A river back from the dead

VAL ROSS chronicles the Canadian-led rescue effort that has devoted five years — and $580-million — to reviving Wadi Hanifah, the fabled river that runs through the capital of Saudi Arabia. As this graphically enhanced map shows so clearly, an array of heavy equipment and thousands of labourers have cleaned up and, in some cases, reshaped the 120-kilometre waterway. Long-lost plants and animals have been reintroduced, and the deluge of sewage and toxic waste that turned the wadi into 'a toilet' has been slowed to a trickle. As a result, the residentsof Riyadh are rediscovering the natural wonder that first gave their city life

You can give yourself virtual vertigo by swooping around on Google Earth, the 3-D computer program that offers aerial views of almost every place on the planet. Especially if you zoom from, say, Toronto to the barren desert of Saudi Arabia and then zero in on the tangle of housing and highways that is Riyadh.

Just to the left of the biggest interchange, you'll see an intriguing dark line. It's a river, Wadi Hanifah, which rises to the northwest of Riyadh and flows for 120 kilometres, passing through the city before disappearing in the desert sand.

This is the water source that made human settlement possible there 1,000 years ago. But now the oil-fuelled Saudi economy has made Riyadh the world's fastest-growing capital city. In 1950, it had fewer than 30,000 residents; today, the metropolitan area's population is about 5.5 million, and is expected to double by 2020.

In the course of this frenzied growth, Riyadhis have embraced the automobile and the high-rise — and turned their life-giving waterway in a dumpsite for everything from construction debris, chemical waste and old tires to sewage and animal carcasses.

It's hard to plan wisely for any city metastasizing at such a feverish rate, but Riyadh had the bad luck to fall into the hands of Western planners who preferred highways to sidewalks. The city's name derives from *rowdah*, the Arabic word for garden, but most of the few remaining green spaces are found within the walled neighbourhoods inhabited by the rich.

However, attitudes change, and six years ago, the Arriyadh Development Authority (ADA), which is responsible for local planning, drew a line in the sand, and the Saudi princes who call the shots summoned experts from Canada to help reclaim their river.

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The architecture firm Moriyama & Teshima is better known for designing remarkable museums and site-sensitive buildings, but it also has a planning arm with an international reputation for environmental design. Led by George Stockton and Drew Wensley, its president and executive vice-president, Moriyama & Teshima Planners Ltd. has been working with Buro Happold, an British engineering firm, to perform a $580-million (U.S.) environmental miracle — arguably the biggest water-reclamation project in human history.

The work is at least two years from completion, but already Google Earth reveals a stunning dark green area along the *wadi* in the heart of Riyadh and, in the south, a shimmering expanse of lake.

The bigger miracles are visible on the ground. Long-absent kingfishers, falcons and herons have returned to make a permanent home, and not far from the river there are massive tanks of tilapia, a species that is native to the Middle East and now often on offer at Canadian fish counters. Soon, when the water is clean enough, the tilapia will be freed from the tanks, and Mr. Stockton and Mr. Wensley hope to taste the results for themselves.

"What a barbecue that would be," Mr. Stockton says with a laugh. "After vigorous testing," Mr. Wensley cautions.

At 62, Mr. Stockton has watched a lot of purified water go under the bridge. He left his native North Carolina in 1969, during the Vietnam War, to join Moriyama & Teshima — attracted, he says, "by the ethical point of view shared by everyone."

Many landscape architects redesign backyards, but he has worked on entire water systems, such as the South Saskatchewan River, whose 100-year plan is considered a reclamation benchmark, and the Niagara River corridor, now a stately strip of parkland dotted with gardens, wineries and historic towns.

Most dramatic of all was the transformation of Lake Ramsey, located at the epicentre of the mining Mordor known as Sudbury, Ont. Thanks to cleaner smelting and refining technologies and to Inco Ltd.'s Superstack (which disperses emissions more widely), the Sudbury skies brightened, allowing Moriyama & Teshima to concentrate on cleansing the water and bringing back aquatic life. In 1992, Sudbury received a United Nations award for the lake, where tourists now fish for walleye and bass.

The *wadi* project sprang from the firm's award-winning architectural work on Saudi Arabia's national museum, a curving edifice of golden limestone surrounded by 83 acres of pools, palms and walkways that opened in 1999. Invited to discuss major changes for the city as a whole, Mr. Stockton outlined the benefits of cleaning up the river, and was given the green light. No competition, no fuss.

