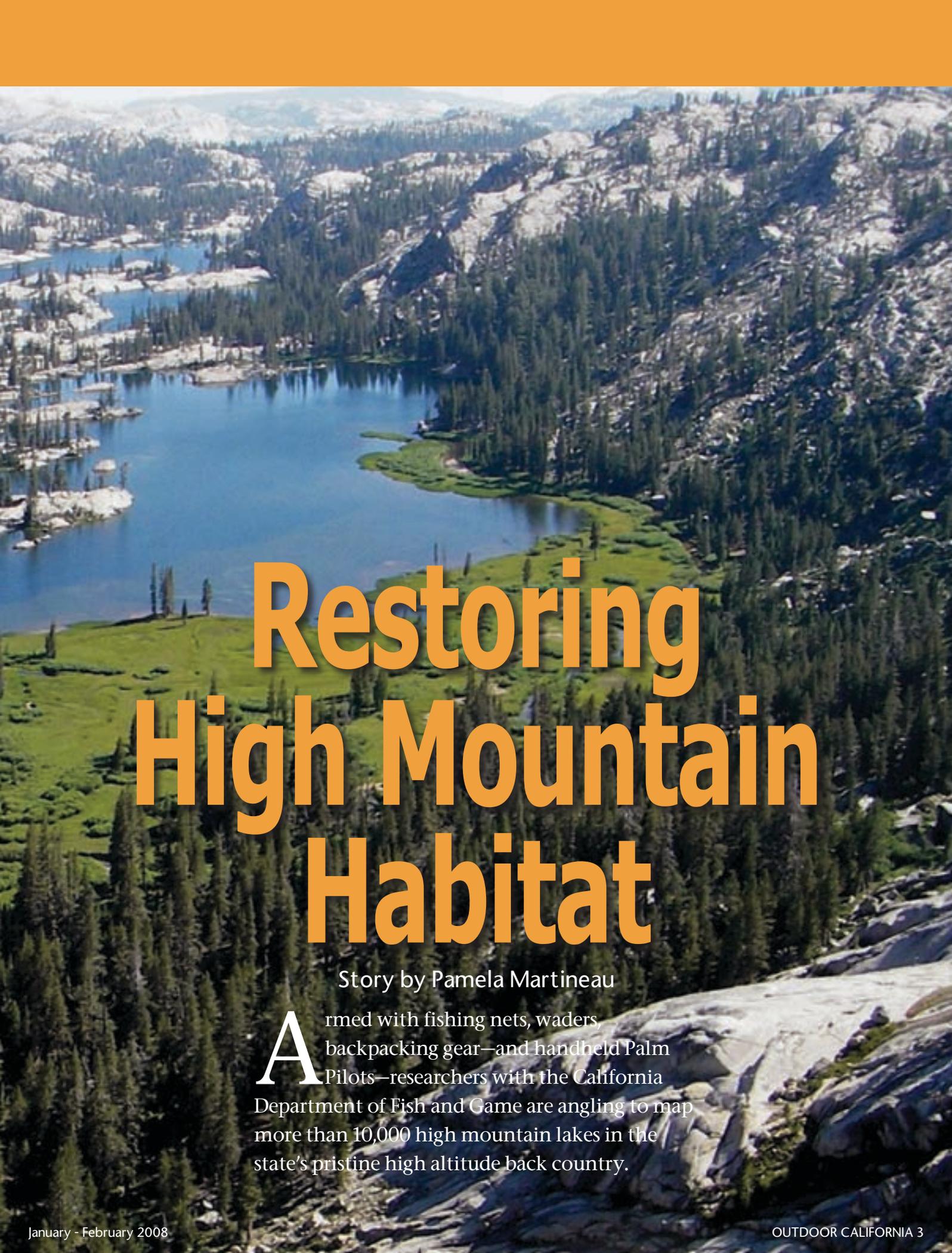


# *Special Report*



Upper Buck Lake in the Emigrant Wilderness

*DFG File Photo*



# Restoring High Mountain Habitat

Story by Pamela Martineau

**A**rmed with fishing nets, waders, backpacking gear—and handheld Palm Pilots—researchers with the California Department of Fish and Game are angling to map more than 10,000 high mountain lakes in the state's pristine high altitude back country.

