CEAP Objective 4

Selection and placement of conservation practices to optimize:

1) Environmental outcome at the watershed level

2) Profit maximization at the farm level

3) Program efficiency

The technology T may be built from the data

$k = 1,\ldots,K$ observations, DMU's (Decision Making Units)

inputs $x^k = (x_{k1},\ldots,x_{kN}) \in \Re_+^N$

outputs $y^k = (y_{k1},\ldots,y_{kM}) \in \Re_+^M$

$$T = \{(x,y) : \sum_{k=1}^{K} z_k y_{km} \geq y_m, \qquad m = 1,\ldots,M,$$

$$\sum_{k=1}^{K} z_k x_{kn} \leq x_n, \qquad n = 1,\ldots,N,$$

$$z_n \geq 0, \quad k = 1,\ldots,K \},$$

Profit Maximization

$$\Pi\left(p^k, w^k\right) = \max_{(y_m, x_n)} \sum_{m=1}^{M} p_m^k y_m - \sum_{n=1}^{N} w_n^k x_n$$

subject to

$$\sum_{k=1}^{K} z_k y_{km} \geq y_m \,, \qquad m = 1, \ldots, M$$

$$\sum_{k=1}^{K} z_k x_{kn} \leq x_n \,, \qquad n = 1, \ldots, N$$

$$z_k \geq 0, \;\; k = 1, \ldots, K,$$

Profit Maximization with Undesirable Outputs, *b = 1,…,I*

$$\Pi\left(p^k, w^k\right) = \max_{(y_m, x_n)} \sum_{m=1}^{M} p_m^k y_m - \sum_{n=1}^{N} w_n^k x_n$$

subject to

$$\sum_{k=1}^{K} z_k y_{km} \geq y_m \,, \qquad m = 1,\ldots,M$$

$$\sum_{k=1}^{K} z_k b_{ki} = b_i \,, \qquad i = 1,\ldots,I$$

$$\sum_{k=1}^{K} z_k x_{kn} \leq x_n \,, \qquad n = 1,\ldots,N$$

$$z_k \geq 0, \;\; k = 1,\ldots,K,$$

Profit Maximization at the Watershed Level

$$\Pi\left(p^k, w^k\right) = \max_{(y_m, x_n)} \sum_{k=1}^{K} \left(\sum_{m=1}^{M} p_m^k y_m - \sum_{n=1}^{N} w_n^k x_n \right)$$

subject to

$$\sum_{k=1}^{K} z_k^1 y_{km} \geq y_m^1, \qquad m = 1,\ldots,M$$

firm 1

$$\sum_{k=1}^{K} z_k^1 b_{ki} = b_i^1, \qquad i = 1,\ldots,I$$

$$\sum_{k=1}^{K} z_k^1 x_{kn} \leq x_n, \qquad n = 1,\ldots,N$$

$$z_k^1 \geq 0, \qquad k = 1,\ldots,K$$

⋮

⋮

⋮

firm k

Multiple Objective DEA

$\min\ f(SWAT)$ — Environmental outcome at the watershed level

$$\Pi\left(p^k, w^k\right) = \max_{(y_m, x_n)} \sum_{m=1}^{M} p_m^k y_m - \sum_{n=1}^{N} w_n^k x_n$$ — Profit maximization at the farm level

$$\Pi\left(p^k, w^k\right) = \max_{(y_m, x_n)} \sum_{k=1}^{K} \left(\sum_{m=1}^{M} p_m^k y_m - \sum_{n=1}^{N} w_n^k x_n \right)$$ — Program efficiency

