this category by 75 percent. Ten states also require hunter orange for small game and/or upland bird hunting.

In some states, turkey hunters display a blaze orange band above their blind to alert other hunters. So there is no doubt that wearing this color greatly reduces your chance of being the victim or the shooter in a hunting accident.

ORANGE

So why don't more Oregon hunters wear hunter orange? Some hunters believe that big game animals can identify colors, including hunter orange. While most of the research indicates that big game animals live in a world of blacks, whites and grays, some evidence does exist to the contrary.

One study by Deer Unlimited of America, Inc., a research and conservation group based in South Carolina, indicates that it is the solid color, any color, that deer can see. They recommend wearing patterned clothing — hunter orange broken up in a camouflage pattern. However, a few states have said that camo-hunter orange does not meet their requirements for big game hunting.

But the bottom line on this issue is whether or not your chances of harvesting a big game animal will be reduced by wearing hunter orange. And when we look at the states requiring hunter orange, not one of them responding to a survey by the Washington Department of Game reports any reduction in overall harvest and hunter success ratios. Even major big game states, such as Montana, Wyoming and Colorado, have noted no decrease in either category attributable to the hunter orange requirement.

One obstacle for Oregon hunters has been the general unavailability of hunter orange garments, even though the material has been around for twenty years or more. It is not easy to find acceptable blaze orange hunting clothing even in the larger metropolitan areas.

This can change if there is a demand, and the evidence shows that there should be a demand from hunters who want to avoid being involved in a hunting accident.

Oregon has so far left the decision of whether to wear hunter orange up to the individual. Many hunters have considered the wearing of this color as part of their responsibility as sportsmen to themselves and other hunters. More should adopt this philosophy. As hunters, all of us need to be a part of the solution to problems; mandatory laws are a last-resort solution.
also important. Hunter orange clothing is a tremendous aid in helping hunters maintain visual contact with one another.

In addition, hunter orange can be recognized by hunters with color vision deficiencies — almost ten percent of all hunters.

In no way should the wearing of hunter orange be a substitute for, or an excuse for, not following one of the cardinal rules of firearm safety - BE SURE OF YOUR TARGET. Hunter orange is simply an additional reminder to help the "other guy" remember that rule.

Hunting accidents are often caused by a lack of communication between hunting partners. Failure to plan a hunt, and hunt a plan is a big factor in many accidents. But not all of that communication is verbal. Visual communication is also important. Hunter orange clothing is a tremendous aid in helping hunters maintain visual contact with one another.

Experienced hunters know that, unless they know the location of their partners or other hunters at all times, they cannot determine their safe zone of fire. Any hunter who has seen even a short glimpse of hunter orange in the corner of his eye knows full well the value of this color.

The Redlegs Are Coming !
The Redlegs Are Coming !

BOB KUHN

A program to introduce a new upland game bird species in Oregon is gaining momentum, and appears to be on track for release of birds into the wild next spring. French red-legged partridge chicks have been hatched at the Department of Fish and Wildlife E.E. Wilson Game Farm north of Corvallis during this past summer. The first brood of chicks, totalling 970 birds, hatched Friday, June 13, followed by additional hatches over the next several weeks.

Department game bird biologist Ken Durbin says that traditionally unlucky day should mark the beginning of lucky days ahead for bird hunters in many parts of the state.

Biologists are still studying potential sites, but likely contenders for the first releases are Jackson County near Medford; the White River Wildlife Area on the east slope of Mt. Hood; and the Willamette Valley, according to Durbin.

The red-legged partridge is native to France, but has been introduced in other countries. It is a well-established game bird in England.

This bird closely resembles the chukar partridge in appearance, but differs in habitat preference. It is this difference that stimulated the Oregon program.

While chukar prefer dry, rocky canyons and steep slopes in eastern Oregon, the redleg should adapt to agricultural fringe areas with higher rainfall amounts, says Durbin.

"We believe this introduction has excellent prospects. The birds should do well in some areas where native birds do not."

This effort to bring redlegs to Oregon began in July 1985 with the purchase of 750 eggs from a game breeder in eastern Canada. From these eggs, the department established a breeding population of 500 birds at the game farm. The eggs being incubated and hatched this summer were from these Canadian imports.

The redleg program started last year with a $9,000 grant from the Oregon Wildlife Heritage Foundation. These funds covered the cost for purchase and shipment of the original eggs and modifications at the game farm. The foundation also brought a Canadian breeding expert to Oregon to review potential release sites and advise on propagation methods at the game farm.