# Special Report

The High Mountain Lakes Project, underway for several years, seeks to restore habitat for threatened species in back country waterways. It also aims to map the best trout fishing spots for California's anglers.

The project springs from a simple idea: Send biologists into the field to survey each high mountain lake and inventory its natural resources. Requiring a huge amount of leg work and attention to detail, the project could pay off enormously for some of the state's threatened wildlife species as well as recreational fishermen.

Already, numerous teams of biological surveyors have visited most of the designated bodies of water. The trained surveyors inspect the waterways and inventory their natural resources, transmitting the information to an interactive database in Sacramento via the handheld personal digital assistants, PDAs.

Every high mountain pond or

lake found to contain decent habitat for mountain yellow-legged frogs—a threatened species—or other species of amphibians is entered into the interactive database. Introduced and native species of trout also are documented in the same computer catalogue. The resulting database is intended to help state and federal biologists plan for species management and recovery as well as recreational fishing for years to come.

"We're trying to go to every single lake in the high mountains," says Curtis Milliron, a senior biologist with DFG who coordinates the mountain lakes project. "There's tremendous value in the data we collect."

The value in the data is immense, for it offers a detailed map that tells biologists where they should do habitat restoration for threatened species and where they should allow non-native trout to remain for recreational fishing. When complete, the information also will be used to create

a map for recreational anglers to locate high mountain lakes with fisheries.

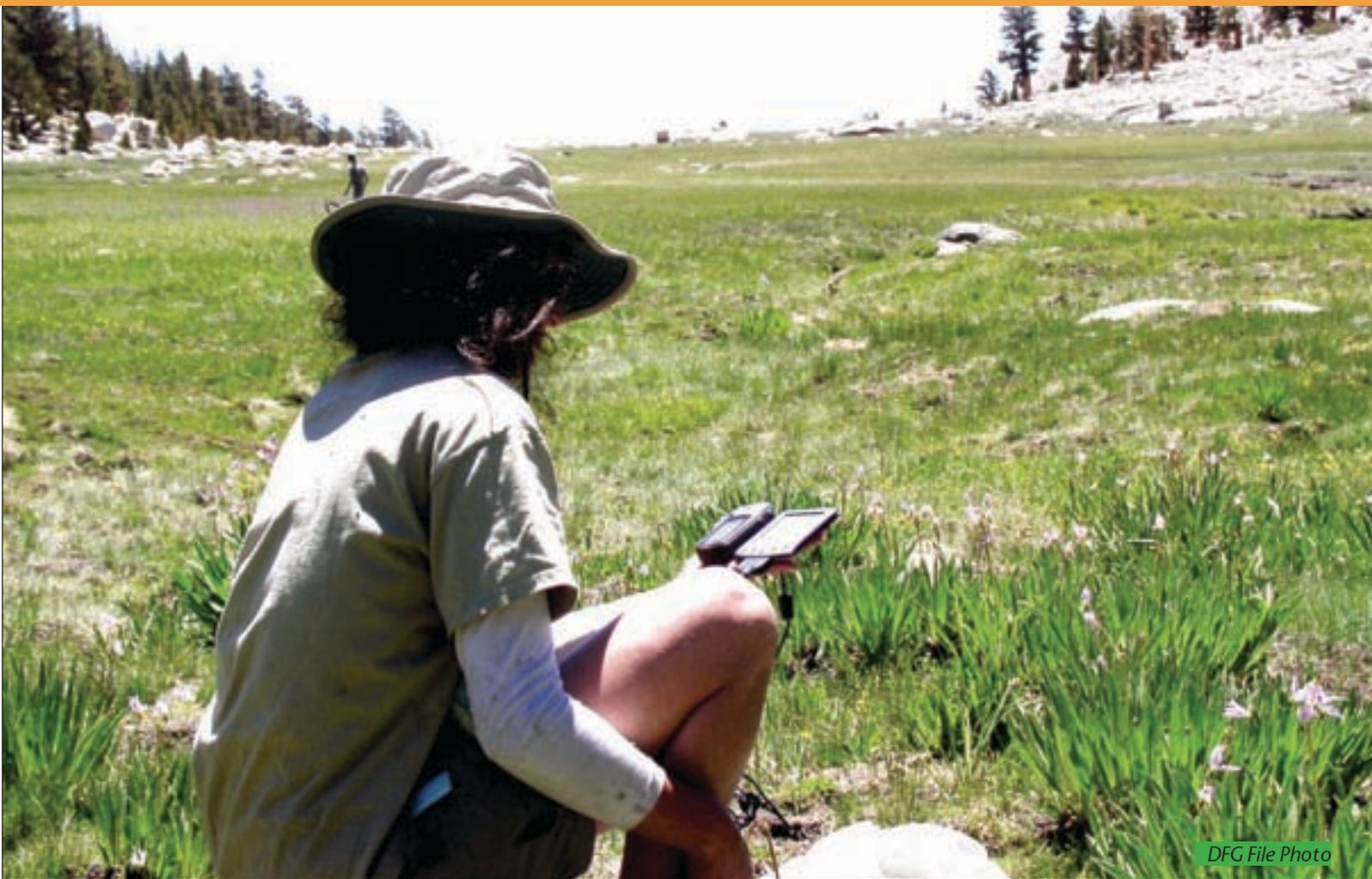
"It really is trying to figure out how to get some balance back into the system," Milliron says of the project.