He and Mr. Wensley, 36, started work in July, 2001, putting in long hours amid aerial photos and maps of the *wadi* that line their Toronto office. Only a month after the Sept. 11, 2001, terrorist attacks, they flew to Riyadh to take stock. "On that first trip together, Drew and I felt like medieval cathedral builders," Mr. Stockton recalls. "We saw that it would be a huge job and we would never live to see the end of the work, but we knew it would be incredible."

They spent a week driving the length of the *wadi*, mostly in 50-degree temperatures. "You drink lots of warm tea, and stay in the air-conditioned car as long as you possibly can," Mr. Wensley says.

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Riyadh receives only 100 millimetres (about four inches) of rain a year, but it comes all at once and, as they drove, the Canadians saw evidence of destructive flash floods. (Last March, a sudden rain sent a metre-high wave through the *wadi* at 60 kilometres an hour, knocking over construction equipment and leaving the ground so mucky that work was delayed for a week.) They also noted that not only was Riyadh a barren-looking place, the *wadi* was dirtiest where it ran through the capital. "It was a toilet — no, worse," Mr. Stockton says. "A place people did not want to ever go." Mr. Wensley adds, "There was so much garbage in the stream, birds were walking across it."

The Canadians worked on their master plan seven days a week for 17 weeks. They had conducted an inventory of habitats and plants, and decided that the first challenge was to restore the trees, grasses and shrubs clinging to life along the *wadi*. They proposed establishing a series of plant nurseries. "We wanted to capture the seeds from the same gene pool that had always existed," Mr. Stockton says.

They divided the project into five zones, and fought the flash flooding by widening the *wadi*, reducing the slope of its banks and building catchment areas to contain the extra water. They even had to determine the size of the rocks needed to line the channels: about 200 mm in diameter— big enough not to be swept away and small enough to provide habitat for small organisms.

To improve water quality, they started monitoring farm and industrial dumping, and looking for leaky septic tanks. Within Riyadh, they had to remove vast quantities of construction rubble from the stream. The *wadi* receives all of the city's wastewater — a million cubic metres a day — and in time it will have to be able to cleanse that much, so the water can be reused by the city. (Riyadh's drinking water comes from desalination plants fed by the sea, but the *wadi* provides everything else.)

Once the river has left the city, most of the work consists of making its course more natural and improving shoreline and water quality of its southern "lakes district," for the sake of fish, birds, and mammals such as foxes and desert cats. With the help of Google Earth, you can see saw-tooth structures on one stretch of water that mark the concrete "bioremediation cells" in which harmful bacteria are killed off and unwanted chemicals removed. The technology is managed and monitored from Canada.

For two years, Joy Kennedy, a water-quality specialist with Nelson Environmentals, has been tracking the *wadi*'s water chemistry from her office in Winnipeg. "There is still lots of grey water," she says. "But some things have made a huge difference — such as closing a tannery."

Last year, while studying Nelson's data, Mr. Stockton and Mr. Wensley noticed a spike in toxins. Aerial photographs revealed a plume of white sludge coming from a mammoth tanning factory.

When further testing revealed the sludge to be carcinogenic, the problem was dealt with quickly, Saudi-style: "We had the ADA make them stop," Mr. Wensley says. (Since the pyramids were built, architects have found that working with absolute rulers has its advantages. "It's a top-down situation," Mr. Wensley notes. "If we were trying this in Toronto, we'd still be arguing about the master plan.")

A similar bolt from above is about to strike a Riyadh abattoir, which has been dumping blood and guts into the river. "It may cost somebody his job," Mr. Stockton says, "but it's the right thing to do."

The Canadians are not above rolling up their sleeves from time to time. They have been known to pick up shovels on occasion and work alongside some of the thousands of labourers employed on the project. "We want them to know that we recognize their efforts," Mr. Wensley says.

This kind of rigour helped the reclamation project to win the Washington-based Waterfront Center's top honour for planning in 2003. "The jury was stunned at the project's environmental sensitivity," says Ann Breen, co-director of the centre, adding that the project "could become a model for many other countries."

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What do the Saudi people think? Because the public has so few avenues for free expression, it's hard to say. But unlike Western-led developments that have sparked dissent in Afghanistan and Iraq, this project springs from a local initiative. "I believe the design will be very good when it is complete," says Abdullah Alkaff, senior electrical engineer with the ADA. "If they can reduce the pollution, if things go smoothly, they will give Riyadh a new location, people will go there and get used to it. I am sure people will like it."