About 5,000 French red-legged partridge chicks have been hatched at the Department of Fish and Wildlife E.E. Wilson Game Farm north of Corvallis.

BOB KUHN

The French red-legged partridge resembles the chukar, but prefers less rugged habitats. Introduction of this bird to some areas of western Oregon is planned for 1987.

Durbin says the foundation is continuing to accept donations that will in turn be used for support of the redleg program and other upland bird projects. Donations may be sent to the **Oregon Wildlife Heritage Foundation, Upland Bird Fund, PO Box 8301, Portland, OR 97207.**

The one-week visit by partridge expert Jean Ridel of Ontario, Canada was particularly helpful concerning innovations he suggested for the game bird production program, according to Durbin.

Ridel recommended that the old breeding facility, previously used for pheasant, be upgraded to allow artifical lighting and climate control. By manipulating the environment, game farm operators can bring the partridges to egg-laying maturity any time of the year, rather than just during the natural spring laying season.

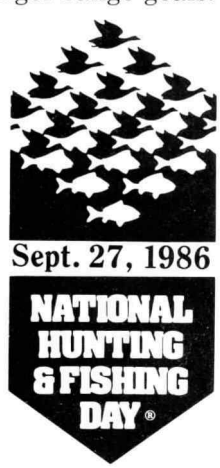
This will allow increased egg production and a uniform, steady egg flow. "It's a whole new area of propagation for us that also has the potential for use with the other game bird species we raise," Durbin said.

There will be other differences with the redleg program. Pheasant production at the game farm is geared primarily to release of adult birds prior to fall hunting seasons. The redleg introduction is aimed at encouraging natural production, says Durbin.

"Our objective is to get birds into the wild that will establish a self-sustaining population as soon as possible. We plan to get them out in spring after the winter pinch period, and hope they get with it and start producing," he said.

If all goes well, the first release of 5,000 birds next spring will be followed by 8,500 in 1988 and possible expansion after that to 10,000 birds annually.

"How far we go, and how fast depends a lot on our experience with this first group," says Durbin. "We still have some unknowns that we want to be certain about before we set longer-range goals."



The ESTUARY

At no time of night or day is an estuary the same as an hour before. The cycles of the tide give a visible sense of life to the place. This environment alternately has the look of a marsh or of a muddy wasteland, veined with meandering river channels.

This place where fresh and salt water mix is filled with a concentration of plant and animal life unequaled in richness and diversity.

There are 22 formally-classified estuaries in Oregon, ranging from the expansive Columbia outlet in the north, to the tiny Winchuck River estuary just north of the California state line. Each has distinct characteristics and qualities. All have extreme value as habitats for fish and wildlife.

The list of species that depend on estuaries for all or part of their life cycle would fill pages. From single-celled animals and plants to 300-pound seals, a complex web of life is formed. There are simply no other places like this.

Some animals are full-time residents. Clams, mud-burrowing shrimp, and a variety of other invertebrates, find their nitches, and generally stay put. Other species, such as the crab, are more mobile.

Studies have shown a continuous interchange of crab between the ocean and the estuary. The ocean is home, but the bay is a quiet sanctuary used for feeding and rearing.

The estuary is also a vital link for fish and birds that use this habitat for only part of their life cycle, i.e., anchovie and herring are considered ocean fish. Yet they enter the estuaries to spawn.

Salmon and steelhead smolts migrating to sea use the transitional nature of this habitat to acclimate to saltwater, and build strength for a long ocean voyage.

