Think big

The best way to manage national parks in the face of the effects of climate change is not to manage at the park level, but to work with landscapes. A new US initiative shows the way.

In 1882, the US conservationist George Bird Grinnell wrote about humans invading natural habitats as “the tide of immigration” that was then sweeping across the American West. “There is one spot left, a single rock about which this tide will break, and past which it will sweep, leaving it undefiled by the unsightly tracts of civilization.” That rock was Yellowstone National Park, then just ten years old.

Thanks in large part to the success of Yellowstone, this rocks-in-the-tide or ‘protected area’ model has been adopted worldwide. Yellowstone remains the archetype for the park as an island in space and time, walled-off from changes to the land around it. But any park scientist or manager will tell you that to freeze a park in time is an unattainable ideal. And for better or worse, parks cannot be completely isolated in space either. Yellowstone is surrounded by national forests, ranches, game refuges and other natural lands that are ten times the size of the park itself, as well as by the spawning tendrils of residential development. European spotted knapweed gets in and grizzly bears get out.

As the effects of global climate change begin to unspool, park managers at Yellowstone and around the world are deciding how to proceed, torn between their impulse to fight to keep ecosystems the way they are and a reluctance to fiddle with nature too much (see page 150).

Perhaps the best approach is for them to ponder instead the larger landscape in which their parks sit. Scaling up is reassuring. At the park level, climate change may extirpate a species. At the landscape level, climate change merely moves it. And scaling up is more effective. Ecologists and conservation biologists have known for decades that isolated parks leak species. Smaller populations have smaller gene pools in which maladapted traits are more likely to become fixed. Smaller populations are more vulnerable to drought, pests, hard winters or simple bad luck.

This is why conservation biologists, since at least the early 1990s, have called for parks to be connected to one another by unbroken corridors of nature, through which large species can move. For small mobile species, such as birds and insects, a stepping-stone scatter of protected areas close to one another has much the same effect. Climate change makes such connectivity even more important, as species challenged by the changing climate will need big gene pools to draw from and lots of different places to which they can move to. In particular, sites with microclimates to harbour species that can’t take the heat need to be identified, protected and linked to existing protected areas.

As corridor ecology has taken off as a scientific subfield, so have corridor and connectivity projects such as the Yellowstone to Yukon Conservation Initiative in North America and the Australian Alps to Atherton Connectivity Conservation Area. Britain’s Royal Society for the Protection of Birds is restoring lands beyond nature reserves in its Futurescapes programme. Some projects are even species-specific, such as Protecting the Pronghorn Path — a 240-kilometre-long federally designated and protected ‘migration corridor’ put in place on all the different lands that the American antelope crosses on its way between summer and winter ranges in Wyoming. As the pronghorns make their way back and forth, the ungulates trapse across national forests, Bureau of Land Management gas fields, private cattle ranches and state-owned roads, where the department of transportation is this winter installing pronghorn-friendly underpasses. Coordinating all of those players is a massive job, one that was tackled in this case by the Wildlife Conservation Society, based in New York. But there is not the money to do for the whole of Earth what the society was able to do in Wyoming.

In February 2010, the US Department of Interior ordered all the land-management agencies it oversees to join with other federal, state and private land managers in ‘landscape conservation cooperatives’ to help to understand and respond to the effects of climate change. At a recent scientific meeting in Yellowstone, many scientists groaned at the prospect of yet another entity in the already crowded and confusing realm of conservation planning. But if these cooperatives are widely embraced, they could be a way to move beyond the/triumph that landscape-level conservation is needed, and start to do it.

It would be unforgivable to lose honeyeaters, antelopes, grizzlies and orchids, not because scientists didn’t know how to save them, but because they were mired in bureaucratic mud.

Different strokes

Scientists in Romania and Bulgaria are having the best and the worst of times.

Marine geologist Liviu Giosan has lived through history. As a student in Romania he took part in the December 1989 demonstrations that brought down the communist government. Just months earlier, no one in the deeply isolated country would have believed that the hated dictatorship could ever fall. Yet the euphoria lasted barely six months. In June 1990, miners joined troops in violently crushing the street protests by students demonstrating against the communist presence in the newly elected government. After he got his degree in 1993, Giosan left for the United States to build a scientific career for himself — something he knew he couldn’t do at home. He is now an associate scientist at Woods Hole Oceanographic Institution, Massachusetts.

Most of the brightest young scientists in Romania — and
neighbouring Bulgaria, which shares a similar history — have emigrated as soon as they could. Very few have returned. It remains hard to do science in these countries, even though both joined the European Union in 2007. A few bright spots exist, but too much of the research landscape is still dominated by old-guard scientists who don’t produce results, resist the introduction of international research standards and block the system to fresh blood.

As we report on page 142, the tide may just have turned for Romanian scientists. The government there is boosting funds and seems to know what is required for them to be spent wisely, and how to overcome scepticism among research émigrés. The Romanian government has a serious long-term plan for science, and this deserves recognition. Romanian scientists abroad, Giosan among them, are starting to smile.