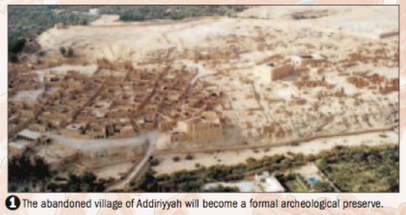
There are already signs that he is right. Riyadh is reorienting itself to its waterway — the value of real estate near the *wadi* has gone up tenfold, and Saudi scientists have gone canoeing on the river. Admittedly, they were working, but families may do so for pleasure very soon.

"We're planning to be finished by 2008, *Inshallah*," Mr. Stockton says, using the Arabic term for "God willing."

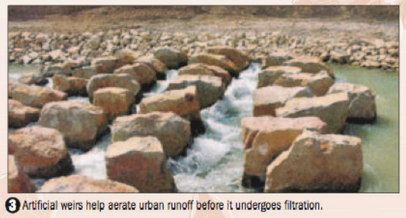
He calls it "a wonderful expression," but Mr. Wensley quietly adds that he has been told that it also can mean "not a chance."

Val Ross is a senior writer for The Globe and Mail's Review section.

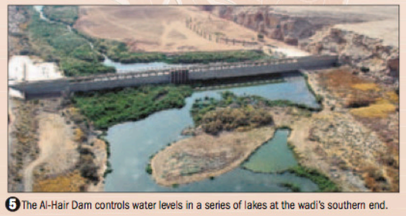

Before the reclamation project began, Wadi Hanifah was often treated as a garbage dump.