"We learn where we are going to manage for native species and remove trout ... and where we will have recreational fisheries," Milliron adds.

Initially launched in 1998, the lakes project gained momentum after 2000. That's when the U.S. Fish and Wildlife Service required the state to draw up a Wildlife Action Plan that would outline how the state planned to spend federal dollars for wildlife preservation. California Wildlife: Conservation Challenges became the state's answer to the federal requirement. The lakes project, like others developed within the scope of the federally-required plan, receives funds through federal grants. Those federal grants require state matching funds to continue to flow.



DFG File Photo



DFG File Photo

The Department of Fish and Game sends biologists into the field to survey each of the state's high mountain lakes and inventory its natural resources. A member of the survey crew (opposite page) uses a float tube to set a net and determine fish species. Above, researchers use hand-held PDAs to back up data on memory cards and then download the information to a secure server in Sacramento when the crew returns from the field. The resulting database is intended to help state and federal biologists plan for species management and recovery, as well as recreational fishing for years to come. Below left, survey crews record the presence of a mountain yellow-legged frog (*Rana sierrae*), and below right, a western terrestrial garter snake (*Thamnophis elegans*), a native amphibian predator. Next page: At one of the state's remote unmapped ponds, a biologist conducts what is called a visual encounter survey.



DFG File Photos



# Special Report

David Bunn of the Wildlife Health Center at the University of California, Davis, was project manager and co-author of the state's wildlife conservation strategy. He says the lakes program grew out of concern over loss of amphibian species.

"Fish and Game's high mountain lakes project was prompted by concern that fish stocking in high Sierra lakes was contributing to the decline of native amphibian species," says Bunn, who served as deputy director of DFG's Office of Legislative Affairs under former Gov. Gray Davis. "Fish and Game launched the project seeking answers on how to conserve the native species while maintaining the recreational fishing opportunities."

But visiting the thousands of unspoiled lakes tucked into the wilds of the Sierra Nevada range is no small task. As simple as it sounds, the multi-year project requires an immense amount of work and detailed planning. Already, about 85 percent of the lakes DFG knows of have been surveyed. Sometimes, the researchers are surprised by what they find.