The sentiment is not shared by those who watch the situation in Bulgaria with mounting despair. The Bulgarian government has only a short-term plan, the long-term consequences of which are likely to be disastrous. Funds have been slashed and the control of dozens of research institutes is set to be handed to the government from the Bulgarian Academy of Sciences, which will survive only as an academy. To separate active research from a learned society is not necessarily wrong — the status of both Britain’s Royal Society and France’s Académie Française demonstrates that — but the Bulgarian government is yet to show that it knows what to do with the institutes it is so keen to adopt.

In fact, it is clear that this populist government — which took office in July 2009 on an anti-corruption mandate — is not interested in science, and has convinced many among the general public that it is a waste of money. Its science and education minister, Serej Ignatov, was politically too weak to oppose a budget cut of more than one-third ordered in mid-2010. Science in Bulgaria has been humiliated as never before.

It is true that the Bulgarian Academy of Sciences needs deeper reform. Under pressure from previous governments to raise its game, the academy organized an international evaluation and slimmed down to a fraction of the size it was in richer, Soviet times. But greater change is needed.

As the Romanian government has noted, a poorly performing science base cannot be fixed by just throwing money at it: regulations need to ensure that the money is well used. But in the same way, reforms are pointless if budgets are so restricted that little serious research can be performed — as is now the case in Bulgaria.

The Bulgarian government, together with its scientists, must urgently create a long-term scientific plan for the country, and a strategy to put the plan into operation and ensure that it is successful. It cannot afford to reject the European Union philosophy of a future centred on a knowledge-based economy.

In the meantime, it needs to restore budgets for science and universities to levels that allow them to function properly, and delay plans to break up the academy. Only when a proper long-term strategy is in place will the government know what it needs to do about its research institutes and their budgets. If it needs inspiration in this, it need only look north to its neighbour Romania. The contrast between the age of wisdom and the age of foolishness is clear.

First do no harm
Simple tools to diagnose mental illness should not be offered without sound supporting evidence.

Incorrect diagnosis of people with psychiatric disorders has far-reaching implications. Miss the manic phases of people with bipolar disorder, for instance, and, rather than the mood-stabilizers they need, they might be given antidepressants. The drugs could make them ‘hypomanic’ — a state in which they might spend money recklessly, invest irrationally and jabber incessantly so that friends and employers no longer want them around — and tip them into even more extreme bipolar cycles. Meanwhile, if the hallucinations of a person with schizophrenia don’t become apparent during analysis, the patient may likewise be diagnosed as depressed, be given antidepressants and go on to become even more withdrawn. Unfortunately, misdiagnosis happens all too often — in around 70% of cases of bipolar disorder, according to some estimates. And such mistakes often go uncorrected for years.

The problem is that, in the absence of clear-cut biological markers for such disorders, doctors depend on subjective examinations to fit patients into poorly defined categories. The uncertainty inherent in these diagnoses is a menace, and not only for patients. The problem affects pharmaceutical companies working to develop new drugs, insurance companies trying to determine coverage, health-care systems and employers. Researchers are desperate for objective diagnostic markers to replace subjective examinations. In their search they have studied genetics and investigated tools such as electroencephalography and functional magnetic resonance imaging. Despite many claims and limited successes, so far none of these findings has been replicated consistently enough to merit widespread clinical use.

Last year, doctors in Japan started using a relatively new technique — near-infrared spectroscopy (NIRS) — to distinguish between schizophrenia, depression, bipolar disorder and normal mental-health states (see page 148). It is not difficult to see why this was a popular move. Doctors like it because it is easy to use. Patients like its objective nature, and that it provides them with physiological evidence of a disorder. And officials at the health ministry are happy because it represents a public success of their drive to innovate.

In Japan, NIRS diagnosis is one of dozens of advanced medical techniques offered to patients — at their own expense — despite not having gone through the clinical trials needed for approval by national health insurance. But is it ready for the clinic? Most scientists contacted by Nature do not think so. The patient groups of the supporting studies were small. The tests have not been reproduced in various clinical settings as one might hope. There is no international consensus on how best to measure NIRS parameters, much less a clear consensus on how to apply them to mental health. And if it is not ready, the same advantage that has patients lining up for it — the authority of an objective, physiological measure, the air of the incontrovertible — will become an obstacle. A misdiagnosis that carries the authority of an ‘objective’ measurement will probably be even more difficult to overturn.

The doctors who offer the technique say that it is only an aid, just one tool in their toolbox. Indeed, they are following Japan’s advanced medical technology protocol properly and offering, in good faith, a diagnostic test that they believe works. Their attempts to use it seem sincere, and not motivated by profit. Still, if the technique has not been clinically validated, patients should not be paying for it, particularly given the challenging scientific landscape of mental-health problems.

Japan’s advanced medical-technologies programme is blurring the line between protocols that have been properly validated and those that have not. More rigorous verification methods are needed, starting with multiple blind trials in large patient groups.

NIRS does show promise. It is easy, quick and, perhaps combined with other diagnostic techniques, could be a powerful tool, if the right validation studies are done. If the clinics that offer the technique are so sure that it works, then they should present the supporting evidence to prove it. Meanwhile, other neuroscientists should continue the search for more conventional biomarkers. To offer better care to people with mental-health problems is a noble motive, but one that needs to have science alongside desire at its heart.