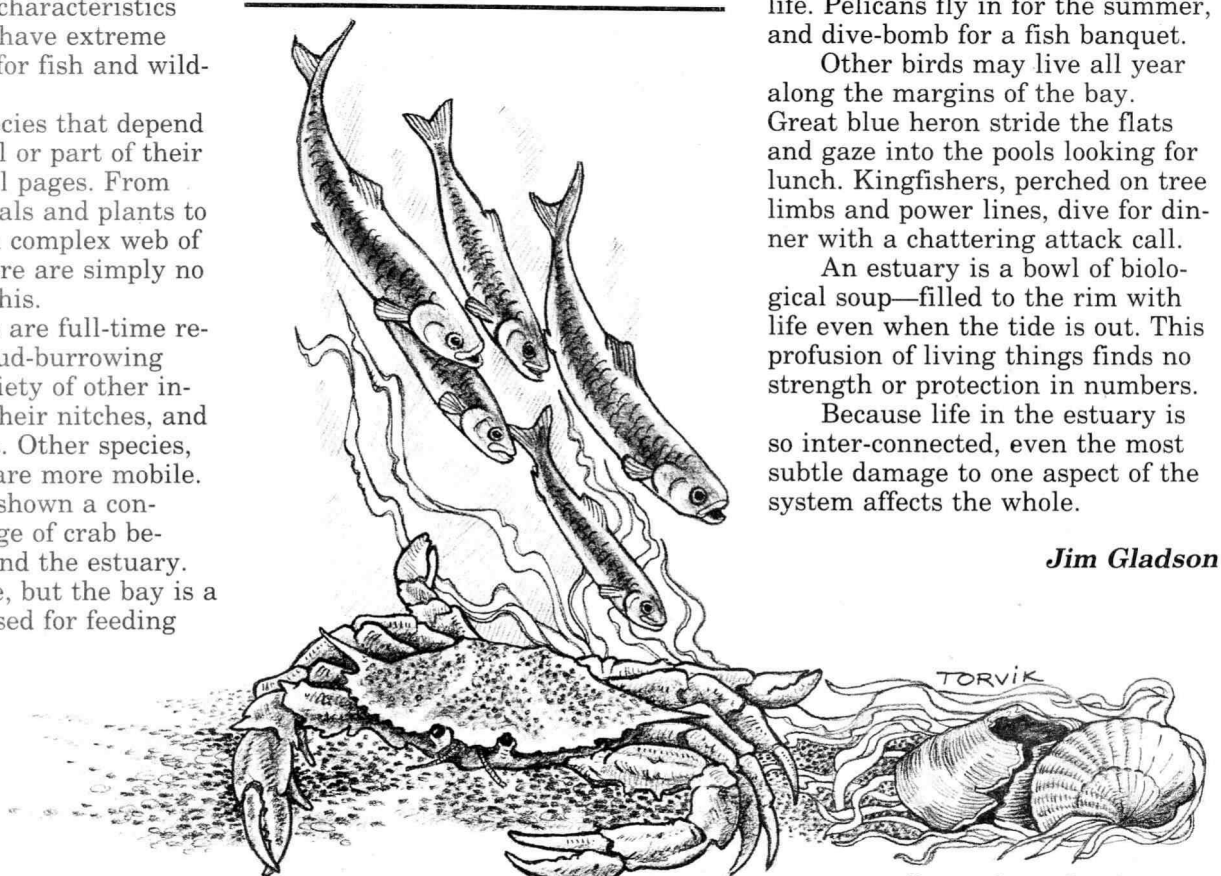
Migrating birds also use the estuary as a rest ánd feeding stop as they travel along the coastal flyway. Shorebirds probe the mudflats for buried morsels, while ducks and geese feed in open water or graze on shoreline and submerged plant life. Pelicans fly in for the summer, and dive-bomb for a fish banquet.

Other birds may live all year along the margins of the bay. Great blue heron stride the flats and gaze into the pools looking for lunch. Kingfishers, perched on tree limbs and power lines, dive for dinner with a chattering attack call.

An estuary is a bowl of biological soup—filled to the rim with life even when the tide is out. This profusion of living things finds no strength or protection in numbers.

Because life in the estuary is so inter-connected, even the most subtle damage to one aspect of the system affects the whole.

Jim Gladson



ESTUARY CONNECTIONS

A hawk eats a fish that eats a smaller fish that eats an insect that eats a plant that gets its energy from the sun. Eventually, all these animals and plants die, decompose and provide nutrients for other plants and animals. So it goes in the natural world—everything is connected to everything else.

Anything that happens to one link in the chain affects all the other links. And it is hard to find a place with more connections between plants and animals than the estuary. This is because estuaries are one of the most productive areas on earth.

What are the "estuary connections"? When you diagram them on paper, they appear like a spider's web. But this kind of diagram showing what eats what is called a FOOD WEB. The arrows show which way the food energy is going, such as from a plant to a grasshopper that eats that plant.

The Oregon estuary food web diagram below already has the "food energy arrows" drawn for you. Your task is to cut out and place each group of organisms in the correct place on the diagram. Below each cut-out is a clue to *some* of the things each eats. Can you figure out the estuary connections without looking at the answers on page 2?