subject to

firm 1

$$\sum_{k=1}^{K} z_k^1 y_{km} \geq y_m^1, \quad m = 1,\ldots,M$$

$$\sum_{k=1}^{K} z_k^1 b_{ki} = b_i^1, \quad i = 1,\ldots,I$$

$$\sum_{k=1}^{K} z_k^1 x_{kn} \leq x_n, \quad n = 1,\ldots,N$$

$$z_k^1 \geq 0, \quad k = 1,\ldots,K$$

⋮

firm k

$$\sum_{k=1}^{K} z_k y_{km} \geq y_m, \quad m = 1,\ldots,M$$

$$\sum_{k=1}^{K} z_k x_{kn} \leq x_n, \quad n = 1,\ldots,N$$

$$z_k \geq 0, \ k = 1,\ldots,K,$$

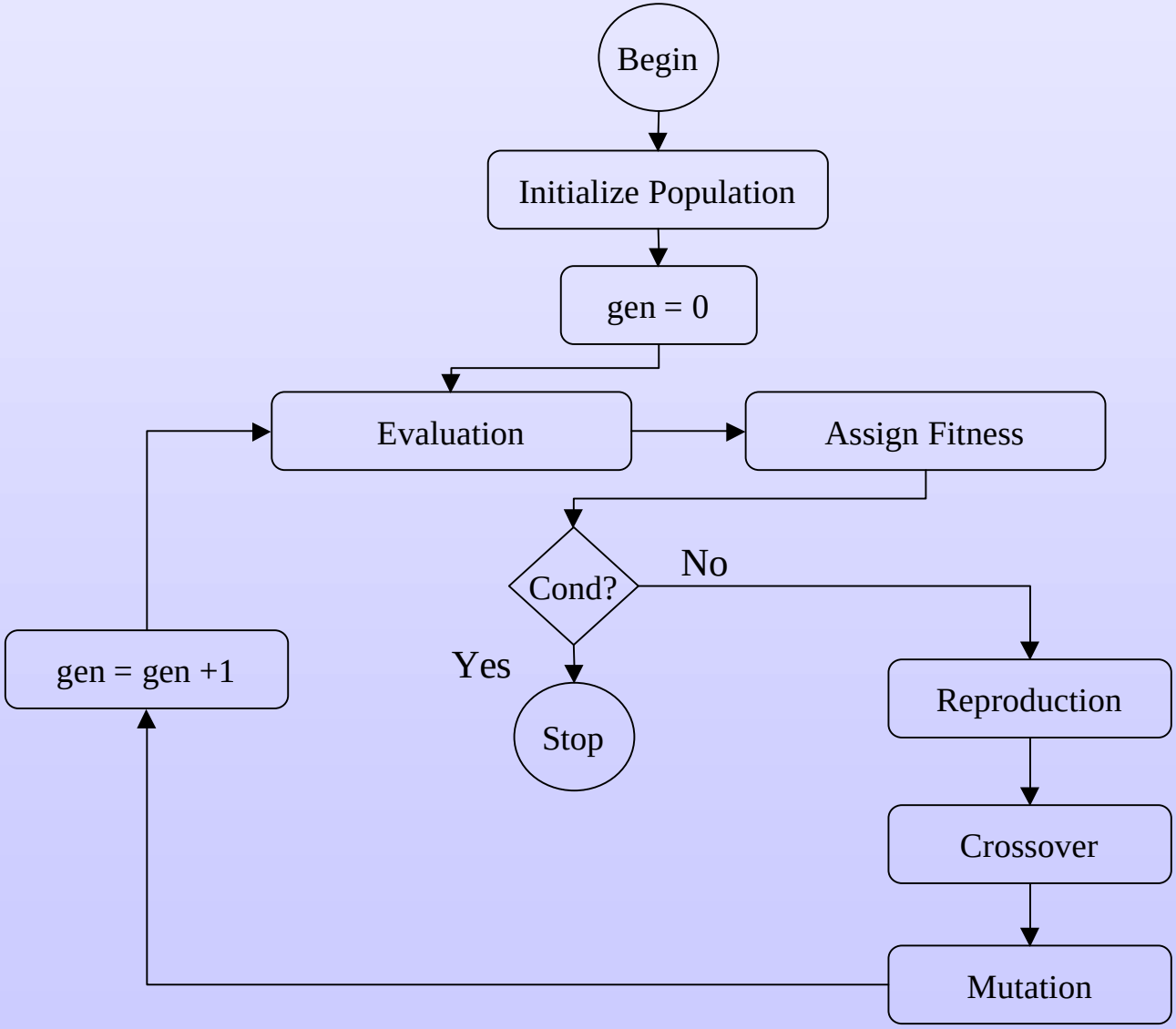
Optimization Methods for Multiple Objectives