1 The abandoned village of Addiriyyah will become a formal archeological preserve.

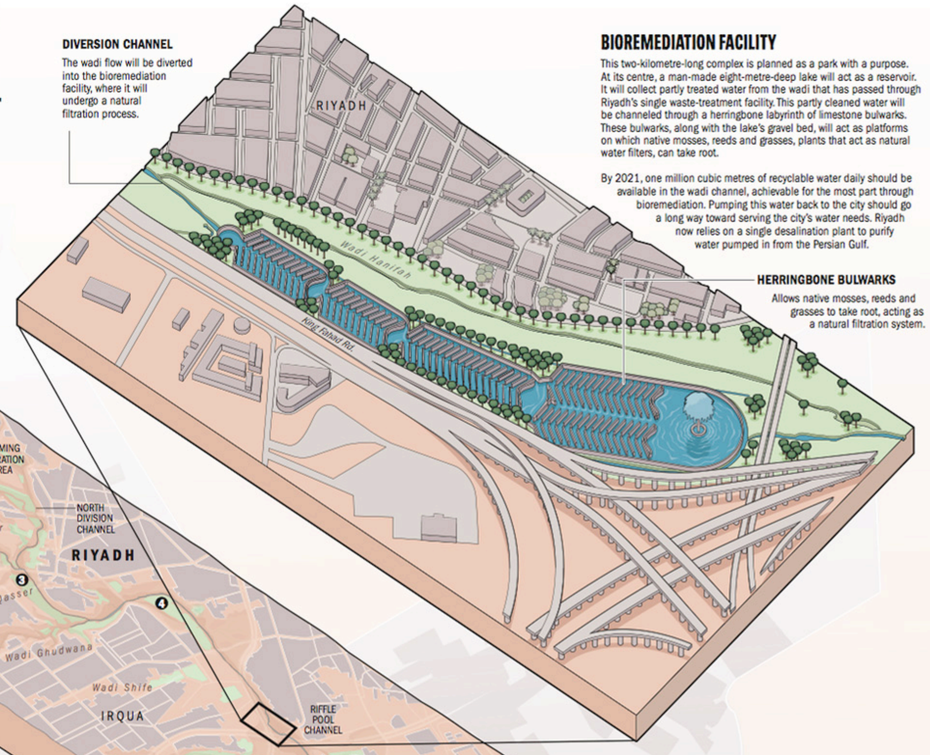

2 Native plants cultivated in greenhouses will be replanted along the wadi's length.

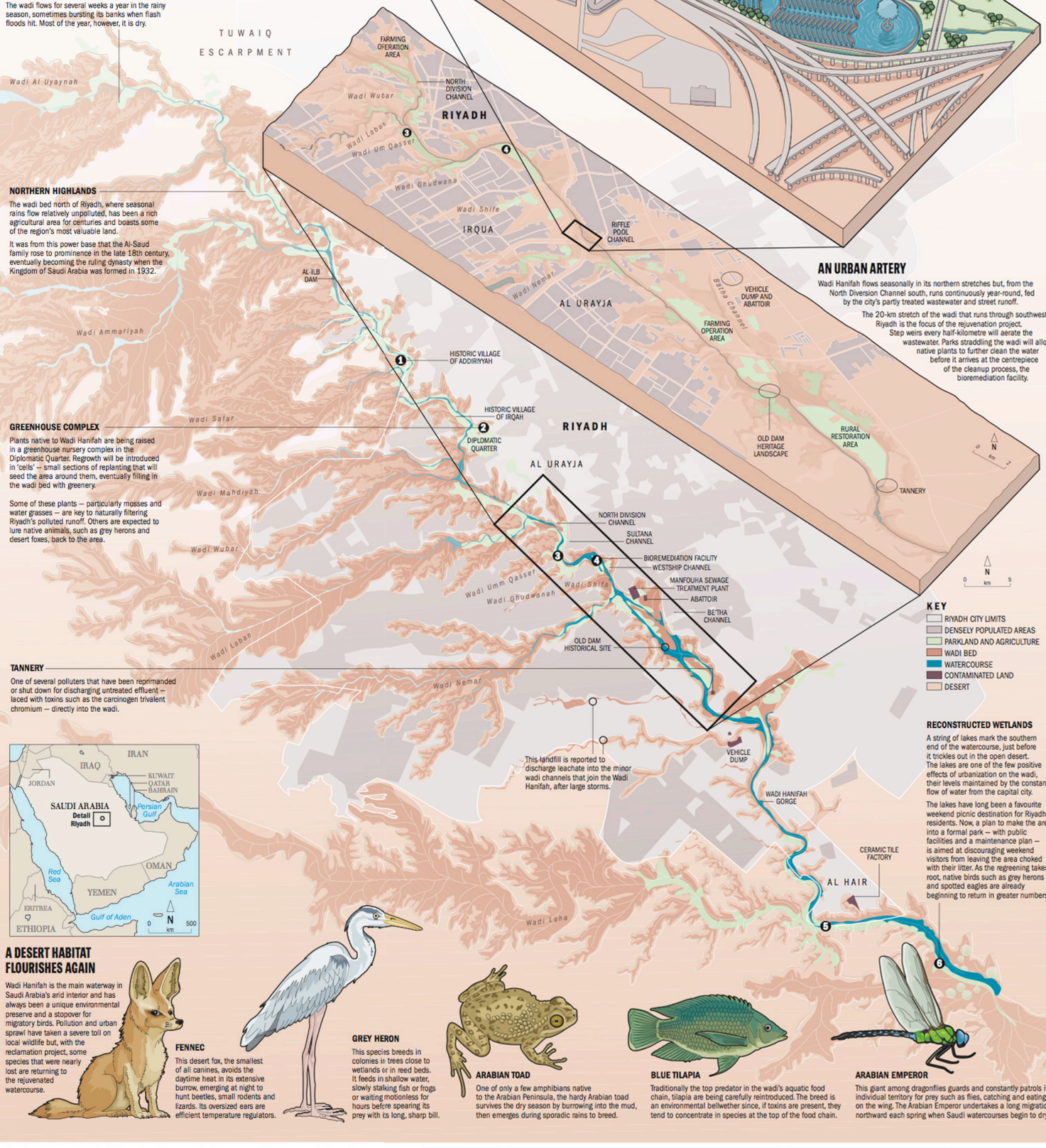

3 Artificial weirs help aerate urban runoff before it undergoes filtration.


4 Construction crews install limestone facing in a massive filtration reservoir in Riyadh.


5 The Al-Hair Dam controls water levels in a series of lakes at the wadi's southern end.


6 Reclaimed wetlands and massive irrigation projects dot the southern end of the wadi.





SOURCES: *MORIYAMA & TESHIMA PLANNERS LTD.; MOHAMMAD AL-ASAD AND YILDIRIM YAVUZ: WADI HANIFAH DEVELOPMENT PLAN (2004); ARRIYADH DEVELOPMENT AUTHORITY*

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