To really understand how this food web works, you should know that:

Aquatic means water-dwelling.
Benthic means to live on the estuary bottom.
Decompose means to break down or decay.
Herbivore is an animal that eats plants.
Invertebrate is an animal that does *not* have an inner skeleton; like insects, clams and worms.
Microfauna are very small animals.
Microorganisms are very small plants and animals.
Microscopic means that something is so small that you need a microscope to see it.
Organic means living or decaying (once-living) material.
Photosynthetic means to make food from the sun's energy, carbon dioxide, and water.
Phytoplankton are plant plankton.
Plankton is any very small, floating living thing.
Predator is an animal that eats other animals.
Suspension means particles of debris that stay in the water and do not sink.
Terrestrial means land-dwelling.
Zooplankton are animal plankton.

Bill Hastie

Eat zooplankton herbivores.

Algae are microscopic photosynthetic plants. Bacteria decompose organic material.

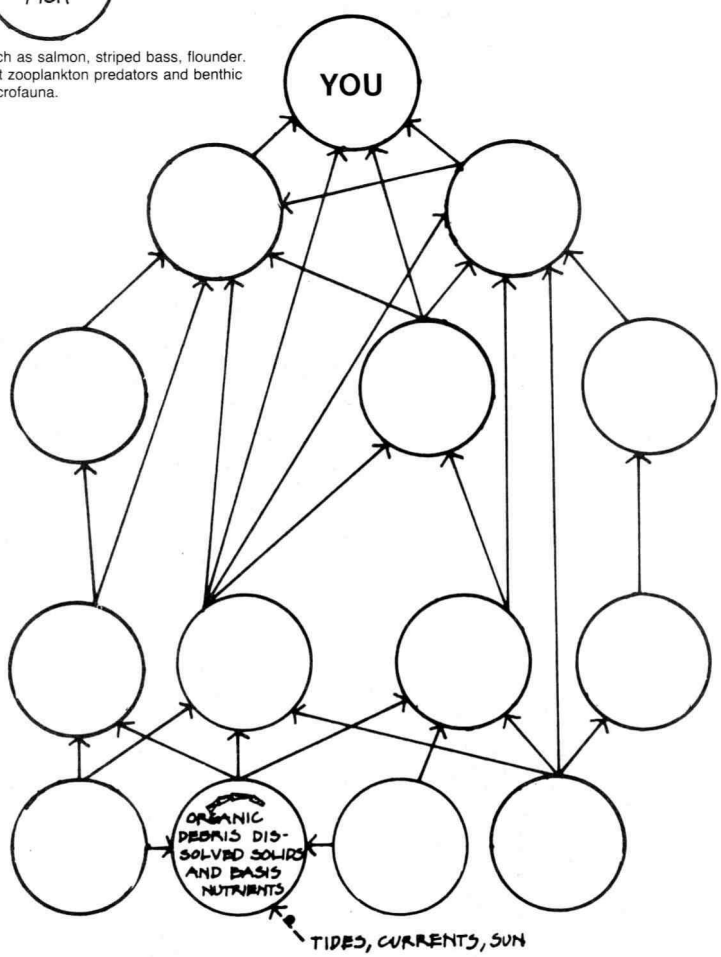
such as dragon flies. Eat terrestrial invertebrate herbivores.

such as clams and crabs. Eat organic debris.

Eat phytoplankton.

Floating microscopic photosynthetic plants.

such as salmon, striped bass, flounder. Eat zooplankton predators and benthic microfauna.

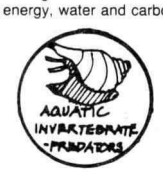


such as grasshoppers. Eat rooted vegetation and organic debris.

Eat benthic algae and bacteria.