Classical methods

- No preference
- Posteriori
- A priori
- Interactive

Evolutionary methods

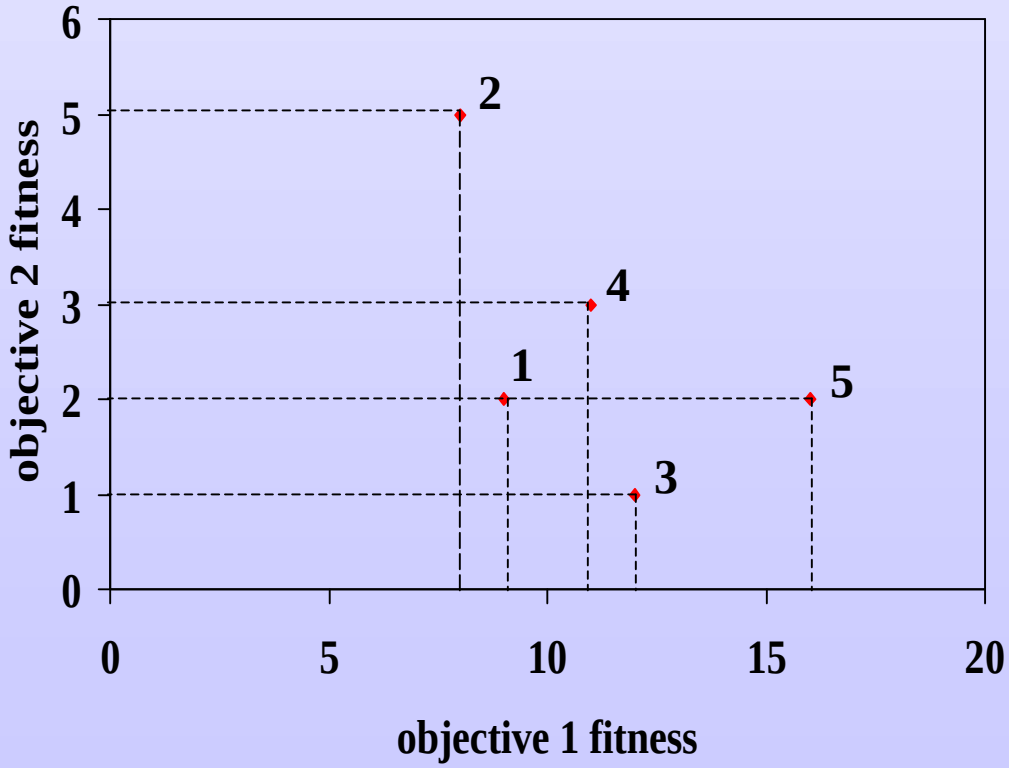
Flowchart of Working Principle of a Genetic Algorithm



Parallelization of Evolutionary Algorithms

- Island Model GA

- Non-dominated Sorting, NSGA II



NFSPRC Beowulf Cluster

- 24 Pentium 4 processors (2.4 GHz) processor, 1 GB of RAM,– 12 with hyperthreading technology
- 24 port, 1 Gbit/s (gigabit/second) ethernet switch
- Integrated INTEL 10/100/1000 Mbps NIC
- 24 ports - KVM switches
- Linux, Fedora Core2, kernel version 2.6.5smp

Cluster Software

OSCAR

Open Source Cluster Application Resources

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OSCAR

OSCAR : Open Source Cluster Application Resources

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OSCAR 3.0 Released !

Download now ! (cache)

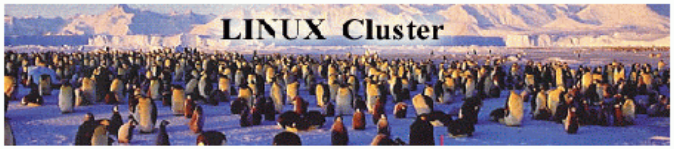
OSCAR version 3.0 is a snapshot of the best known methods for building, programming, and using clusters. It consists of a fully integrated and easy to install software bundle designed for high performance cluster computing. Everything needed to install, build, maintain, and use a modest sized Linux cluster is included in the suite, making it unnecessary to download or even install any individual software packages on your cluster.

OSCAR is the first project by the Open Cluster Group. For more information on the group and its projects, visit its website http://www.OpenClusterGroup.org/ (cache)

OSCAR development is hosted at SourceForge (cache). To see all the nitty-gritty details, visit our SourceForge project page (cache).

Specific items of interest on our SourceForce project page include:

- OSCAR's mailing lists (cache) (including web archives of old messages)
- Software downloads (cache) (distribution tarballs)
- OSCAR's CVS repository (cache)



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OSCAR News

- Repository switch from CVS to SVN
- OSCAR'04 Proceedings
- Ganglia package for OSCAR 3.0
- OSCAR Symposium 2004
- OSCAR on CD released !
- New Web Site
- OSCAR 2.3.1 Released !
- OSCAR 2.3 Released !