"When we get out in the field, we find a lot of unmapped waters," says Milliron, who estimates that about 10 percent of the state's high altitude lakes and ponds are unmarked. "We're really trying to go to every single lake or pond in the high mountains."

The work is done primarily in the spring and summer when teams of trained researchers are able to backpack into the wilds of the Sierra Nevada and other high country regions. The researchers are trained to follow a strict protocol in surveying the waterways.

If researchers see fish in the waterway, the protocol dictates they must do a fish survey. If they come upon a waterway and can see to the bottom of the entire pond or lake—and see no fish—they can call the waterway "fishless." If they see fish, or cannot determine fish presence visually, the researchers use nets to determine the species and their overall condition.

The researchers also conduct what is called a "littoral zone survey." That survey chronicles whether the first 3 meters in the water has a bottom of silt, sand, gravel, boulder, bedrock or woody debris. This information is important because it helps determine what kind of species can survive in this habitat. For instance, mountain yellow-legged frogs may benefit







At right, getting wet is part of the day's work as a researcher strings a net that will determine a pond's fish species. Above, a researcher conducts a depth profile of a lake using a portable sonar device. Determining the depth of a lake or pond helps verify whether the waterway can support mountain yellow-legged frogs, which require deeper water for habitat.

when silt is present.

Knowing the depth of the waterway also is critical. Researchers conduct a depth profile to find the maximum depth. This information helps determine whether the waterway is good habitat for mountain yellow-legged frogs, which often require deeper water for over-winter habitat.

The data are used to determine which waterways are to be preserved as habitat for the frogs and other native species, and which waterways should be used for recreational fishing. Mountain yellow-legged frogs often use the same type habitats as fish in part because their larvae take several years to go from egg to hopping adult. The frogs remain as tadpoles for two to four years, whereas other frogs transform from tadpole to adult in about three months. The fish and tadpoles can almost never live in the same habitat.

"If you have fish present, you usually don't have tadpoles," says Milliron.

Throughout California's back country, non-native trout have been stocked in many habitats that frogs used to have to themselves. Researchers with DFG use the survey information to determine where they should remove non-native trout and return the waterway

to its natural state and where they should leave the trout for recreational anglers.

The criteria biologists use to make this recommendation is complex. Basically, they must ask if fish removal is feasible, reasonable, biologically doable and acceptable to the public.

If a pond or lake has barriers that block new fish coming in, it may then be possible to remove the fish. It doesn't make sense to remove fish from a waterway where they can immediately return.

Also, if a waterway is popular with anglers and important to the local economy, DFG is less likely to recommend removing the fish.

"If it's a high-use area, then we might be less inclined to stop stocking," says Milliron. He explains that DFG conducts public workshops with the local board of supervisors to allow members of the public to give input about the issue before any decision is made to remove fish from a high-use waterway. Pack stock operators, who take visitors into high country areas using horses, also would be notified.

Milliron says DFG hopes to use the data to publish an angler's guide to California's back country. That way they can tell anglers where fish are present and



how to locate the waterways.

"We're trying not to disappoint anglers by removing fish. Most back country anglers understand our need to return some balance to the system, but they need to be kept informed," says Milliron.

DFG estimates more than \$1.8 million has been spent on the project already and more work needs to be done. Each year, the



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project costs roughly between \$200,000 and \$400,000 to implement. Four regional districts are assisting with the project, and those involved hope that the project continues to be funded by the state so it receives the federal matching funds.

"Funding is always a challenge," says Milliron. "We need to continually find the 50 percent state match required for some

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federal grants."

Bunn, the UC Davis project manager, says the value of the mountain lakes project is immense.

"Fish and Game's High Mountain Lakes Project demonstrates the tremendous value of gathering current biological and ecological information," says Bunn. "The Department's good field

work discovered the answers they sought to improve conservation for all species. The project is a model for tackling other difficult conservation issues that require up-to-date field data."

*Pamela Martineau is a freelance writer who formerly worked for The Sacramento Bee for 10 years. She now lives in the Dominican Republic with her family.*