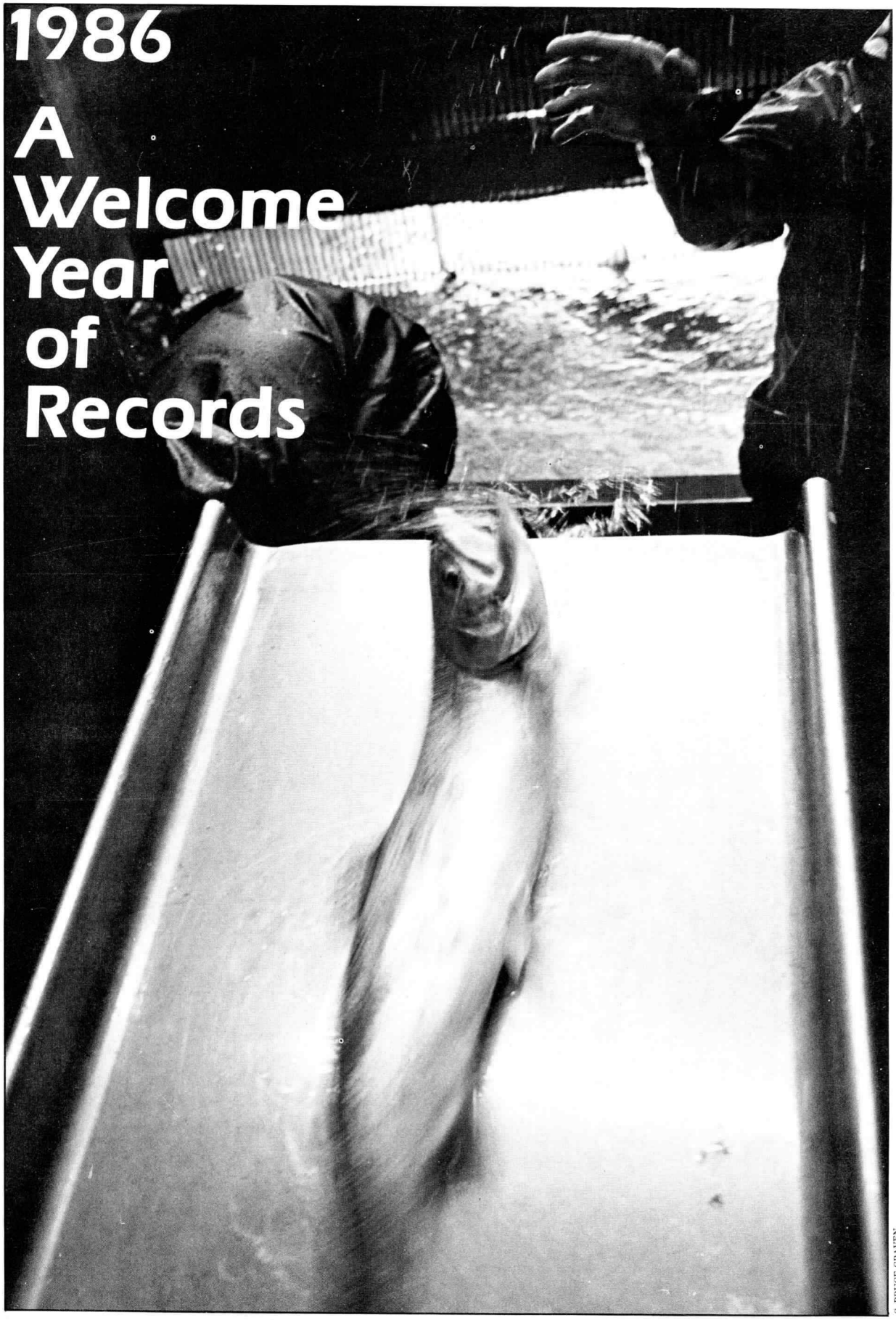
such as king fisher, osprey, ducks. Eat both terrestrial invertebrate predators and herbivores.

such as eelgrass. Makes food from the sun's energy, water and carbon dioxide.



such as snails. Eat deposit and suspension feeders and benthic microfauna.

1986 A Welcome Year of Records



Some adult steelhead were trapped at hatcheries, then hauled back downstream to give anglers another chance to catch them.

S. BRUCE CRAVEN

There has never been anything like it on the Rogue River — at least not since they started counting salmon at the Gold Ray Dam fish ladder in 1942.

By August 1, more than 85,000 spring chinook had passed the dam, headed for a hatchery and spawning grounds upstream. This showing shatters the old record of 59,000 set in 1963.

The high run has even the oldtimers on the river trying to remember when fishing was this good. Catch rates on the upper river at times equalled successes normally enjoyed only in ocean fisheries.

It was almost too good for one angler, "I caught 12 salmon by early June. So I just stopped. I didn't know what to do with any more fish," he said.

The 1986 spring run is even more remarkable because it comes almost on the heels of successive record low returns in 1983 and 1984. Gold Ray counts barely topped 12,000 chinook in each of those years.