Last changes

1) TEAM
2) OSCAROnDebian
3) OscarDevel
4) ToDoWeb
5) SandBox
6) Software
7) OSCAR
8) OSCAROnOpteron
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Implementation of GA

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PGAPack Parallel Genetic Algorithm Library

PGAPack is a general-purpose, data-structure-neutral, parallel genetic algorithm library. It is intended to provide most capabilities desired in a genetic algorithm library, in an integrated, seamless, and portable manner. Key features are in PGAPack V1.0 include:

- Callable from Fortran or C.
- Runs on uniprocessors, parallel computers, and workstation networks.
- Binary-, integer-, real-, and character-valued native data types.
- Full extensibility to support custom operators and new data types.
- Easy-to-use interface for novice and application users.
- Multiple levels of access for expert users.
- Parameterized population replacement.
- Multiple crossover, mutation, and selection operators.
- Easy integration of hill-climbing heuristics.
- Extensive debugging facilities.
- Large set of example problems.
- Detailed users guide.

Availability

PGAPack is available by anonymous ftp from ftp.mcs.anl.gov in pub/pgapack as pgapack.tar.Z.

Documentation

A PostScript version of the PGAPack users manual is available here.

Mailing List

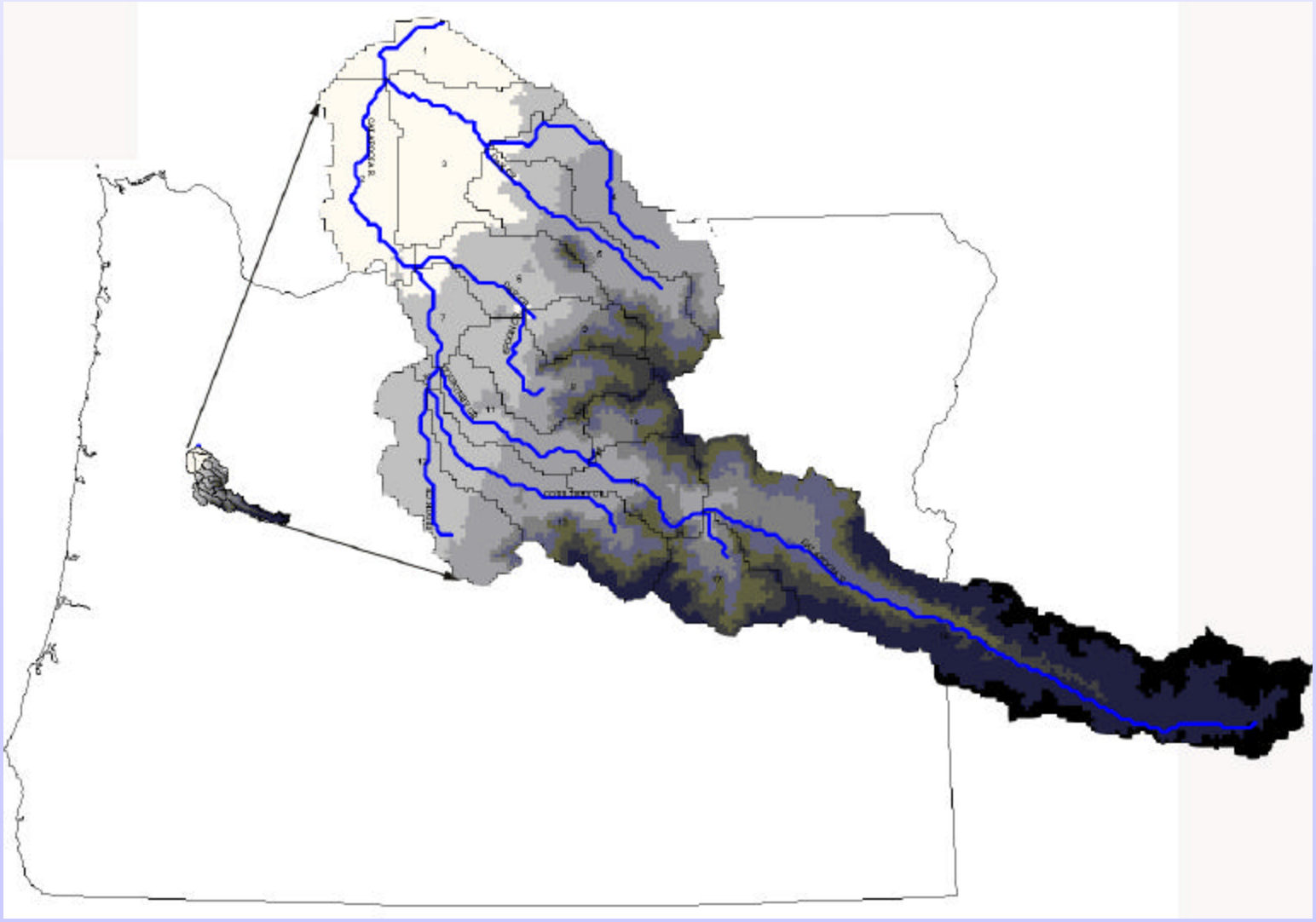
To join the PGAPack mailing list to receive announcements of new versions, enhancements, and bug fixes, send electronic mail to pgapack@mcs.anl.gov. Send bug reports to pgapack-bugs@mcs.anl.gov.

Developers

PGAPack was developed by David Levine of the Mathematics and Computer Science Division at Argonne National Laboratory. Philip Hallstrom, David Noelle, Greg Reeder, and Brian Walenz, participants in Argonne's Science and Engineering Research Semester program, provided significant help.

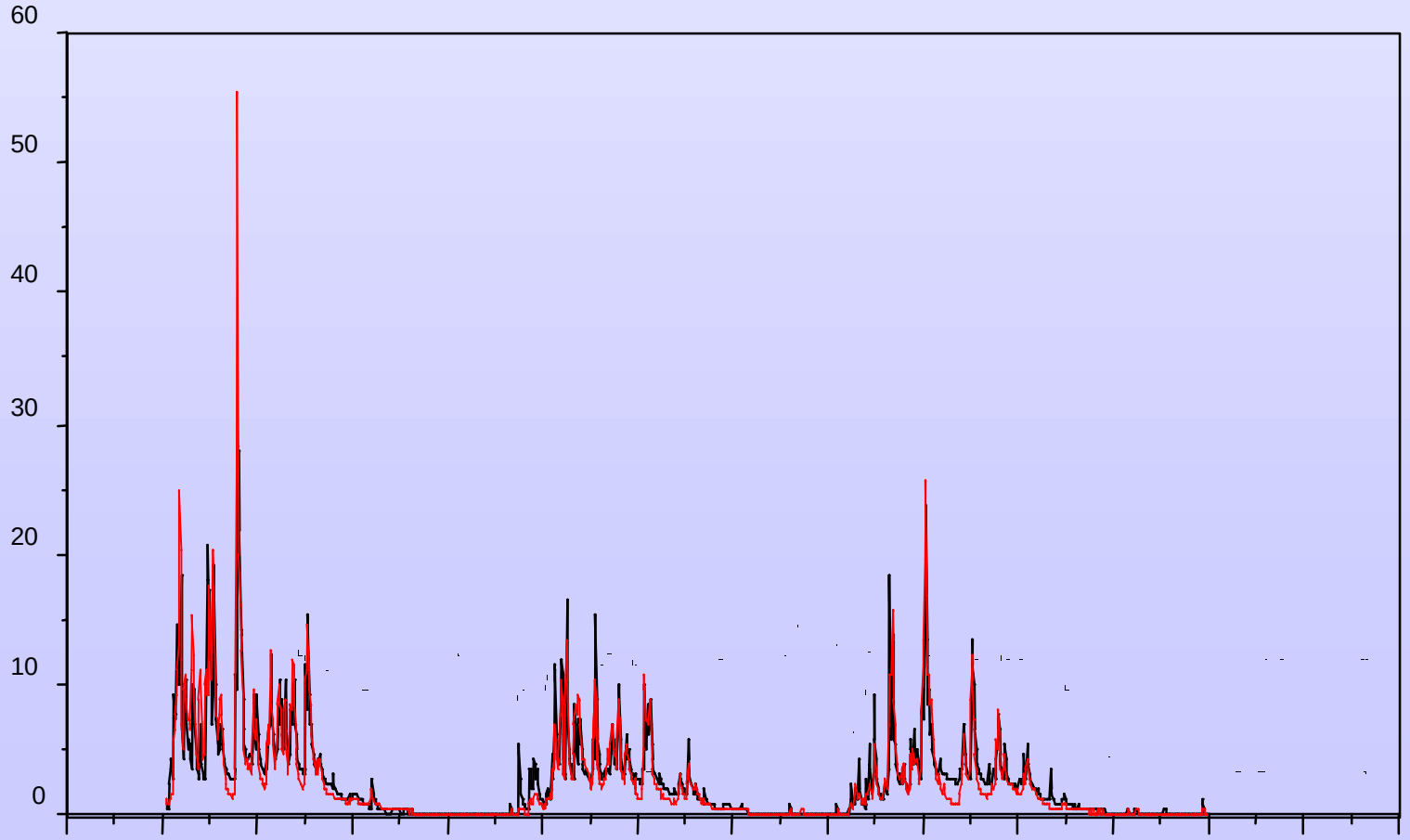
[Account Request | Quad | Denali | Yukon | Tundra | ADSM | Announcements | CCST | MCS]