This dramatic recovery is credited to improved ocean conditions, reduced offshore fisheries and doubled salmon smolt production at the Department of Fish and Wildlife Cole Rivers Hatchery.

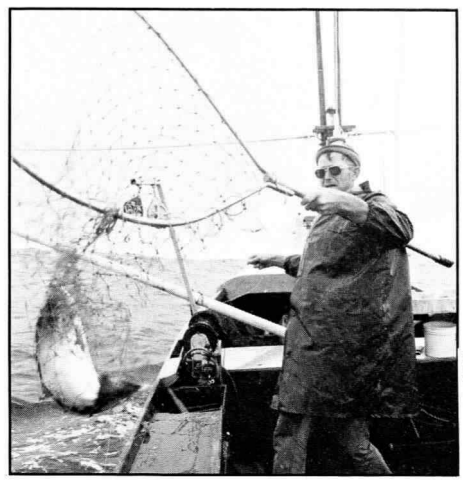
While the Rogue can get credit for the most spectacular turnaround, 1986 was also a good year for other spring chinook runs as well.

Returns of Willamette River springers topped the preseason prediction by more than 5,000 fish. Biologists expected about 65,000 chinook this year. Instead, the final tally exceeded 70,000 springer — an above-average showing.

Unlike the Rogue, however, angling success in the Columbia and Willamette rivers was spotty. Unfavorable water conditions during the April and May fishing period gets the blame for a disappointing sport catch. Anglers in upper Willamette tributaries had one of their better years, however.

Not to be outdone by Willamette and Rogue stocks, Columbia River spring chinook bound for the upper river passed Bonneville Dam at the best rate in eight years. More than 118,000 chinook went through the counting station.

Overall, the spring and summer runs into Oregon rivers have been the best in more than a decade. At this time, biologists also expect a good performance for coho and chinook returns this fall.



S. BRUCE CRAVEN

Commercial and sport fishermen got increased ocean catch quotas this year because hatchery-produced coho salmon returns are the best since the late 1970's. The naturally spawning coho run is still depressed however.

Like the Rogue, 1984 was a record low chinook run on the Columbia, with fewer than 47,000 fish passing Bonneville. Returns jumped to 83,000 last year.

However, a continuing upward trend may not be in store, according to Department of Fish and Wildlife biologist Burnie Bohn. "We are encouraged to have two up years in a row, but counts of three-year-old jack salmon have dropped off this year. That is not a good sign," he said.

The jack count is a fair indicator of four-year-old adult returns next year, says Bohn. "Two years of increases don't make a trend. These fish still need protection. The 1986 return is still well below the 200,000-fish runs of the early 1970's," he said.

He does say there might be a positive trend for Columbia River summer steelhead, however. "It looks good now. The run has been up every year since 1983. Last year, a record run of 340,000 went over Bonneville. This year is shaping up to be a least as good or better," he said.

Counting fish is not nearly as much fun as catching them. This strong return has meant good times along Columbia tributaries including the Deschutes and John Day rivers, as well as northeast Oregon tributaries to the Snake and Columbia rivers.

On the North and South Santiam rivers it was the Willamette summer steelie that brought out anglers. This summer run did not exist until a hatchery program began in upper tributaries in the late 1960's.

Now that program is making up for lost time. The steelhead count at Willamette Falls may reach 40,000 fish. That is a big jump from past record of 25,000.

Dave Anderson, department district fish biologist in Roseburg, says his chinook returns on the Umpqua River suffer in comparison to the Rogue. However, the count over Winchester Dam shows that chinook should still number more than 10,000 fish. That is only the 12th time since World War II that mark has been passed.

Summer steelhead returns are at a near record-setting pace, according to Anderson. The 1984 and 1985 runs both increased substantially over a record low run in 1983. The run this year could come close to the 16,185 record set in 1971.

Overall, the spring and summer runs into Oregon rivers have been the best in more than a decade. At this time, biologists also expect a good performance for coho and chinook returns this fall.

This general recovery from record lows just two or three years ago shows how resilient salmon and steelhead can be. But the lesson is also there that man has no control over the consequences when nature deals a blow like the El Niño years of 1983-84.

A record return of summer steelhead to the Willamette River system brought good fishing for anglers, and large returns to department hatcheries. These fish are anesthetized to prevent injury during handling.

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