Location of the Calapooia watershed

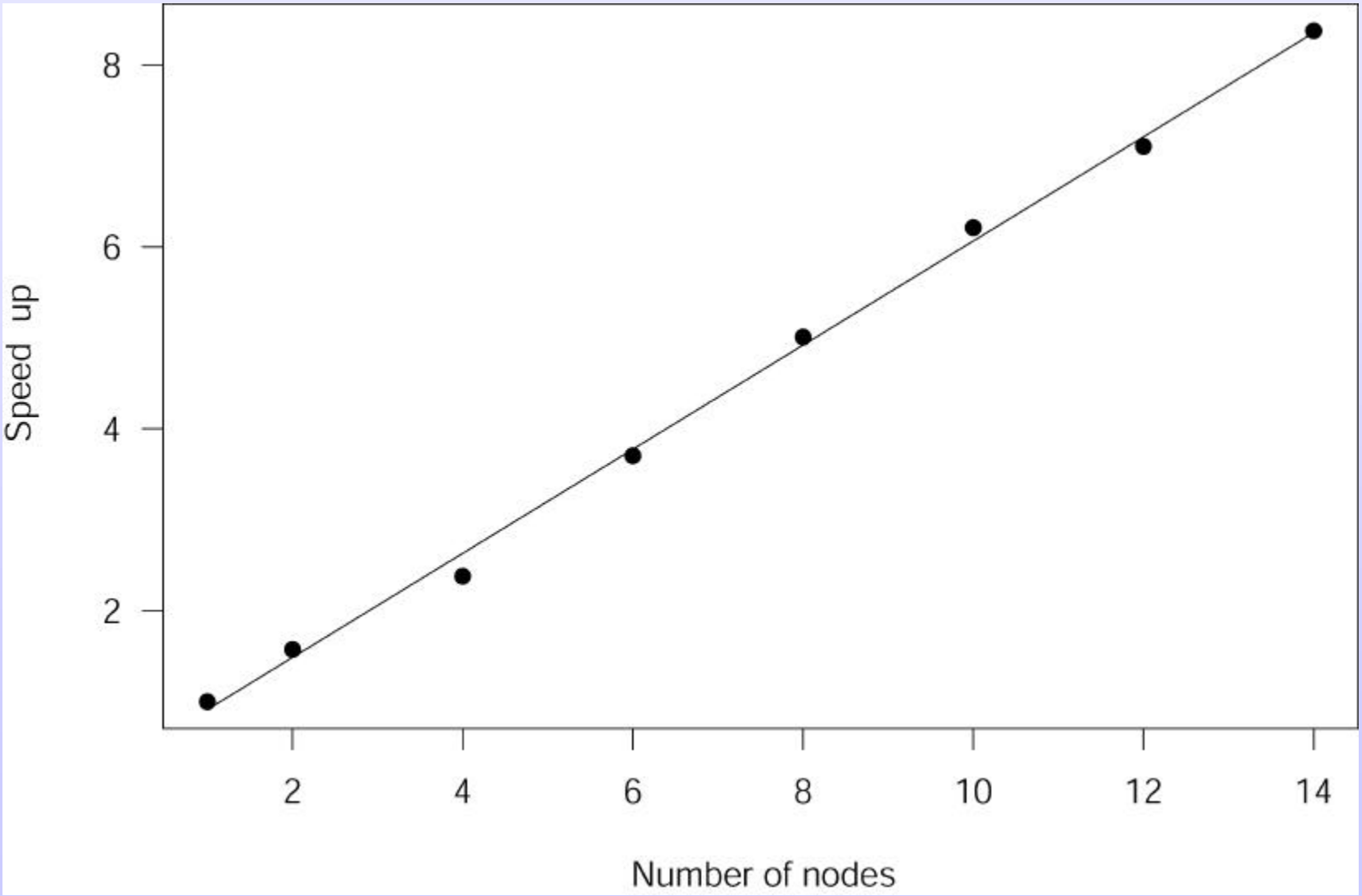


Auto-calibration of SWAT, Stream Flow on the Calapooia River

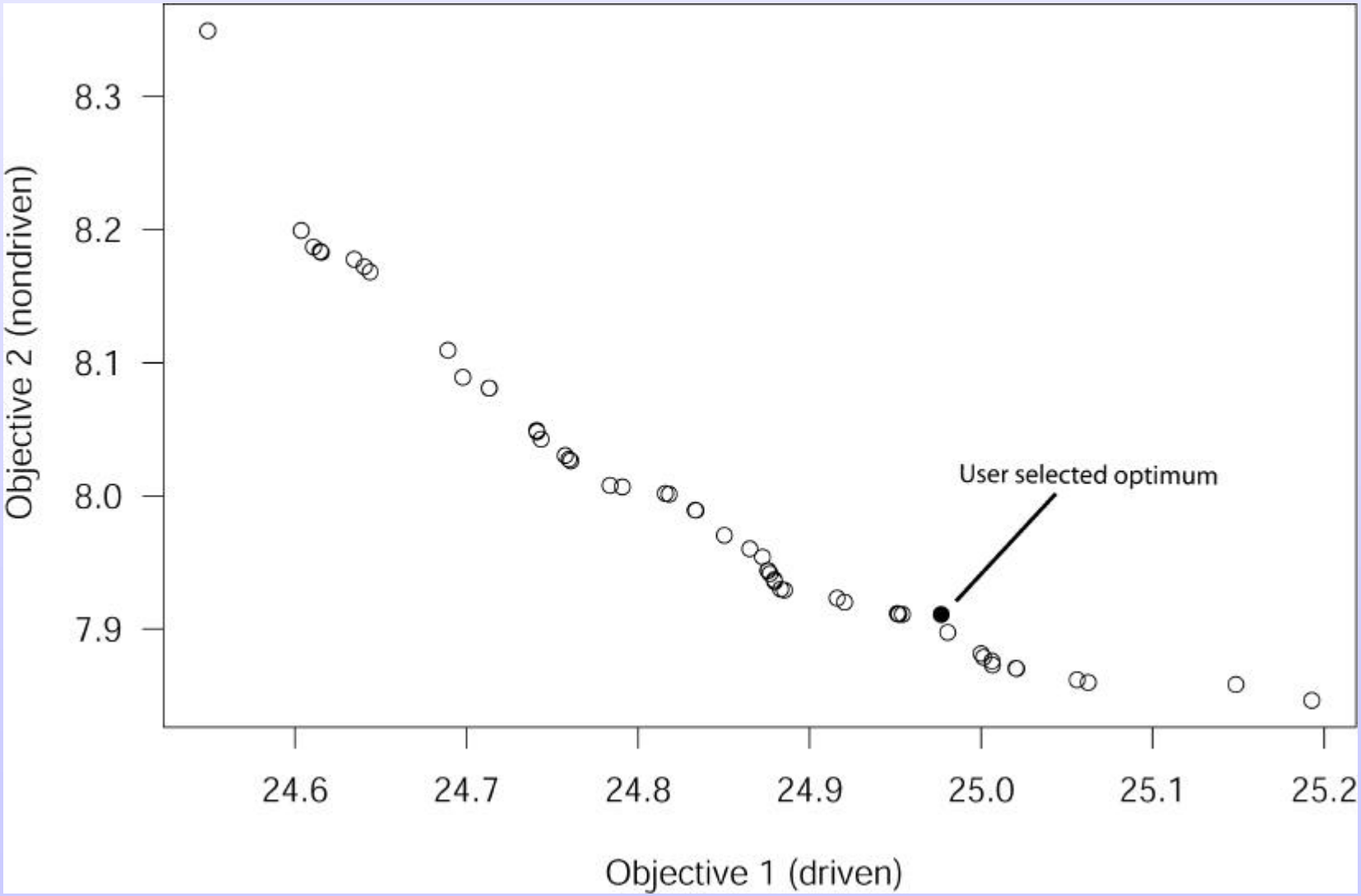
103 Parameters: curve number, gw.revap., etc in 17 sub-watersheds



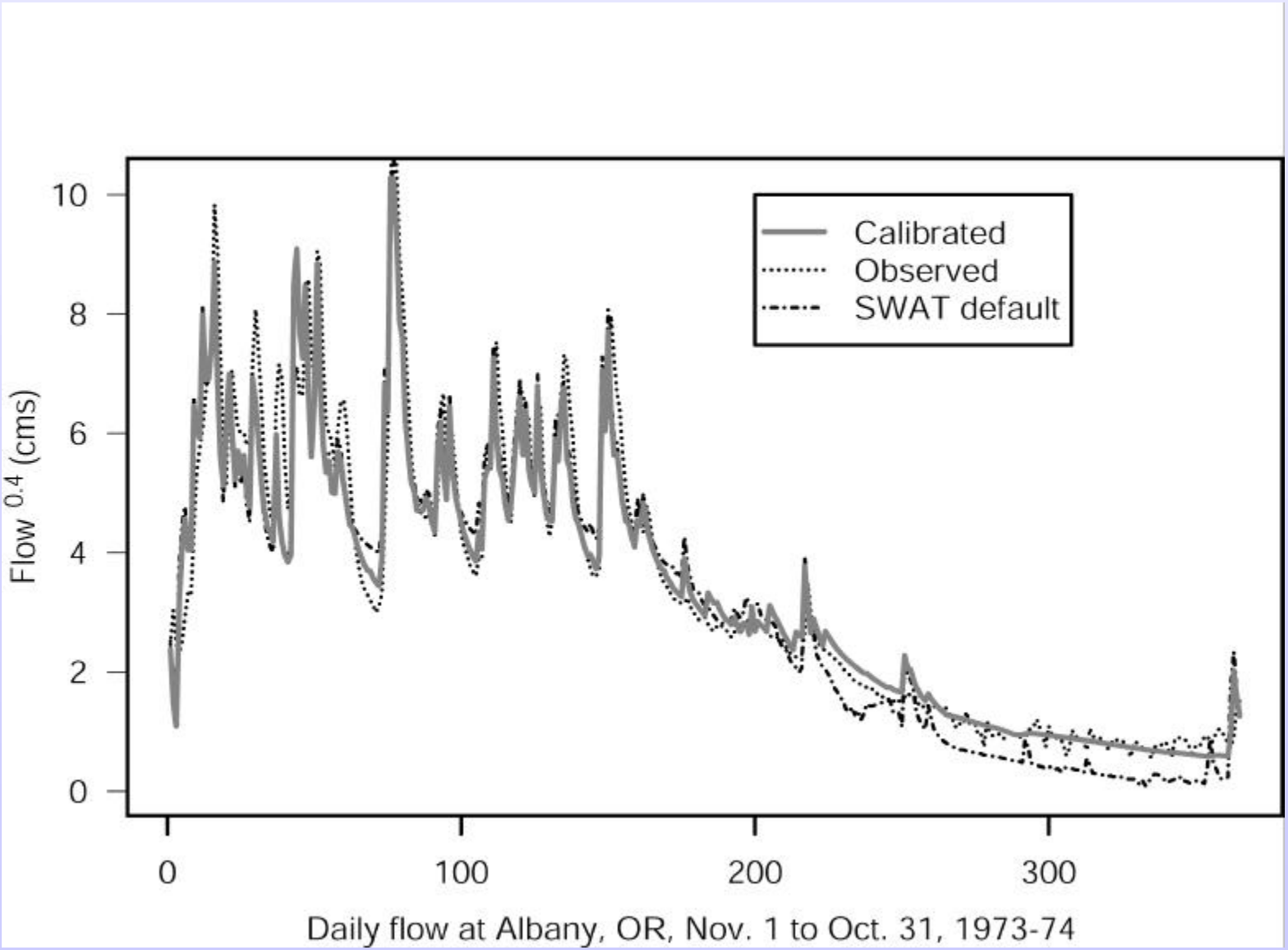
Change in speed of calculation / processor



NSGA-II estimate of the Pareto optimal set for multiple objective minimization of driven and nondriven error



Selection from Pareto optimum set



CEAP-ARS Deliverable

Database of Pareto optimal solutions